Technology In Massachusetts Schools

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Introduction

The use of technology in education made headlines in 2006, with Time magazine's cover story entitled "How to Bring Our Schools Out of the 20th Century."[1] The article acknowledged the need to increase the use of technology in schools, saying that "considering the pace of change in other areas of life, our public schools tend to feel like throwbacks." The article also emphasized the importance of developing twenty-first century learners, saying, "This is a story about the big public conversation the nation is not having about education . . . whether an entire generation of kids will fail to make the grade in the global economy because they can't think their way through abstract problems, work in teams, distinguish good information from bad or speak a language other than English."

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. In 2006, the Department began implementing the first phase of an Educational Data Warehouse and Reporting System for use by Department and district staff. After a thorough bid and evaluation process, the Department selected Cognos Corporation as its data warehouse provider. The long-term goal of this pilot is to provide a powerful, standardized, and user-friendly system for reporting and analyzing educational data for all Commonwealth school districts, at a substantially reduced cost.[2]

The Department has also been developing another system, the Education Personnel Information Management System (EPIMS), which will collect individual educator data from all public school districts and charter schools. EPIMS will help 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. A pilot group of school districts submitted data in the fall of 2006, and the collection will be expanded statewide in the fall of 2007.[3]

To help districts design their technology programs for the 21st century, the Department has worked with technology stakeholders to develop planning tools. In 2006, the state's Educational Technology Advisory Council (ETAC) updated its School Technology and Readiness (STaR) Chart.[4] This chart describes the complex set of interactions of people, materials, infrastructure and continuous support involved in the effective use of technology. Using the recommendations from the StaR Chart, along with advice from school personnel across the state, the Department has drafted a new set of guidelines[5] for

[1] The complete article is available online at http://www.time.com/time/magazine/article/0,9171,1568480-1,00.html .
[2] Further details about the data warehouse project are available at http://www.doe.mass.edu/news/news.asp?id=2772 .
[3] Further details about EPIMS are available at http://www.doe.mass.edu/infoservices/data/epims/ .
[4] The StaR Chart is available at http://www.doe.mass.edu/boe/sac/edtech/star.html .
[5] The guidelines are available in the Appendix of this document, as well as online at http://www.doe.mass.edu/edtech/planning.html .

districts to use in technology planning. These recommended guidelines are designed to help districts take advantage of technology's power to improve teaching and learning.

Another tool will assist districts in identifying what Massachusetts students should know and be able to do in order to use technology for learning. In 2006, the Department began working with the Mass Technology Leadership Council (MTLC) to update the state's instructional technology standards,[6] originally published in 2001. The Council brought together a group of educators from higher education, K-12 school districts, and educational organizations in 2006 to review the original document and provide feedback to the Department. The introduction to the draft of the new document explains its purpose:" In the 21st century students must expand their knowledge and develop a myriad of new skills so that they can take advantage of technology's increased power to enhance learning and ultimately prepare themselves for the increasingly competitive world beyond school."

Finally, to support 21st century 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 Technology Professional Development (PTPD),[8] the Department has offered online courses using MassONE as the delivery system. Another project, the Partnership for Online Professional Development (POPD), will offer a new set of courses in the 2007-2008 school year.

Many Massachusetts school districts are using these systems and tools, along with local resources and expertise, to prepare themselves for the technological demands of the 21st century. According to data submitted by school districts in 2006, technology literacy has increased; student-to-computer ratios have improved; Internet connectivity is up; and the turnaround time for technical support has improved. However, there is still much room for improvement. More than 20% of school districts have not met the guidelines set in 2004 for student access to high-capacity computers. Moreover, an estimated 26% of teachers use technology with their students only occasionally, if at all. In order to prepare students for a technology-driven world, schools need to provide a robust technology infrastructure, increased professional development, and ample support for the use of technology. This report will gauge the progress of districts in providing these prerequisites for effective technology use.

[6] The instructional technology standards are available at http://www.doe.mass.edu/edtech/standards.html .
[7] Information about MassONE is available at http://massone.mass.edu/ .
[8] Information about the Partnership for Technology Professional Development is available at http://www.doe.mass.edu/edtech/teacher/ptpd.html .

Teaching and Learning

In his recent op-ed piece in the *Boston Globe*, Commissioner David Driscoll commented on the importance preparing students for the 21st century, writing, "Manufacturing jobs are going overseas, salaries for blue-collar jobs are low, and most white-collar jobs today require at least an undergraduate -- if not graduate -- degree. This, coupled with the rise in global competition and the demand for new jobs in the science, technology, and engineering industries, creates an urgent need for all students to strive to reach their full academic potential in school."

Technology Proficiency

Student Technology Literacy

The *Massachusetts Recommended PreK-12 Instructional Technology Standards* [9], published in 2001, 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. 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. The results are shown in the table on the next page.

Districts were also asked to report the percentage of students that fell into each of three categories: those who had mastered all or most of the standards, those who had mastered about half of the standards, and those who had mastered less than half of the standards.

