Technology in Massachusetts Schools

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"Throughout its history, the Commonwealth has been a leader in education. But our world is changing and so we, too, must change in order to ensure our place at the top for the next generation. The vision our administration has laid out will guarantee that Massachusetts students graduate with the tools to allow them to compete not just on the national stage, but with their peers across the globe."

– Governor Deval Patrick[1]

Introduction

The Board of Elementary and Secondary Education shares the Governor's concern about the need to prepare students for the 21st century economy. Board Chairman Paul Reville underscored the importance of this issue, stating, "We are not currently providing our students with all the skills they need to be successful in a technologically complex, globally competitive world. These skills are sometimes included in the strategies teachers use to address core subjects, but too often they are neglected."[2] In an effort to find ways to better integrate these skills into the public school curriculum, Reville has named more than 20 educators, business leaders and innovators to a 21st Century Skills Task Force. [3]

To provide guidance to schools in preparing students for the 21st century, the Board voted in April of 2008 to approve the *Massachusetts Technology Literacy Standards and Expectations.*[4] To develop these standards, which update the state's 2001 instructional technology standards, the Department of Elementary and Secondary Education worked with the Massachusetts Technology Leadership Council (MTLC), and a team of educators and business partners.

In addition to the technology standards, the state provides a number of other tools to support schools as they move into the 21st century. The Department is developing improved systems to collect, analyze, and report data, which will ultimately allow districts to make decisions about instructional practices that will better meet students' needs. The Department is currently working with 100 districts to implement the initial phase of an Educational Data Warehouse and Reporting System. The Department has secured a statewide software license, making it possible for all public school administrators and teachers to access the Data Warehouse. The long-term goal of this project is to provide a powerful, standardized, and user-friendly system for reporting and analyzing educational data for all Commonwealth school districts.[5]

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[1] Governor Patrick made this statement as he announced Massachusetts' participation in the Partnership for 21st Century Skills; the announcement is available online at: http://www.21stcenturyskills.org/index.php?option=com_content&task=view&id=328&Itemid=64

[2] Full text of Chairman Reville's remarks is available at http://www.doe.mass.edu/news/news.asp?id=4074

[3] Additional details about the task force are available at http://www.doe.mass.edu/news/news.asp?id=4099

[4] The 2008 *Massachusetts Technology Literacy Standards and Expectations* are available at http://www.doe.mass.edu/edtech/standards.html

[5] Further details about the Educational Data Warehouse project are available at http://www.doe.mass.edu/infoservices/dw/

Another initiative, the Education Personnel Information Management System (EPIMS), is completing its first year of statewide data collection from all public school districts and charter schools. EPIMS is helping the Department meet federal and state reporting requirements, perform greatly needed analysis on the state's educator workforce, evaluate current educational practices and programs, and assist districts with their recruiting efforts. The EPIMS data will be loaded into the state Data Warehouse prior to the beginning of the 2008-2009 school year.[6]

To support teaching and learning, the Department provides all districts with access to MassONE,[7] a set of web-based tools for communication, collaboration, and curriculum planning. Since its launch in 2005, MassONE has continued to develop new tools and streamline its operations. In addition, through the Partnership for Online Professional Development (POPD),[8] the Department has offered online courses using MassONE, along with the open source Moodle course management system, to deliver the courses.

Many school districts are using these systems and tools, along with local resources and expertise, to prepare students for the technological demands of the 21st century. According to data submitted by districts in 2007, student and teacher technology literacy has increased, the student-to-computer ratio has improved, and technical problems are being resolved more quickly.

Even though some schools may be doing well, challenges remain in many areas. A closer look at the data reveals that some schools are lagging behind in providing the resources that are needed to help their students thrive in the 21st century. Some elementary schools have only a few computers, making them virtually inaccessible for regular use in instruction. There are also high schools with fewer than one computer for every ten students. In some schools, especially in low-income areas, fewer than one-third of the classrooms connected to the Internet. In addition, many schools' Internet connections may not have sufficient bandwidth to allow teachers to take advantage of the rich online resources that engage students and help them learn. Moreover, an estimated 25% of teachers used technology with their students only occasionally, if at all.

Technology has the power to enhance students' learning, engage them, and ultimately prepare them for the competitive world beyond school. In order to prepare students for their future in this increasingly digital world, it is critical that districts provide a robust technology infrastructure, ample support for the use of technology, and increased professional development for teachers.

This report uses data submitted by districts to gauge our progress as a state in providing the prerequisites for 21st century learning. Individual districts may want to use the report's finding to judge their own progress. Policymakers can use the information to develop strategies to support local districts as they prepare students for their future.

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[6] Further details about EPIMS are available at http://www.doe.mass.edu/infoservices/data/epims/
[7] Information about MassONE is available at http://massone.mass.edu/
[8] Information about the Partnership for Online Professional Development is available at http://www.doe.mass.edu/edtech/grants/fy08/popd.html

Teaching and Learning

"In all sectors of society, the instruments of technology have become essential to research, analyze, evaluate, synthesize, create, and communicate. Massachusetts' students must be prepared to use these instruments in learning science, mathematics and the humanities and how to succeed in a global society facilitated by technology."[9]

Technology Proficiency

Student Technology Literacy

In order to guide districts in preparing students for a technology-driven world, the Department has updated its technology standards for students. Approved by the Board of Elementary and Secondary Education in 2008, the *Massachusetts Technology Literacy Standards and Expectations*[10] define what students should know and be able to do in order to be considered technologically literate.

The technology 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. The standards recommend that students learn technology skills within the context of the curriculum, to enhance their learning of both the technology skills and the subject matter.

Districts were asked to report the percentage of students in grades 4, 8, and 12 who fell into each of three categories: those who had mastered all or most of the skills for their grade span, those who had mastered about half of them, and those who had mastered less than half of them. Because the data in this report is for the 2006-2007 school year, it is based on the 2001 instructional technology standards. The grade spans used were Prek-4, grades 5-8, and grades 9-12.

The most common method used to determine students' levels of technology literacy, used by 54% of districts, was the use of a teacher survey. In addition, 43% of districts used more than one method, including methods such as informal interviews with staff or observations in their computer labs, and a number of districts used more than one method. To obtain more specific data, 37% of districts assessed technology literacy at the individual student level, with approximately half of the districts using a student survey and half of them using some kind of student assessment.

[9] Massachusetts Educational Technology Advisory Council (ETAC), FY 2009 Council Statement, available at http://www.doe.mass.edu/boe/sac/edtech/ .
[10] The *Massachusetts Technology Literacy Standards and Expectations* are available at http://www.doe.mass.edu/edtech/standards.html

Student Technology Literacy *Statewide Averages Based on District Reports*			
	Grade 4 students	**Grade 8 students**	**Grade 12 students**
Have mastered all or nearly all of the skills for their grade span.	52%	59%	61%
Have mastered half or more than half of the skills for their grade span.	31%	29%	28%
Have mastered less than half of the skills for their grade span.	17%	12%	11%

Districts have a special responsibility to help students understand Standard 2, which deals with ethics and safety issues when using technology. Standard 2, the Department's *Local Technology Plan Guidelines*[11] state that districts should have an Acceptable Use Policy regarding Internet and network use. In 2006-2007, 98% of districts reported that they had such a policy, and 93% of districts were providing formal instruction about the responsible use of technology, including ethics and safety issues. In addition, 91% of districts included this policy in their student handbook, while 93% included it on their school or district web site.

Teacher Technology Literacy

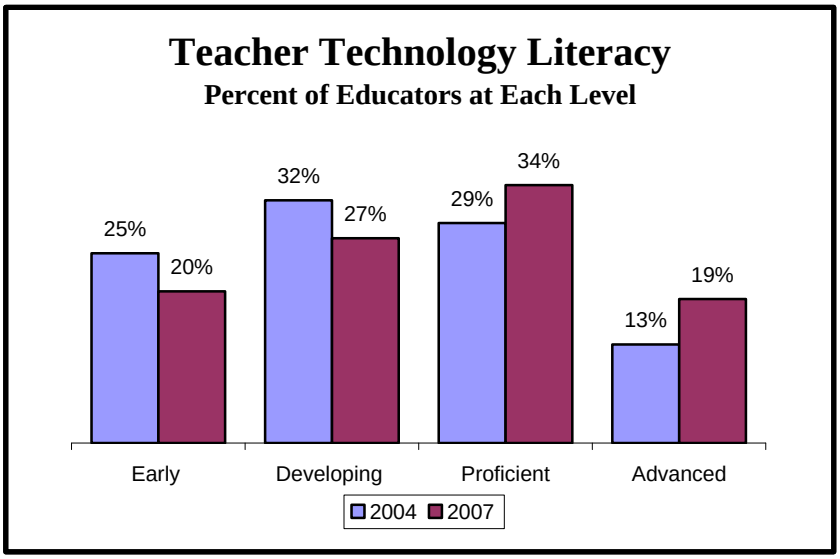
In order to help students become technologically literate, teachers must also be fluent with technology. To help teachers determine their own levels of technology proficiency and determine their need for professional development, the Department provides the online Technology Self-Assessment Tool (TSAT)[12]. This interactive tool, which aggregates teacher data, is available through the Department's MassONE portal. (In order to preserve the privacy of individual users, the MassONE TSAT reports only aggregated data, as opposed to data from individual teachers.) For those who prefer to print out a paper checklist, a PDF file is available on the Department's web site.

Districts were asked to use either the TSAT application or their own methods. In 2006 59% of districts used either the TSAT or a locally developed survey aligned to the TSAT.

[11] The current guidelines are available at http://www.doe.mass.edu/edtech/planning.html .
[12] Information about the TSAT is available at http://www.doe.mass.edu/edtech/standards/sa_tool.html . The Department will update the TSAT in 2008 so that it will align with the new standards for students.

The TSAT has four levels, each of which lists an average of 25 skills. The four levels were created to align with the levels in the Massachusetts STaR Chart[13], a tool that helps districts assess their readiness to use technology to improve student learning.

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. A teacher's level is defined as the level where the teacher needs to stop and learn those skills. As the graph and table below illustrate, there has been considerable progress in teacher technology literacy since the TSAT was first used in 2004. The number of teachers who are at the Early Technology level has decreased, while the number at the Advanced level has increased. This is good news, because it means that more teachers will be able to help their students develop the 21st century skills they need.