The most common method used to determine students' levels of technology literacy, used by 54% of districts, was the use of a teacher survey. Many districts, 43% of the total, 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, 35% 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] The *Massachusetts Recommended PreK-12 Instructional Technology Standards* 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 standards.	51%	56%	58%
Have mastered half or more than half of the standards.	32%	30%	29%
Have mastered less than half of the standards.	17%	14%	12%

Teacher Technology Literacy

In order to help students become technologically literate, teachers also need to be knowledgeable about 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)[10], which is available on MassONE as an interactive tool, which aggregates teacher data, and a PDF file on the Department's web site. (In order to preserve the privacy of individual users, the MassONE TSAT reports only aggregated data, as opposed to data from individual teachers.)

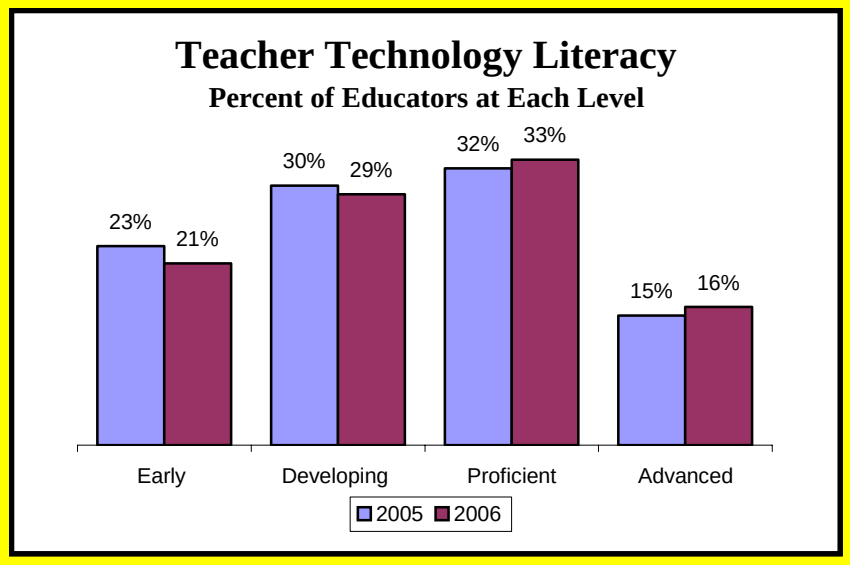
Districts were asked to use either the TSAT application or their own methods. In 2006 61% of districts used either the TSAT or a locally developed survey aligned to the TSAT. Nearly two-thirds of the districts used informal observation to gauge technology literacy, often in addition to another method like the TSAT.

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[11], 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, districts are showing progress

[10] Information about the TSAT is available at http://www.doe.mass.edu/edtech/standards/sa_tool.html .
[11] The Massachusetts STaR (School Technology and Readiness) Chart is available at http://www.doe.mass.edu/boe/sac/edtech/star.html .

in teacher technology literacy. 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	**2005**	**2006**
Early technology	23%	21%
Developing technology	30%	29%
Proficient	32%	33%
Advanced	15%	16%

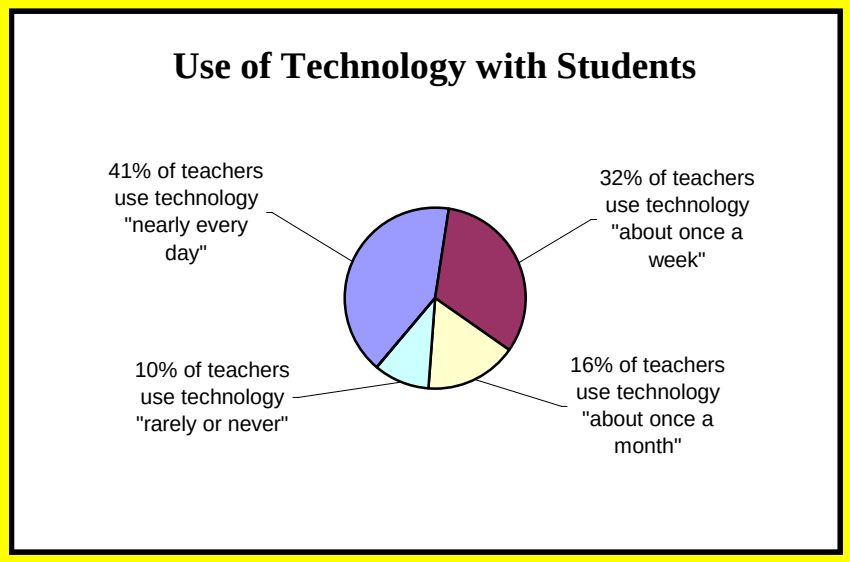
Use of Technology

The Department's technology guidelines recommend that at least 85% of teachers use technology each week with their students.[12]

[12] The *Local Technology Plan Guidelines (School Year 2007-2008 through 20010-2011)* are included in the Appendix of this report.