Teacher Technology Literacy

Percent of Educators at Each Level

Level	2004	2007
Early technology	25%	20%
Developing technology	32%	27%
Proficient	29%	34%
Advanced	13%	19%

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

With students increasingly using the Internet both at school and in the community, educators need to teach them about the potential risks associated with being online. In order to do this, educators themselves need to be informed. In 2006-2007, 89% of districts reported that they provide formal instruction to staff about the responsible use of technology, including ethics and safety issues.

Use of Technology

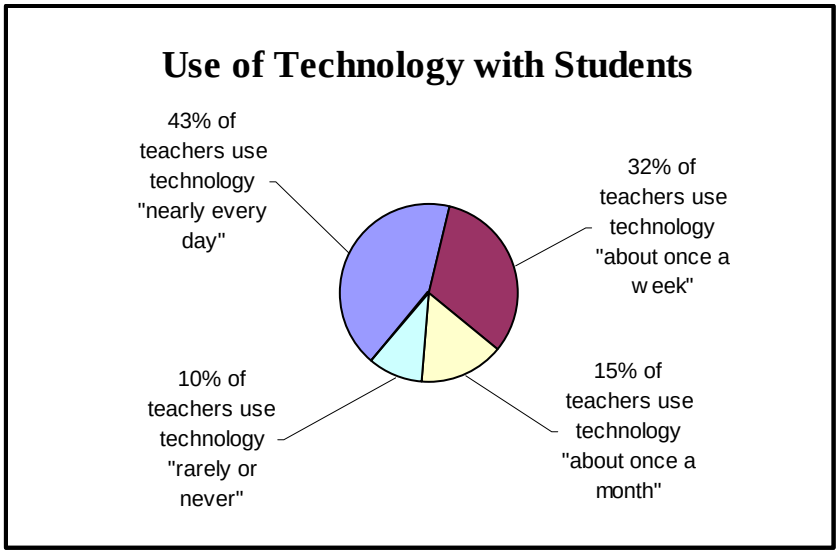
In order for students to master the technology skills they need, students must have frequent opportunities to practice what they are learning. The Educational Technology Advisory Council (ETAC) points out another reason to use technology: "Technology has created a vast new landscape of teaching and learning potential both in and out of schools. Teaching with technology creates many new opportunities for differentiated instruction that meet the needs of all students, regardless of ability."[14]

Teacher Use of Computers with Students

The Department's technology guidelines recommend that at least 85% of teachers use technology each week with their students.[15] According to the data submitted by districts, the percentage of teachers using technology with their students "about once a week" or more was about 75%, a modest increase since 2006. The percentage of teachers using technology on a daily basis with students also appears to have increased slightly, from 41% to 43%.

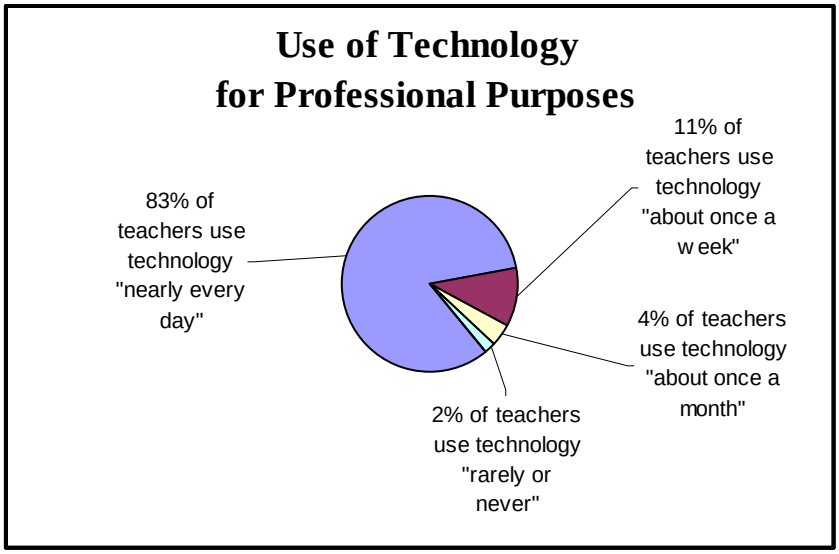
To gauge technology use, 32% of districts used the Department's Teacher Technology Use Survey,[16] while two-thirds of districts used the survey along with one or more other methods. These methods included things like local surveys, informal observation, and network usage.

[14] Massachusetts Educational Technology Advisory Council (ETAC), FY 2009 Council Statement, available at http://www.doe.mass.edu/boe/sac/edtech/ .
[15] The *Local Technology Plan Guidelines (School Year 2007-2008 through 20010-2011)* are included in the Appendix of this report. They are also available at http://www.doe.mass.edu/edtech/planning.html .
[16] The Teacher Technology Use Survey is available at http://www.doe.mass.edu/edtech/techplan/ .



Use of Technology with Students *Statewide Averages Based on District Reporting*	
Frequency	**Percent of teachers**
Used technology nearly every day	43%
Used technology about once a week	32%
Used technology about once a month	15%
Use technology rarely or never	10%

The Department's 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 2006 show that 83% of teachers used technology professionally every day, up from 79% last year.



Use of Technology for Professional Purposes *Statewide Averages Based on Districts' Estimates and Surveys*	
Frequency	**Percent of teachers**
Used technology nearly every day	83%
Used technology about once a week	11%
Used technology about once a month	4%
Used technology rarely or never	2%

Assistive Technologies and Universal Design

Technology offers many ways to assist students with disabilities, including learning disabilities.[17] For example, text-to-speech software allows students to hear text read on the computer. Word processing software is helpful to students who have difficulty writing with a pencil or pen.

[17] For more information, see the *Assistive Technology Guide for Massachusetts Schools*, available at http://www.doe.mass.edu/edtech/assistive/ATguide.pdf

Accommodations for the MCAS

A number of students with disabilities have been using assistive technologies to take the MCAS. In order to use these testing accommodations, a student's IEP or 504 team must determine how the student will participate in the MCAS and document this information in the student's IEP or 504 plan. Also, it is important that the student use the accommodation routinely during classroom instruction assessment in the subject. 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 use of word processors for students who have difficulty writing and the use of text-to-speech software for students who have difficulty reading.

Use of Assistive Technology on the MCAS

Number of Students Using the Accommodation

MCAS Test	Word processor	Text-to-speech
ELA-Composition	5145	155
ELA-Reading or Language and Literature	6995	435
Mathematics	3652	249
Science and Technology/ Engineering	2449	137

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 2007, electronic portfolios were submitted for 564 students.

[18] *Requirements for the Participation of Students with Disabilities in MCAS* is available at http://www.doe.mass.edu/mcas/participation/?section=sped

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

Resources for Providing Accessible Instructional Materials

In 2006 Massachusetts signed on to participate in the new National Instructional Materials Access Center (NIMAC), a repository of digital textbook files. The NIMAC was established through the Individuals with Disabilities Education Act to help school district provide instructional materials to students with disabilities in a timely manner. All of the files in the NIMAC conform to the National Instructional Materials Accessibility Standard (NIMAS), which provides a common digital format that can be converted into Braille, large print, audiobooks, and e-text. School districts in Massachusetts and across the country are helping build this national repository by stipulating in their contracts with textbook publishers that digital files be sent to the NIMAC.[20]

Because NIMAS files are XML source files, they need to be converted before students can use them. The following organizations will coordinate the conversion of NIMAS files into student-ready formats for Massachusetts school districts: the state's Accessible Instructional Materials (AIM) Library, Recording for the Blind and Dyslexic, and Bookshare. Because the use of NIMAS-derived materials is limited by law to students with a documented print disability in their IEP plan, districts need to submit proof of student eligibility before requesting materials.[21]

In 2007, Massachusetts joined with CAST (the Center for Applied Special Technology) and 14 other states to participate in the Accessible Instructional Materials (AIM) Consortium.[22] Through this consortium, organized by CAST and funded by a federal grant, Massachusetts is receiving funding[23], technical assistance, and an opportunity to collaborate with other states on how to best provide accessible instructional materials, including NIMAS-derived materials, to students with disabilities. Massachusetts is using its share of the funding to provide professional development and outreach to educators.

Use of MassONE

Use of MassONE continues to grow, with 155,353 user accounts as of May 2008. This represents a 41% increase since March 2007. Currently, 35% of the accounts are held by educators, while 65% are held by students.

MassONE offers a suite of tools and resources, which schools are using in various ways. For example, some educators use the discussion forums, virtual hard drive, and drop box to enable students to communicate, collaborate, and submit assignments online. Other educators also use the lesson plan tool, the searchable curriculum standards database, and the survey creation tool to enhance their instruction.

Plans are underway to incorporate a new curriculum tool into MassONE. In 2007, the Department received a federal grant, in partnership with CAST, to develop an online

[20] Additional information about NIMAS and the NIMAC is available at http://www.doe.mass.edu/edtech/assistive/nimas.html

[21] Detailed information on ordering NIMAS-derived materials for students is provided on the Department's web site (http://www.doe.mass.edu/edtech/assistive/nimas.html).

[22] Additional information about the AIM Consortium is available at http://aim.cast.org/

[23] The funding allocated to Massachusetts for state-specific activities is $166,666.

application designed to improve middle school students' writing.[24] The application is currently being tested in two middle schools in Springfield and Taunton. Once it has been successfully tested, the Department plans to make the application available to all Massachusetts schools through the MassONE.

Approximately one-third of the reporting districts are making use of MassONE's Technology Self-Assessment Tool to gauge teachers' need for technology professional development. As the next section of this report explains, educators are also using MassONE's tools to take part in online professional development courses.

[24] Information about this project is available at http://www.doe.mass.edu/news/news.asp?id=3517 .

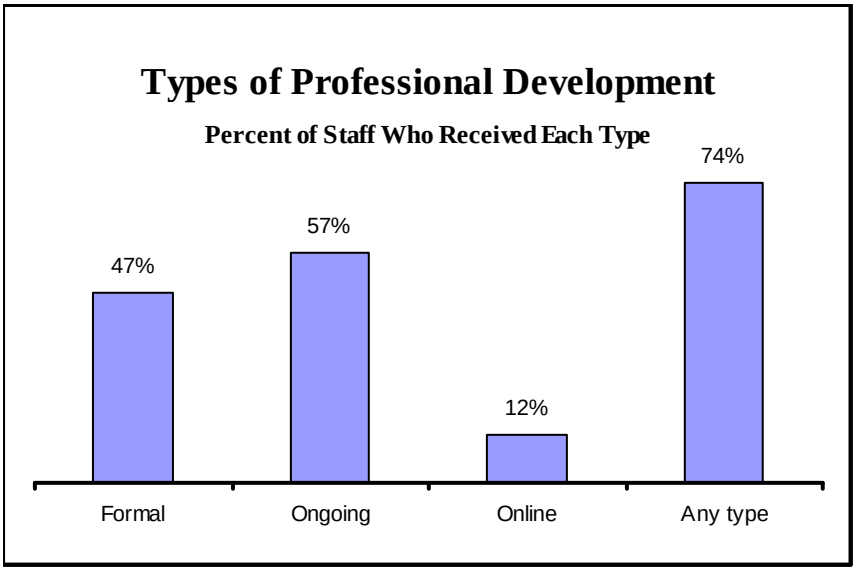
Educator Professional Development

According to numerous studies, technology is likely to impact student learning only when teachers receive adequate and appropriate professional development[25]. Massachusetts districts are addressing the need for technology professional development, reporting, on average, that 74% of their teachers received some type of technology training in 2006-2007.

Types of Technology Professional Development

Districts indicated that nearly 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 technology professional development such as coaching and co-teaching. This use of ongoing professional development 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."

Although the percentage of educators receiving online professional development is still less than those receiving other types, 80% of districts reported some use of online professional development.



[25] From *The Learning Return on Our Educational Technology Investment: A Review of Findings from Research*, WestEd, 2002; available at http://www.wested.org/online_pubs/learning_return.pdf .

Types of Technology Professional Development Received	
Professional development type	**Percent of staff who received it**
Formal professional development	47%
Ongoing professional development	57%
Online professional development	12%
Any type of professional development	74%

Use of MassONE for Professional Development

Since 2006, the Department of Education has used MassONE for various professional development initiatives, which included topics in special education, curriculum, and technology. While some of these courses were taught exclusively online, others combined face-to-face meetings with online collaboration and resource sharing.

Partnership for Online Professional Development

Through the Partnership for Online Professional Development (POPD), eight districts received grants through Title IID to work with curriculum specialists and online learning experts, in cooperation with the Department, to develop and teach online courses through MassONE.[26] These districts are piloting the use of Moodle, an open source[27] course management system, within the MassONE environment. Moodle has an easy-to-use system that allows online instructors to upload, edit, and manage their course content. It also offers a number of tools that instructors can use in teaching their courses, including discussion forums, a quiz creation tool, a personal journal, a grade book, a calendar, and a drop box for assignments. Moodle has the advantage of a large user base (more than 18 million users in 196 countries) and a large group of developers around the world who contribute to its development and maintenance.

More than 300 educators have benefitted from the POPD courses. In the fall, approximately 150 educators took online courses on topics in science, mathematics, and English language arts. In the spring, 50 of these educators received training in methods for teaching online. In the summer of 2008, approximately 200 educators are taking online courses taught by instructors who completed the project's training in online teaching methodologies. The project's spring 2008 evaluation report[28] indicates that the

[26] Additional information about the Partnership for Online Professional Development is available at http://www.doe.mass.edu/edtech/grants/fy08/popd.html

[27] 'Open source" resources like Moodle save money because they do not involve license fees.

[28] The complete report is available at http://www.doe.mass.edu/edtech/grants/fy08/popd.html .

vast majority of educators were pleased with the quality online courses. In addition, they liked the opportunity to share ideas with educators from other schools

Project FOCUS Academy

In 2006, Project FOCUS Academy, a professional development project focusing on the education of students with disabilities, began offering online courses through MassONE. The goal of this federally funded project was to help ensure successful post-secondary outcomes for students with disabilities. More than 100 participants from nine high schools participated in three semesters of graduate-level courses. Participants included classroom teachers, special education teachers, parents, and other district personnel. Although the courses were conducted primarily online, face-to-face meetings were used for the first and last classes to help reinforce the feeling of community.[29]

In 2007-2008, two online courses focusing on post-school outcomes were offered as part of a new, five-year federal grant called the Massachusetts Focus Academy. The titles of the courses were (1) Youth Development and Self-Determination and (2) Transition Topics. In post-course surveys, the vast majority of participants said that they would recommend the course to others. In addition, most of the participants reported that the course they took was having an impact on their work with students. The overall intent of the Massachusetts Focus Academy is to build a system of professional development that is accessible throughout the state. Educators and family members across the state will be able to access the online training, which will also include face-to-face opportunities.

Thinkfinity

Thinkfinity is a comprehensive program that provides teachers with over 55,000 online educational resources, including standards-based, grade-specific, K-12 lesson plans and interactive tools and materials. MassONE's lesson plan tool offers links to Thinkfinity, so that teachers can create customized lesson plans incorporating its resources.

A $65,000 grant from the Verizon Foundation is making it possible to create a statewide network of Thinkfinity trainers, who can then provide professional development to others. The grant also provides resources to validate the alignment of Thinkfinity resources with the Massachusetts Curriculum Frameworks.[30]

[29] Information about Project FOCUS Academy is available at http://www.doe.mass.edu/sped/projectfocus/
[30] Information about the Massachusetts Thinkfinity Partnership is available at http://www.doe.mass.edu/edtech/teacher/thinkfinity.html

Infrastructure for Technology

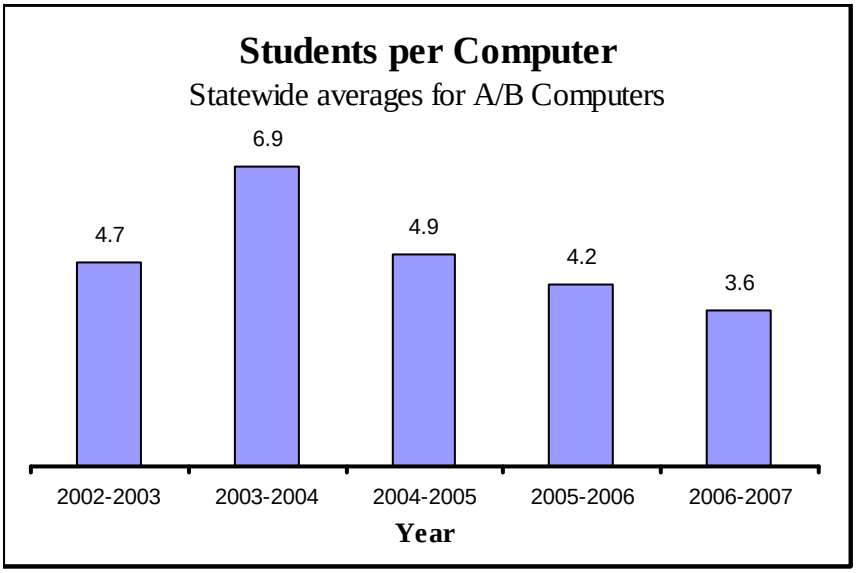
In order to support teachers as they prepare students for the 21st century, districts need to provide a robust technology infrastructure and ensure its reliability to maximize educational uptime. In Massachusetts, districts can use the Department's technology guidelines to assess their performance in these areas.[31]

Computers

The Department's guidelines recommend that districts maintain a ratio of fewer than five students per high-capacity Internet-connected computer. In 2007, the ratio of students to high-capacity computers dropped from 4.2 to 3.6.

At the time this data was reported (2007), Type A and B computers were considered to be "high-capacity computers." 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).

As the graph and table below illustrate, the ratios have been improving since 2004, when Department updated its computer specifications for high-capacity computers.



[31] The *Local Technology Plan Guidelines (School Year 2007-2008 through 2010-2011*) are included in the Appendix of this report; they are also available online at http://www.doe.mass.edu/edtech/planning.html

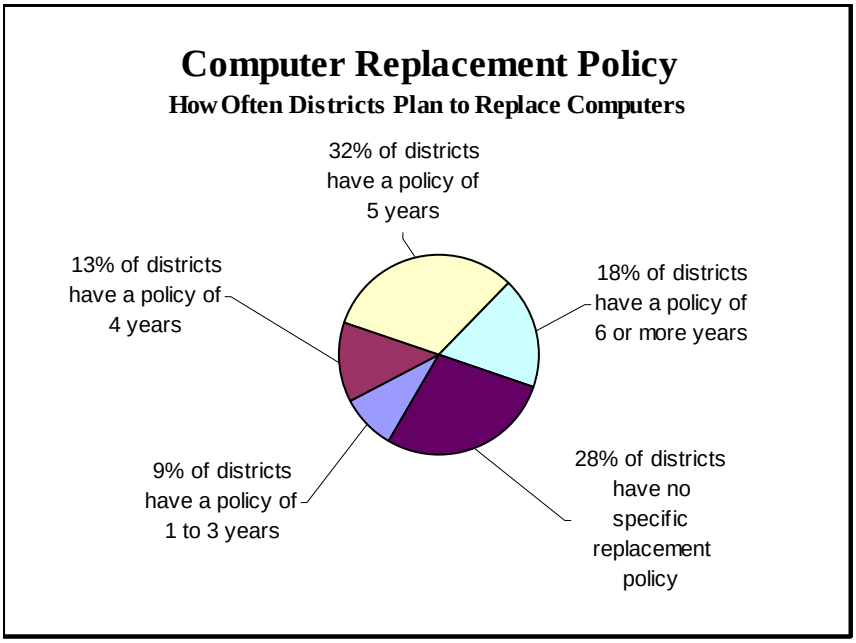
Students per Computer *Statewide Averages for A/B Computers*	
School year	**Ratio of students to computers**
2002-2003	4.7
2003-2004	6.9
2004-2005	4.9
2005-2006	4.2
2006-2007	3.6

The Department updated its computer specifications in 2008. To develop the new specifications, the Department drafted new specifications, asked technology directors from 385 districts to respond to them through an online survey, and then analyzed the feedback from the 82 technology directors who took the survey. The new specifications will be used in collecting technology data in the fall of 2008. At that time, the ratio of students to computers will rise if districts have not updated their inventories.

Having up-to-date computers and software is important for schools. Newer software applications, which are often more intuitive and engaging for students, generally require the use of newer computer operating systems and web browsers. Typically, older computers are not powerful enough to handle these new systems. Also, developers of technology products eventually stop supporting older operating systems, because it is not cost effective.

For school administrators, using older technology may result in difficulty accessing some of the Department's applications for submitting or accessing data. For teachers and students, older systems may preclude the use of some of the most innovative and engaging technology products, such as streaming video collections, interactive curriculum materials, and applications to assist students with disabilities.

In order to plan for the expenditures needed in order to provide up-to-date computers, it is a good idea to have a computer replacement policy. The percentage of districts that have such a policy has risen over the past year from 66% to 72%. The average replacement cycle for those districts was 4.9 years. It should be noted that in lean budget years, districts may have difficulty implementing these policies. The Department's 2008 data collection, which will use the recently updated computer specifications, will show how well districts are managing this challenge.



Computer Replacement Policy *How Often Districts Plan to Replace Computers*	
Replacement cycle	**Percent of districts**
2 to 3 years	9%
4 years	13%
5 years	32%
6 or more years	18%
do not have a policy for replacement	28%

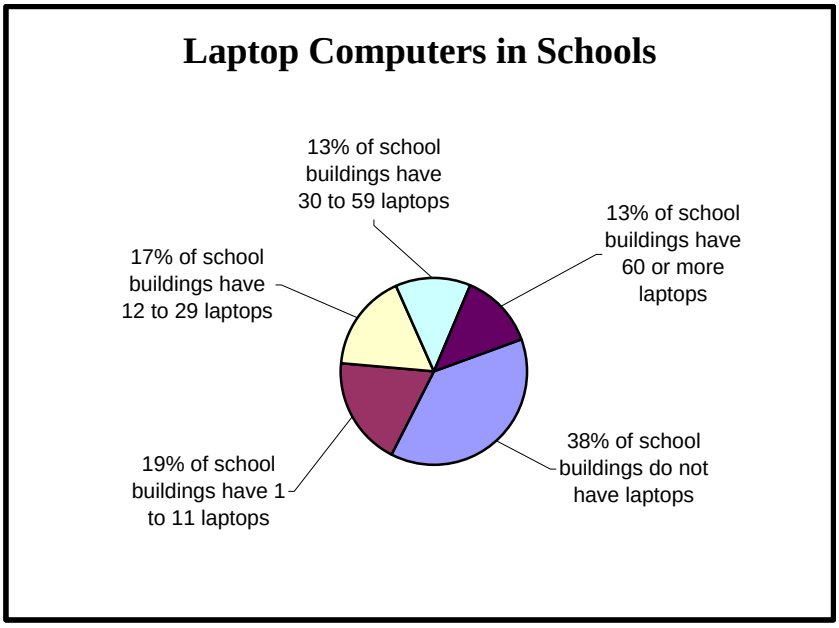
Laptop Computers Used for Instruction

Because of the convenience that laptop computers offer, their use continues to grow. Over the past year, there was an increase of more than 20% in the number of instructional laptops in schools across the state, according to the data submitted to the Department by districts.

Laptops offer the advantage of anytime, anywhere learning. For example, if students need to collect environmental data for a science project, they can take the laptops outdoors. If

they need to complete a project over the weekend, students can take a laptop home, providing their school allows it.

Since they are movable, laptops provide a way that schools can increase access to computers. Instead of building additional computer labs, many schools are investing in "mobile laptop labs," carts that can be moved from classroom to classroom as needed. When they are not in use, the carts offer a place to securely store and charge the computers. As the graph and table below illustrate, 26% of school buildings were equipped with 30 or more laptop computers, making it possible to equip one or more classroom at a time with laptops.



Laptop Computers in Schools	
Number of laptops in school	**Percent of school buildings**
none	38%
1 to 11	19%
12 to 29	17%
30 to 59	13%
60 or more	13%

Wireless

With an increased number of laptop computers in schools, the use of wireless connectivity has also grown. In 2006, 839 school buildings had wireless connectivity, while in 2007, 1085 (or 62% of the total schools reporting) had it. Moreover, 67% of the buildings with laptop computers offered wireless connectivity for all of the laptops.

Connectivity

Districts continue to make progress in connecting their classrooms to the Internet. In 2007, 91% of districts reported that all of their classrooms were wired, which is up from 87% in the previous year. In addition, the average district had 99% of its classrooms and 97% of its computers connected to the Internet.

Average Connectivity in Districts

School Year	Percent of classrooms connected
2002-2003	94%
2003-2004	97%
2004-2005	98%
2005-2006	99%
2006-2007	99%

Although the data suggest that most schools have high-speed connections, some of these connections may not be adequate for 21st century teaching and learning. Depending on how many computers are accessing the Internet simultaneously, a school's connection may not be sufficient to provide the needed access speeds. Moreover, according to a new national report from the State Educational Technology Directors Association (SETDA)[32], "schools will need to significantly upgrade their systems in order to keep pace with what children are accustomed to at home."

It is also worth noting that 29% of schools are connected to the Internet through their district's wide area network. As a result, users in all of the district's schools are sharing an Internet connection. In several urban districts, for example, more than 2,000 computers are sharing a connection, which may prevent them from accessing some of the rich online resources that are so beneficial in teaching and learning. Districts need plan for current needs and future growth as they build their networks, as well as when they purchase additional computers to connect to existing networks.

[32] The report is available at http://www.setda.org/web/guest/class2020actionplan .

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. No Child Left Behind has encouraged states and school districts to make use of data systems to support high quality, targeted instruction by providing cost-effective, timely information to administrators and educators.

Education Data Warehouse and Reporting System

Improving educational performance and accountability depends on understanding the relationships among areas such as curricula, assessments, special programs, teacher qualifications, program spending, discipline incidents and attendance. To leverage the full potential of the information that is collected, the Department and district decision-makers need to be able to link and analyze the data.

In order to take advantage of the rich data sets that are available, the Department is implementing a statewide Education Data Warehouse and Reporting System for use by district and Department staff. The system is structured to maintain large amounts of historical data for analysis and reporting. It is capable of linking student and teacher information over multiple years, across multiple schools and districts. Using the warehouse, Department and district leaders can take key metrics from multiple areas and analyze them in a single view. For example, districts will be able to perform analyses to determine which programs have the greatest impact on specific student groups.

Current status

The initial phase of the project involves over 100 districts. The Department has loaded six years of SIMS (student) and MCAS data into the system for all school districts. Participating districts are currently using the system's web-based tools to analyze and generate reports using their district data.[33]

In addition, some of the participating districts have loaded their own data into the system, including local assessment data, student grades, and staff data. This enables the districts to generate reports correlating their local data to SIMS and MCAS. For example, the districts can find out if students' MCAS scores are related to scores on local assessments, as well as to the students' grades. Districts are also able to select cohorts of students, such as low-income students or limited English proficient students, and follow their academic progress over time.

The Department has secured a statewide software license for the data warehouse, allowing all public school educators and policy makers in the Commonwealth to access it. The state is covering the costs of the software licenses and centralized hosting of the warehouse. Districts will need to cover the costs of training for staff who will use the data

[33] Information about the Data Warehouse project is available at http://www.doe.mass.edu/infoservices/dw/

warehouse. In addition, there may be costs associated with the loading of data from the local data systems into the data warehouse, such as creating data extracts from local systems, and any staff time need for data cleanup

The state will pay for the ongoing software maintenance for the warehouse licenses. In addition, the state is using federal funding to support the development of professional development materials and activities so that school districts will be able to take advantage of this resource.

Education Personnel Information Management System

The Department's first statewide Education Personnel Information Management System (EPIMS) collection opened in October of 2007. EPIMS collects demographic data and work assignment information on individual public school educational staff and has replaced the DSSR (District School Staffing Report), which reported similar information on an aggregate basis. The EPIMS data will enable Massachusetts to comply fully with the No Child Left Behind Act by accurately reporting on highly qualified teachers. EPIMS data also will be used to perform greatly needed analysis on the state's educator workforce that, over time, will identify high need areas, evaluate current educational practices and programs, and assist districts with their recruiting efforts.

Currently, EPIMS data is being loaded into the NCLB Report Card Assistant for district use. The data is also being loaded into the Education Data Warehouse and Reporting System, enabling districts to use their own EPIMS data, together with SIMS and MCAS data, for analysis and reporting. Efforts are also underway to connect the EPIMS database to ELAR, the Education Licensure and Recruitment database. Detailed information about the EPIMS data collection is available on the Department's web site,[34] and Department staff are available to assist districts in complying with this significant data collection project.

The Future

The long-term goal of these initiatives is to provide a powerful, standardized, and user-friendly system for reporting and analyzing education data for all school districts at a substantially reduced cost. The Department will gradually expand participation in the data warehouse until every school district is included.[35]

The Data Warehouse will eventually capture data on every class offered in every public school, along with information about the teacher who teaches the class. Local decision makers will be able add their own data to see how student performance is affected, for example, by professional development or the adoption of new curricula. With the availability of the EPIMS data, district leaders will be able to analyze the impact of individual teachers and the types of training they have had.

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[34] Further information about EPIMS is available at http://www.doe.mass.edu/infoservices/data/epims/

[35] For information on participating in the Educational Data Warehouse project, districts can write to datawarehouse@doe.mass.edu

Planning, 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. The Department's technology guidelines provide recommendations that can help districts in developing their technology plans.[36]

A state-approved technology plan is a requirement for eligibility for Title IID technology grants and E-rate discounts. To receive approval from the Department, a district must first develop a three- to five-year plan. The Department strongly recommends that this plan be posted on the district web site. Additionally, the district must submit data to the Department annually to validate its implementation of the plan. For the school year 2006-2007, 328 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 Department's technology guidelines incorporate the requirements for the federal E-rate discount program.[37] 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.

Safety and Security

In order to be eligible for technology funding under Title IID and E-rate, districts also need to certify that they have complied with the Children's Internet Protection Act

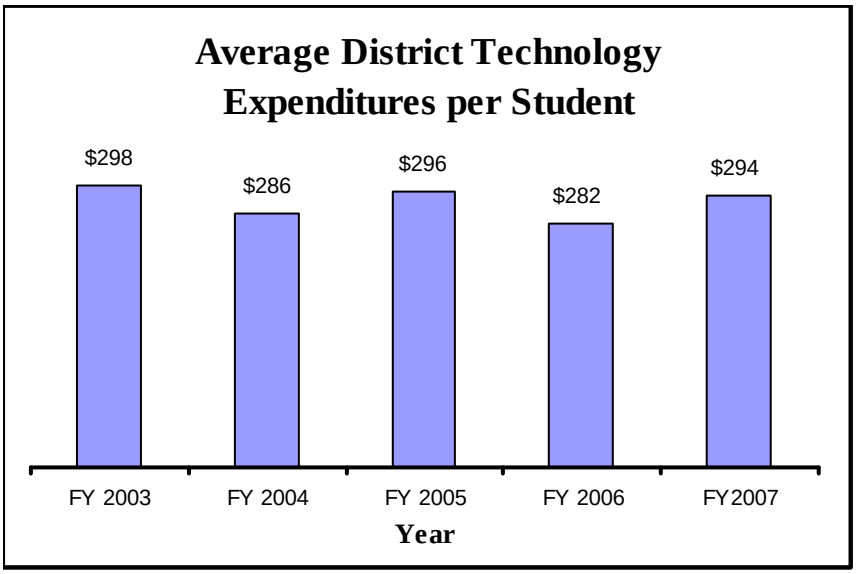
[36] The *Local Technology Plan Guidelines (School Year 2007-2008 through 2010-2011)* are included in the Appendix of this report. They are also available online at http://www.doe.mass.edu/edtech/planning.html
[37] Further information on E-rate is available at http://www.fcc.gov/learnnet .

(CIPA).[38] Briefly, the law requires district to have an Internet safety policy that includes filtering technology that blocks Internet access to images that are obscene, child pornographic, or harmful to minors. In 2006-2007, 99% of districts reported that they had such filters.

In addition to safety, districts need to ensure that their networks and data are protected. The Massachusetts STaR Chart (School Technology and Readiness Chart)[39] developed by the state's The Educational Technology Advisory Council (ETAC) includes strategies for security, including backup and restoration procedures, virus protection, firewall protection, and usage authentication for mobile computer and external access.

Technology Budget

In planning for technology, it is important to take 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 2006-2007 the average per student spending on technology was $294, an increase of more than 4% since 2005-2006[40]. These expenditures include monies from districts' operational budgets, municipals bonds, and grants from federal, state, local, and private sources.



[38] Information on the Children's Internet Protection Act is available at http://www.fcc.gov/cgb/consumerfacts/cipa.html .
[39] The STaR Chart is available at http://www.doe.mass.edu/boe/sac/edtech/star.html .
[40] These figures, as well as those in the graph, are not adjusted for inflation.

Average District Technology Expenditures per Student	
Year	**Average expenditure**
FY2003	$298
FY2004	$286
FY2005	$296
FY2006	$282
FY2007	$294

Providing funding for technology can be challenging, especially in times when budgets are tight. An analysis of the fiscal data reported by districts for 2006-2007 revealed that 85% of the technology expenditures came directly from the district's operational budget, 5% were expenses for which the municipality had bonded, and 10% came from grants and other sources. These data suggest that may be room for growth in the last category. Since technology is critical in preparing students to compete globally in the twenty-first century, districts may want to explore forming local partnerships with the business community.

Most districts have been taking advantage of the federal funding available for technology. For the 2006-2007 school year, through No Child Left Behind's Enhancing Education Through Technology program (Title IID), approximately $1.9 million was available for entitlement grants.[41] A total of 355 districts received these grants.

The No Child Left Behind, Enhancing Education Through Technology (EETT) program also provided $ 2 million for competitive grants. The following competitive grants were awarded:

- 7 Technology Enhancement Competitive Grants to support one-to-one laptop initiatives
- 9 Technology for Data Driven Decisions Grants to support the statewide Data Warehouse Project
- 8 grants to support the pilot project, Partnership for Online Professional Development (POPD)

[41] Information on technology grants is available at http://www.doe.mass.edu/edtech/grants.html .

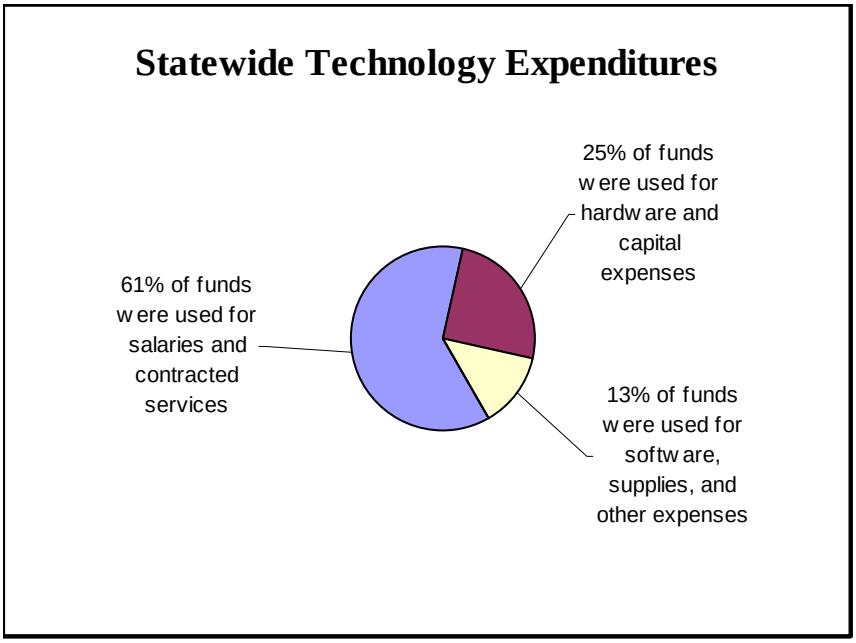
Many of these grants included partner districts, increasing the total number of districts impacted by these projects.[42]

Districts continue to recognize the value of the federal E-rate[43] discount program; 83% of the districts that submitted data used it in 2006-2007. In 2006-2007 Massachusetts schools (public and private) received approximately $31 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 schools are eligible for discounts as high as 90%. The average discount for Massachusetts districts was 59%. Additional information on funding received by the state to support school districts is provided in Appendix C.

The availability of E-rate and Title II funding, underscores the importance of technology planning. By developing a long-range plan and completing the annual online implementation report, districts receive a technology plan approval letter from the Department, making them eligible to apply for the funding. In addition, having a long-range plan helps districts make the best possible use of their funding.

Staffing for Technology Integration

Staffing is critical to the successful utilization of technology. However, one of the greatest challenges school districts face in the area of technology is providing funds for sufficient staffing. Aggregated data from districts shows that staffing and contracted services account for 61% of technology spending, an 8% decrease since last year, but closer to the previous year's 62%. On the other hand, spending for hardware and other capital expenses was up 5% since last year.



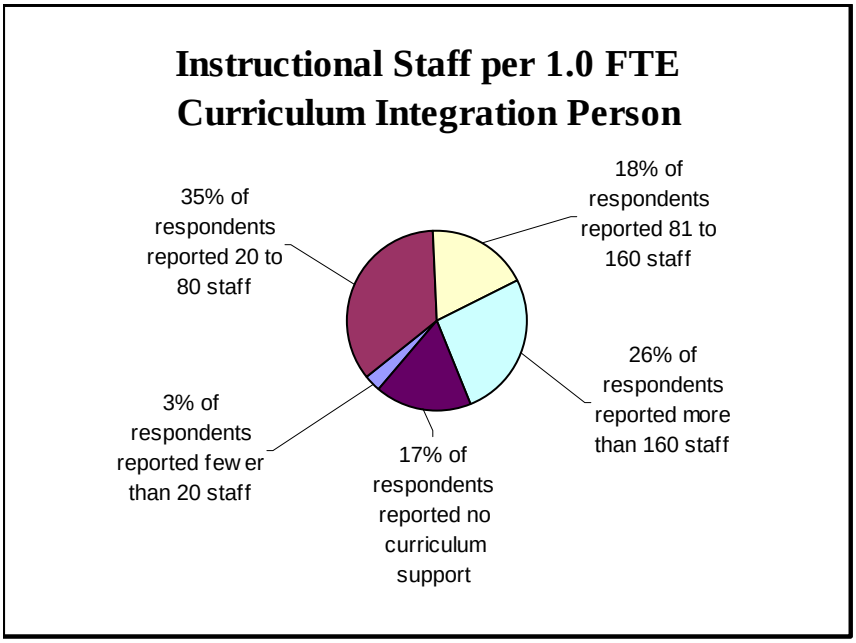
[42] Information about technology grants awarded is at http://www.doe.mass.edu/edtech/grants/archive.html
[43] For more information on E-rate, see http://www.fcc.gov/learnnet/ .

Statewide Technology Expenditures	
Expenditure category	**Percent of funds expended**
Salaries and contracted services	61%
Hardware and capital expenses	25%
Software, supplies, and other expenses	13%

Curriculum Integration Support

Since technology changes quickly and the number of available resources is immense, it is important for teachers to receive ongoing 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. 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 Department's technology guidelines recommend that schools have at least one full-time-equivalent person to support up to 80 teachers. Currently 38% of districts meet this recommendation for curriculum integration support, a decrease since last year. Also illustrating this downward trend is the fact that 43% 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.

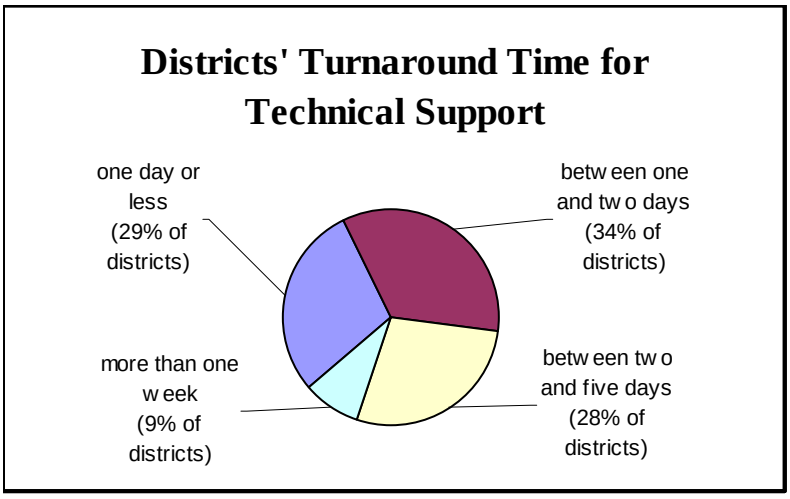


Instructional Staff per 1.0 FTE Curriculum Integration Person	
Staff supported by 1.0 FTE	**Percent of districts**
Fewer than 20 staff members	3%
20 to 80 staff members	35%
81 to 160 staff members	18%
More than 160 staff members	26%
Has no curriculum support	17%

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 Department's technology guidelines recommend that districts have the equivalent of one full-time position (which can include contracted services) to support every 200 computers. In 2007, fewer than 19% of the reporting districts indicated that they had this level of support. On average, according to district data, a technical support person maintains approximately 445 computers, up from 439 in 2006.

Even with the increased number of computers to maintain, technical support personnel were able to resolve problems in 2.7 days, on average, a slight improvement since last year.



Districts' Turnaround Time for Technical Support	
Number of days to resolve a problem	**Percent of districts**
One day or less	29%
Between one and two days	34%
Between two and five days	28%
More than one week	9%

Administrative Software Systems

Technology also plays a role in running an organization in an efficient manner. This year's technology plan implementation report included a new set of questions to gather information about the administrative software districts are using. The questions looked at the student, human resources, and payroll systems maintained by school districts. The purpose of these questions was to collect this information from all districts simultaneously, and to maintain it centrally so that districts would not be asked again each time a new data collection by the state is implemented. Future technology plan implementation reports will provide the previous year's answers to these questions so that districts will only need to update them if they change.

Although the Department makes no recommendations on software, districts are encouraged to consult with each other when researching vendors. To help districts share information, the Department has compiled a list of districts and the software they are currently using. This list is posted on the Department's web site.[44] A summary of the results of the technology plan survey questions on administrative software is as follows:

- Student Information Software
  - 6 software packages account for 83% of the districts.
  - 95% of the systems are maintained by the district.
  - 3% are maintained offsite or by a third party.
  - Plans to migrate to a new system:
    - 50% do not plan to migrate.
    - 20% will be migrating.
    - 30% don't know.

- Human Resources Software
  - 6 software packages account for 73% of the districts.
  - 13% of the districts maintain information in district developed system. These systems range from relational databases that require support by technical staff to spreadsheets and databases.
  - 75% of the human resources systems are maintained by the districts.
  - 20% are maintained by municipal offices.
  - Plans to migrate to a new system:
    - 60% do not plan to migrate.
    - 10% will be migrating.
    - 30% don't know.

- Payroll System
  - 60% of districts use a different system for payroll than for human resources.

[44] Further information about software used in districts across the state is available at http://www.doe.mass.edu/infoservices/vendors/

Conclusion

As the Educational Technology Advisory Council (ETAC) stressed in a recent statement, "Technology continues to transform the world in which we live and work, affecting all aspects of the educational enterprise. It is essential for all Massachusetts students, faculty, and staff to have easy access to 21st century resources to prepare our students to participate and lead in a technology-infused, global society."[45]

As this report has shown, Massachusetts school districts continue to make progress in providing the conditions needed for effective technology use. Many districts are taking advantage of the resources provided by the Department, including technology grants, guidelines for technology planning, instructional technology standards, the MassONE portal, and state data systems. Moreover, districts are working hard, using local resources, to try to keep up with the ever-changing technologies needed for teaching, learning, and working.

Still, challenges remain for many school districts. Some schools do not have enough Internet-connected computers, while others do not have the bandwidth needed to access cutting-edge learning resources. Even in schools that have an adequate technology infrastructure, there are teachers who have not had enough training to be able to use the technology effectively for instruction.

In order to prepare all of our students to compete in this technology-driven world, it is critical that every district provide an up-to-date technology infrastructure, support for technology use, and ongoing professional development on teaching with technology. As Governor Deval Patrick said in June when he unveiled his new education action agenda, "Education transforms lives, and there is no better way to position Massachusetts for prosperity in the 21st Century than to prepare our children with the skills they need to compete anywhere."[46]

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[45] Massachusetts Educational Technology Advisory Council (ETAC), FY 2009 Council Statement, available at http://www.doe.mass.edu/boe/sac/edtech/ .

46 "Ready for 21st Century Success: The New Promise of Public Education," the Patrick Administration Education Action Agenda, is available at http://www.mass.gov/?pageID=gov3topic&L=2&L0=Home&L1=Key+Priorities&sid=Agov3 .

Appendix A

Local Technology Plan Guidelines

(School Year 2007-2008 through 2010-2011)

These guidelines are designed to help districts develop purposeful long-range technology plans. While not mandated, the guidelines represent recommended conditions for effectively integrating technology into teaching and learning.

There are several reasons that a school district should develop and maintain a technology plan. First, comprehensive planning helps the district take advantage of technology's power to improve teaching and learning. Technology has the power to engage and challenge students. Applications such as formative assessment tools can help teachers ensure that students are meeting the standards. By allowing teachers to access information about student learning, information systems make it possible for teachers to support individual students better. Online learning programs can increase the range of learning opportunities available to students, enabling them to study with experts and other students around the globe. Technology can also play a role in ensuring students' safety, by facilitating communication among school personnel and parents.

Funding is another reason technology planning is important. Every school district must have a long-range strategic technology plan approved by the Department of Education in order to be eligible for E-Rate discounts and federal and state technology grants. Each school district is required to develop a 3- to 5-year plan, which should be kept on file locally. Each year, as part of the technology plan approval process, the Department asks districts to report on the progress they have made in implementing their plans through the Department's secure web portal. The Department reviews this data, along with the district's long-range plan, to approve the district's plan. To facilitate this process, the Department asks the district to post its long-range plan on its web site or to email a copy of the plan to the Department.

These guidelines are based on the School Technology and Readiness (STaR) Chart[47] developed by the state's Educational Technology Advisory Council (ETAC). Using the STaR Chart, along with 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 for districts to meet by the end of the school year 2010- 2011. The Department will use these guidelines to gauge the progress of districts' implementation in order to approve their technology plans annually.

[47] Full text of the StaR Chart is available on the Department's web site (http://www.doe.mass.edu/boe/sac/edtech/star.html).

Benchmark 1
Commitment to a Clear Vision and Implementation Strategies

A. The district's technology plan contains a clearly stated and reasonable set of goals and implementation strategies that align with the district-wide school improvement plan. The district is committed to achieving its vision by the end of the school year 2010-2011.

B. The district has a technology team with representatives from a variety of stakeholder groups, including school committee members, administrators, and teachers. The technology team has the support of the district leadership team.

C. Needs Assessment

1. The district assesses the technology products and services that will be needed to improve teaching and learning.

2. The technology plan includes an assessment of the services and products that are currently being used and that the district plans to acquire.

D. The district has a CIPA-compliant Acceptable Use Policy (AUP) regarding Internet and network use. The policy is updated as needed to help ensure safe and ethical use of resources by teachers and students.

E. 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, infrastructure, hardware, software, professional development, support, and contracted services (including telephone services).

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

4. For districts that plan to apply for E-rate reimbursement, the technology plan specifies how the district will pay for the non-discounted portion of their costs for the services procured through E-rate.

F. Evaluation

1. The district evaluates the effectiveness of technology resources toward attainment of educational goals on a regular basis.

2. The district's technology plan includes an evaluation process that enables it to monitor its progress in achieving its goals and to make mid-course

corrections in response to new developments and opportunities as they arise.

Benchmark 2
Technology Integration and Literacy

A. Technology Integration[48]

1. Outside Teaching Time - At least 85% of teachers use technology every day, including some of the following areas: lesson planning, administrative tasks, communications, and collaboration. Teachers share information about technology uses with their colleagues.

2. For Teaching and Learning - At least 85% of teachers use technology appropriately with students every day to improve student learning of the curriculum. Activities include some of the following: research, multimedia, simulations, data interpretation, communications, and collaboration (See the Massachusetts Recommended K-12 Instructional Technology Standards[49]).

B. Technology Literacy

1. At least 85% of eighth grade students show proficiency in all the Massachusetts Recommended PreK-12 Instructional Technology Standards for grade 8.

2. 100% of teachers are working to meet the proficiency level in technology, and by the school year 2010-2011, 60% of teachers will have reached the proficiency level as defined by the Massachusetts Technology Self-Assessment Tool (TSAT)[50].

C. Staffing

1. The district has a district-level technology director/coordinator.

2. The district provides one FTE instructional technology teacher per 60-120 instructional staff.

3. The district has staff dedicated to data management and assessment.

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[48] The Massachusetts Department of Elementary and Secondary Education defines technology integration as the daily use of technology in classrooms, libraries, and labs to improve student learning.
[49] The Massachusetts Technology Literacy Standards and Expectations are available on the Department's web site (http://www.doe.mass.edu/edtech/standards.html).
[50] The Technology Self-Assessment Tool is available as an interactive tool on MassONE, as well as a printable PDF checklist (http://www.doe.mass.edu/edtech/standards/sa_tool.html).

Benchmark 3
Technology Professional Development

A. At the end of three years, at least 85% of district staff will have participated in 45 hours of high-quality professional development[51] that includes 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, study groups, and online professional development. 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.[52]

D. Administrators and teachers consider their own needs for technology professional development, using the technology self-assessment tools provided by the Massachusetts Department of Education or similar tools.[53]

Benchmark 4
Accessibility of Technology

A. Hardware Access

1. The district has an average ratio of fewer than five students per high-capacity[54], Internet-connected computer. The Department will work with stakeholders to review the capacity of the computer on an annual basis. (The goal is to have a one-to-one, high-capacity, Internet-connected computer ratio.)

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

3. The district maximizes access to the general education curriculum for all students, including students with disabilities, using technology in

[51] High quality professional development is described in the Massachusetts 2001 State Plan for Professional Development (http://www.doe.mass.edu/pd/stateplan/).
[52] Details are available on the Department's web site (http://www.doe.mass.edu/edtech/standards/sa_tool.html).
[53] A sample administrator technology self assessment tool is available on the Department's web site (http://www.doe.mass.edu/edtech/standards/tsat_sampadmin.html). The Technology Self-Assessment Tool (TSAT) for teachers is also available as a printable document and as an interactive tool on MassONE (http://www.doe.mass.edu/edtech/standards/sa_tool.html).
[54] In 2007, the Department defined a high-capacity computer as a computer that has at least 256 RAM and either a Pentium 4 processor or a Macintosh G4 processor (or equivalent). The Department also refers to these as Type A computers.

classrooms with universal design principles and assistive technology devices.

4. The district has procurement policies for information and instructional technologies that ensure usability, equivalent access, and interoperability.

5. The district provides classroom access to devices such as digital projectors and electronic whiteboards.

6. The district has established a computer replacement cycle of five years or less.

B. Internet Access

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

2. The district provides bandwidth of at least 10/100/1 Gb to each classroom. At peak, the bandwidth at each computer is at least 100 kbps. The network card for each computer is at least 10/100/1 Gb.

C. Networking (LAN/WAN)

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

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

D. Access to the Internet Outside the School Day

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

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

1. The district provides a network administrator.

2. The district provides timely in-classroom technical support with clear information about how to access the support, so that technical problems will not cause major disruptions to curriculum delivery.

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

Benchmark 5
E-Learning and Communications

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

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

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

D. The district maintains an up-to-date web site that includes information for parents and community members.

E. The district complies with federal and state law[55], and local policies for archiving electronic communications produced by its staff and students. The district informs staff and students that any information distributed over the district or school network may be a public record.

[55] Information about state regulations is available from the state's Record Management Unit (http://www.sec.state.ma.us/arc/arcrmu/rmuidx.htm).

Appendix B

District Statistics

Districts Reporting

School districts that reported on the implementation of their technology plans in 2007 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 2007 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 2006-2007 school year. The ratios reported here are based on data aggregated from the school profile forms and validated by school districts. The Department of Education recommends that school districts 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 type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Abby Kelley Foster Charter Public	3.7	3.7	100	100	no
Abington	5.0	4.6	100	100	yes
Acushnet	1.8	1.7	100	100	yes
Adams-Cheshire	5.3	4.4	100	62	yes
Agawam	4.8	4.8	100	99	yes
Amesbury	4.6	3.7	100	94	yes
Amherst	3.1	3.1	100	100	yes
Amherst-Pelham	2.8	2.7	100	100	yes
Andover	3.2	2.8	100	99	yes
Arlington	3.3	3.3	100	100	yes
Ashburnham-Westminster	3.7	3.5	100	99	yes
Ashland	3.9	3.8	100	100	yes
Assabet Valley Regional Voc. Tech.	1.7	1.7	100	100	yes
Atlantis Charter	3.1	3.1	100	100	no
Attleboro	4.4	4.0	100	93	yes
Auburn	3.4	3.4	100	99	yes
Avon	2.7	2.7	100	100	yes
Ayer	3.3	2.6	100	100	yes
Barnstable	3.7	3.3	100	100	yes
Barnstable Horace Mann Charter	2.4	2.4	100	100	yes
Bedford	2.3	2.3	100	100	yes
Belchertown	4.2	4.2	93	98	yes
Bellingham	2.6	2.3	100	100	yes
Belmont	5.3	4.7	100	100	yes
Benjamin Banneker Charter Public	2.7	2.7	100	100	yes
Benjamin Franklin Classical Charter	3.7	3.7	100	100	no
Berkley	4.5	4.1	100	77	no
Berkshire Arts and Technology Charter	1.2	1.2	100	100	yes
Berkshire Hills	2.8	2.8	100	100	no
Berlin	3.5	2.9	100	100	yes
Berlin-Boylston	4.3	4.3	100	100	yes
Beverly	4.4	3.8	100	100	yes
Billerica	11.0	5.8	100	100	yes
Blackstone Valley Regional Voc. Tech.	1.7	1.7	100	100	yes
Blackstone-Millville	3.4	3.4	100	100	yes
Boston	3.7	3.3	100	100	yes
Boston Collegiate Charter	8.8	8.8	100	100	no
Boston Renaissance Charter Public	4.4	2.6	100	100	no
Bourne	2.5	2.4	100	100	no
Boxborough	3.3	3.3	100	100	yes
Boxford	3.8	3.2	100	100	no
Boylston	3.7	3.6	100	100	yes
Braintree	5.5	5.4	100	100	yes
Brewster	3.8	2.3	100	100	no

District Statistics

School district	Students per type A/B computer	Students per type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Bridgewater-Raynham	5.8	5.3	100	100	yes
Brimfield	6.1	3.9	100	100	yes
Bristol County Agricultural	3.2	3.2	100	100	no
Bristol-Plymouth Regional Voc. Tech.	2.6	2.6	100	100	yes
Brockton	4.2	3.9	100	97	yes
Brookfield	3.3	3.1	100	72	yes
Brookline	2.8	2.8	99	100	yes
Burlington	3.8	3.6	100	100	no
Cambridge	2.1	2.1	100	100	yes
Canton	3.0	2.6	100	100	yes
Cape Cod Lighthouse Charter	2.4	2.4	100	99	no
Cape Cod Regional Voc. Tech.	2.0	2.0	100	97	yes
Carlisle	2.8	2.7	94	98	yes
Central Berkshire	3.5	3.1	100	100	yes
Chatham	1.5	1.5	100	100	no
Chelmsford	4.6	3.7	100	100	yes
Chelsea	3.2	3.0	100	100	yes
Chesterfield-Goshen	34.4	7.5	100	100	yes
Chicopee	4.3	3.9	100	100	yes
City On A Hill Charter Public	3.6	3.6	100	100	no
Clarksburg	4.0	4.0	100	100	yes
Clinton	3.2	2.8	100	100	yes
Codman Academy Charter Public	1.1	1.1	100	100	no
Cohasset	2.1	2.1	100	100	yes
Community Day Charter Public	3.5	3.5	100	100	no
Concord	1.7	1.7	100	100	yes
Concord-Carlisle	1.5	1.5	100	100	yes
Conway	3.1	3.1	100	100	yes
Danvers	3.2	3.2	100	100	yes
Dedham	2.3	2.3	100	100	yes
Deerfield	3.6	3.6	100	100	yes
Dennis-Yarmouth	3.0	2.8	100	100	yes
Dighton-Rehoboth	4.3	4.3	100	100	yes
Douglas	2.9	2.8	100	100	yes
Dover	1.9	1.9	100	100	yes
Dover-Sherborn	1.7	1.7	100	97	yes
Dracut	4.5	4.3	100	100	yes
Dudley-Charlton Reg.	3.7	3.4	100	100	no
Duxbury	3.8	3.4	100	100	yes
East Bridgewater	7.5	6.1	100	91	yes
East Longmeadow	3.1	3.0	100	100	yes
Eastham	2.3	2.1	100	100	no
Easthampton	3.1	3.1	100	96	yes
Easthampton	3.1	3.1	100	96	yes

District Statistics

School district	Students per type A/B computer	Students per type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Easton	4.0	4.0	100	100	yes
Edgartown	2.5	2.4	100	91	yes
Erving	2.1	2.1	100	100	yes
Essex Agricultural Tech.	2.2	2.2	98	100	yes
Everett	3.0	2.9	75	96	yes
Fairhaven	4.3	4.2	99	100	no
Fall River	5.7	5.3	92	92	yes
Falmouth	3.6	3.6	100	99	yes
Fitchburg	6.9	5.4	100	91	yes
Florida	2.4	2.4	100	100	yes
Foxborough Regional Charter	4.6	4.6	100	100	yes
Framingham	3.8	3.1	100	100	yes
Francis W. Parker Charter Essential	3.4	3.4	100	100	yes
Franklin	4.9	2.9	100	100	yes
Franklin County Regional Voc. Tech.	1.7	1.3	100	100	yes
Freetown	2.4	2.4	100	100	yes
Freetown-Lakeville	1.9	1.9	100	100	yes
Frontier	2.0	2.0	100	100	yes
Gardner	4.7	4.7	100	100	yes
Gateway	1.3	1.3	100	100	yes
Georgetown	5.9	5.5	100	97	no
Gill-Montague	2.1	2.1	100	93	yes
Gloucester	4.9	3.6	100	83	yes
Grafton	4.2	4.0	100	100	yes
Granby	4.2	4.1	100	100	yes
Granville	3.0	3.0	100	100	yes
Greater Fall River Regional Voc.Tech.	2.0	2.0	100	98	yes
Greater Lawrence Regional Voc. Tech.	2.8	2.8	100	100	yes
Greater Lowell Regional Voc. Tech.	3.2	2.7	100	100	no
Greater New Bedford Reg. Voc. Tech.	1.7	1.7	100	100	yes
Greenfield	3.1	3.1	94	99	yes
Groton-Dunstable	3.6	3.1	100	100	yes
Hadley	3.1	3.1	100	100	no
Halifax	6.3	5.2	100	60	yes
Hamilton-Wenham	4.1	3.9	100	99	yes
Hampden-Wilbraham	4.3	3.7	100	100	yes
Hampshire	1.9	1.9	100	100	yes
Hancock	2.4	2.4	100	100	yes
Hanover	3.8	3.1	100	99	yes
Harvard	4.4	4.0	100	64	yes
Haverhill	19.0	8.7	94	95	yes
Hawlemont	2.0	1.8	100	100	yes
Health Careers Academy Charter	3.6	3.6	100	100	no
Hill View Montessori Charter Public	9.5	9.5	100	100	no

District Statistics

School district	Students per type A/B computer	Students per type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Hingham	4.2	3.9	100	92	yes
Holbrook	5.9	5.0	100	100	yes
Holland	2.1	2.1	100	100	yes
Holliston	2.4	2.4	100	100	yes
Holyoke	3.4	3.1	100	96	yes
Hopedale	3.8	3.8	100	100	yes
Hopkinton	3.0	2.9	100	99	yes
Hudson	2.5	2.5	100	100	yes
Hull	2.3	2.3	100	100	no
Ipswich	4.1	2.8	100	100	yes
Kingston	5.5	4.5	100	79	yes
Lakeville	5.9	4.1	100	84	yes
Lanesborough	3.1	3.1	100	100	no
Lawrence	3.3	3.3	78	98	yes
Lawrence Family Development Charter	4.0	4.0		100	no
Lee	1.9	1.9	100	100	yes
Leicester	4.4	3.8	100	100	yes
Lenox	3.1	2.8	100	92	yes
Leominster	3.4	3.2	100	96	yes
Leverett	2.5	2.5	100	97	yes
Lexington	3.6	3.6	100	100	no
Lincoln-Sudbury	1.4	1.4	100	100	yes
Longmeadow	2.6	2.5	100	100	yes
Lowell	5.7	3.5	100	86	yes
Lowell Community Charter Public	3.7	3.7	100	100	yes
Ludlow	4.8	4.6	100	98	yes
Lunenburg	4.0	4.0	100	100	yes
Lynn	5.8	4.3	96	93	yes
Lynnfield	2.3	2.3	100	100	no
Malden	2.7	2.7	100	100	yes
Manchester Essex Regional	3.3	3.2	100	100	yes
Mansfield	6.2	5.6	100	100	yes
Marblehead	3.5	3.3	100	97	no
Marblehead Community Charter	5.8	5.8	100	100	no
Marion	2.5	2.5	100	99	yes
Marlborough	9.6	9.6	95	92	yes
Marshfield	4.6	4.6	100	100	yes
Marstons Mills East HM Charter Public	5.1	3.6	100	100	yes
Martha's Vineyard	1.9	1.9	100	100	yes
Martin Luther King Jr. Charter School of Excellence	4.4	4.4	100	100	yes
Masconomet	2.4	2.4	100	100	yes
Mashpee	6.0	6.0	100	100	yes
MATCH Charter Public High	3.8	3.8	100	100	yes

District Statistics

School district	Students per type A/B computer	Students per type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Mattapoisett	1.6	1.6	100	100	yes
Maynard	2.4	2.4	100	100	yes
Medfield	2.8	2.7	100	99	yes
Medford	2.2	2.2	100	100	yes
Medway	4.8	3.7	100	100	yes
Melrose	5.4	5.4	100	100	yes
Mendon-Upton	5.0	5.0	100	100	yes
Methuen	6.7	3.6	99	100	yes
Middleborough	2.6	2.4	100	100	yes
Middleton	4.4	4.3	99	98	no
Milford	6.6	5.4	100	100	yes
Millbury	3.3	3.3	100	97	yes
Millis	3.5	3.4	100	100	yes
Milton	3.5	3.5	100	97	yes
Minuteman Regional Voc.Tech.	1.1	1.1	100	100	yes
Mohawk Trail	4.5	3.1	100	100	yes
Monson	2.9	2.9	100	100	yes
Montachusett Regional Voc. Tech.	2.0	2.0	100	100	yes
Mount Greylock	2.9	2.9	100	100	yes
Nantucket	1.9	1.6	100	100	no
Narragansett	4.2	4.2	100	100	yes
Nashoba	2.6	2.5	100	99	yes
Nashoba Valley Regional Voc. Tech.	2.6	2.0	100	100	yes
Natick	3.6	3.4	100	100	yes
Nauset	3.7	2.9	100	100	no
Needham	3.0	2.9	100	100	yes
Neighborhood House Charter	4.0	4.0	100	100	no
New Bedford	2.9	2.5	97	97	yes
New Salem-Wendell	4.1	3.8	100	100	yes
Newburyport	2.6	2.1	100	30	yes
Newton	3.0	2.6	98	89	yes
Norfolk	3.4	3.3	100	100	yes
Norfolk County Agricultural	2.4	2.4	100	100	yes
North Adams	1.8	1.8	100	100	yes
North Andover	3.0	2.8	100	99	no
North Attleborough	6.8	3.4	100	100	yes
North Brookfield	1.9	1.8	100	97	yes
North Central Charter Essential	2.4	2.4	100	100	no
North Middlesex	5.0	4.3	100	96	yes
North Reading	3.3	3.1	100	100	yes
North Shore Regional Vocational Technical	1.4	1.4	100	100	yes
Northampton	5.0	4.9	100	100	yes
Northampton-Smith Voc.Agricultural	1.7	1.7	100	100	yes

District Statistics

School district	Students per type A/B computer	Students per type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Northboro-Southboro	2.5	2.5	100	100	yes
Northborough	2.9	2.5	100	100	yes
Northbridge	3.3	3.2	99	99	yes
Northeast Metropolitan Reg. Voc. Tech.	2.8	2.8	100	100	no
Northern Berkshire Reg. Voc. Tech.	1.7	1.7	100	100	yes
Norton	6.4	3.9	100	100	yes
Norwell	3.0	2.6	100	100	yes
Norwood	4.5	4.5	100	100	no
Oak Bluffs	2.7	2.7	100	100	yes
Old Colony Regional Voc. Tech.	2.7	2.3	100	0	no
Old Rochester	2.3	2.3	100	99	yes
Orange	2.5	2.4	100	100	yes
Orleans	4.0	2.1	100	100	no
Oxford	5.5	5.5	100	100	yes
Palmer	4.3	4.2	100	100	yes
Pathfinder Regional Voc. Tech.	1.8	1.8	100	100	yes
Peabody	4.6	4.2	94	100	yes
Pelham	2.1	2.1	100	100	yes
Pentucket	6.2	5.2	100	100	yes
Phoenix Charter Academy	3.0	3.0	100	96	no
Pioneer Valley	2.1	2.1	98	98	yes
Pioneer Valley Performing Arts Charter	4.6	4.6	100	100	no
Pittsfield	2.1	2.1	100	99	yes
Plainville	2.1	2.1	100	100	yes
Plymouth	4.0	2.0	100	100	yes
Plympton	2.7	2.7	100	100	yes
Prospect Hill Academy Charter	5.1	5.1	100	100	no
Provincetown	1.1	1.1	100	44	yes
Quabbin	6.2	5.9	100	100	yes
Quaboag Regional	2.9	2.7	100	98	yes
Quincy	5.0	4.4	95	80	yes
Ralph C. Mahar	1.5	1.5	100	100	yes
Randolph	5.9	3.8	100	91	yes
Reading	4.4	3.8	100	100	no
Revere	3.4	3.3	100	100	yes
Rising Tide Charter Public	2.4	2.4	100	100	yes
River Valley Charter	5.3	4.5	100	70	no
Rochester	3.0	3.0	100	100	yes
Rockland	6.8	4.7	100	100	yes
Rowe	1.8	1.5	100	100	yes
Roxbury Preparatory Charter	2.1	2.1	100	100	yes
Sabis International Charter	7.9	7.9	36	92	no
Salem	3.1	2.6	84	74	yes
Sandwich	4.6	4.5	100	100	yes

District Statistics

School district	Students per type A/B computer	Students per type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Saugus	7.7	6.4	100	86	yes
Savoy	2.6	1.9	100	100	yes
Scituate	3.7	3.5	100	100	yes
Seekonk	3.0	2.6	100	100	yes
Seven Hills Charter	2.1	2.1	100	100	yes
Sharon	3.8	3.7	100	100	yes
Shawsheen Valley Regional Voc. Tech.	2.1	2.0	100	100	yes
Sherborn	2.8	2.8	100	100	yes
Shirley	3.1	2.9	100	100	yes
Shrewsbury	3.4	3.3	100	100	yes
Shutesbury	3.5	3.5	100	100	yes
Silver Lake	2.8	2.8	100	96	yes
Smith Leadership Academy Charter	2.1	1.0	100	42	yes
Somerset	2.7	2.4	100	100	yes
Somerville	2.5	2.3	100	100	yes
South Hadley	4.3	4.2	100	100	no
South Middlesex Regional Voc. Tech.	1.8	1.8	100	98	yes
South Shore Regional Voc. Tech.	1.5	1.5	100	98	yes
Southampton	5.3	5.3	100	47	yes
Southborough	2.7	2.2	100	100	yes
Southbridge	1.9	1.9	100	100	yes
Southeastern Regional Voc. Tech.	1.3	1.3	100	100	yes
Southern Berkshire	1.8	1.8	100	100	yes
S. Worcester County Reg. Voc. Tech.	2.6	2.6	100	100	yes
Southwick-Tolland	3.4	3.2	98	87	yes
Spencer-E Brookfield	2.9	2.9	100	94	yes
Springfield	3.2	2.3	87	99	yes
Stoneham	3.6	3.5	100	100	yes
Stoughton	2.6	2.6	100	100	yes
Sturbridge	6.4	4.8	100	93	yes
Sudbury	3.8	3.7	100	100	yes
Sunderland	2.6	2.6	100	100	yes
Sutton	4.1	2.8	100	100	yes
Swampscott	3.5	3.4	100	100	yes
Swansea	4.1	4.0	100	100	yes
Tantasqua	2.8	2.8	100	82	yes
Taunton	2.6	2.6	100	99	yes
Tewksbury	4.6	3.5	100	100	yes
Tisbury	2.8	2.0	100	100	yes
Topsfield	3.1	2.8	100	100	no
Tri County Regional Voc. Tech.	2.5	1.7	100	100	yes
Triton	8.0	3.9	100	94	yes
Truro	1.7	1.7	100	100	no
Tyngsborough	3.5	3.4	100	95	yes

District Statistics

School district	Students per type A/B computer	Students per type A/B/C computer	Percent of classrooms connected to the Internet	Percent of computers connected to the Internet	Did the district receive E-rate?
Up-Island Regional	1.5	1.5	100	100	yes
Upper Cape Cod Regional Voc.Tech.	1.3	1.3	100	100	yes
Uxbridge	5.2	5.2	100	100	yes
Wachusett	3.7	2.6	100	99	yes
Wakefield	4.6	4.6	100	99	yes
Wales	2.7	2.7	100	100	yes
Walpole	2.7	2.5	90	91	yes
Waltham	2.7	2.7	98	100	yes
Ware	4.2	3.1	100	100	yes
Wareham	3.5	2.6	100	100	yes
Watertown	2.9	2.5	100	100	yes
Wayland	2.5	2.5	100	100	yes
Wellesley	3.0	3.0	100	100	yes
Wellfleet	2.2	2.0	100	100	no
West Boylston	2.0	1.9	100	100	yes
West Bridgewater	4.5	4.5	100	100	no
West Springfield	3.9	3.4	100	76	no
Westborough	3.0	2.9	100	100	yes
Westfield	5.0	3.4	100	98	yes
Westford	3.8	3.6	100	86	yes
Westhampton	4.7	4.5	100	91	yes
Weston	2.5	2.4	100	92	yes
Westport	3.5	3.4	100	100	yes
Westwood	3.1	2.9	100	100	yes
Weymouth	3.8	3.8	99	98	yes
Whately	1.9	1.9	100	100	yes
Whitman-Hanson	3.4	3.4	100	100	yes
Whittier Regional Voc. Tech.	1.5	1.5	100	100	yes
Williamsburg	1.9	1.8	100	91	yes
Williamstown	2.9	2.9	100	100	no
Wilmington	4.9	4.9	100	100	yes
Winchendon	4.6	4.2	100	100	yes
Winchester	4.8	4.8	100	100	yes
Woburn	2.5	2.5	100	100	yes
Worcester	3.1	3.1	100	100	yes
Wrentham	1.9	1.9	100	100	yes

District Statistics

Appendix C

Technology Funding

2006-2007 Funding Supporting Schools

Program	Fund Source	Amount
NCLB Title IID	Federal	$3,970,583
E-Rate	Federal	$30,126,475 (includes funding for private schools and public libraries)

2007-2008 Funding Supporting Schools

Program	Fund Source	Amount
NCLB Title IID	Federal (U.S. DOE)	$4,227,829
E-Rate	Federal (The Universal Service Program)	$30,924,415 (includes funding for private schools and public libraries)
Steppingstones Grant	Federal (U.S. DOE)	$197,617
AIM (Accessible Instructional Materials) Consortium Grant	Federal (through CAST)	$166,666
Accessible Instructional Materials Library	State Budget (through Carroll Center for the Blind)	$655,000
Recording for the Blind and Dyslexic	State Budget	$775,000
Massachusetts/Thinkfinity Partnership Program	Verizon (through Lesley University)	$65,000