Teacher Use of Computers with Students

According to the data submitted by districts, the percentage of teachers using technology with their students "about once a week" or more was about 73%, a modest increase since 2005. The percentage of teachers using technology on a daily basis with students also appears to have increased slightly, from 40% to 41%. To gauge technology use, 31% of district's used the Department's Teacher Technology Use Survey[13], while other districts used methods such as local surveys, informal observation, and logs from computer labs.

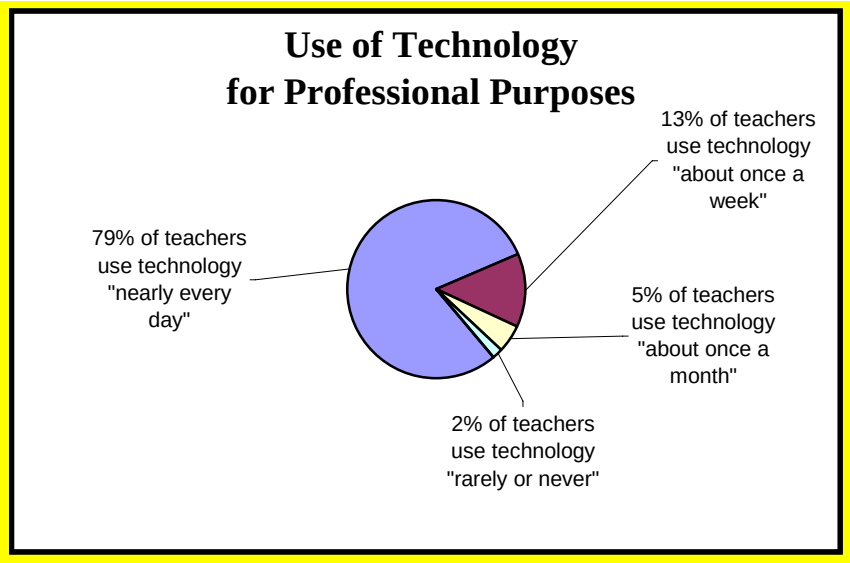


Use of Technology with Students *Statewide Averages Based on District Reporting*	
Frequency	**Percent of teachers**
Used technology nearly every day	41%
Used technology about once a week	32%
Used technology about once a month	16%
Use technology rarely or never	10%

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

[13] The Teacher Technology Use Survey is available at http://www.doe.mass.edu/edtech/techplan/ .

show that 79% of teachers used technology professionally every day, up from 75% last year.



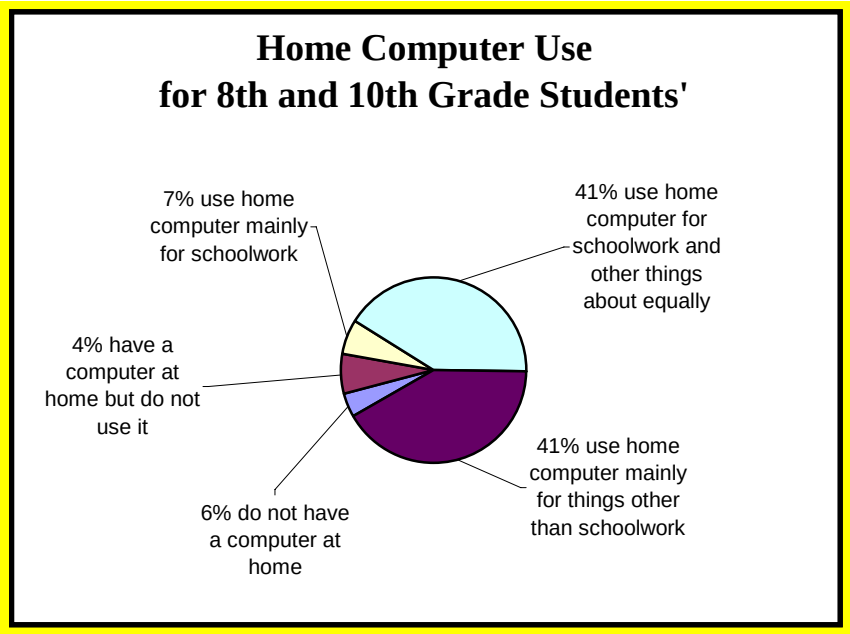
Use of Technology for Professional Purposes *Statewide Averages Based on Districts' Estimates and Surveys*	
Frequency	**Percent of teachers**
Used technology nearly every day	79%
Used technology about once a week	13%
Used technology about once a month	5%
Used technology rarely or never	2%

Student Use of Computers at Home

It is useful to know whether students use computers at home. Students' home use of computers is likely to affect their overall proficiency with technology, as well as their feelings about the use or lack of use of technology in their schools. In addition, educators need to be aware of students' home access to computers, especially when they are developing homework assignments.

As part of a questionnaire distributed with the MCAS tests, eighth and tenth grade students were asked to describe their use of computers at home. The question was

answered by 127,403 eighth and tenth graders. Student selected from one of five choices describing their home computer use, as shown in the graphs and tables below. Interestingly, just 10% of the students who responded do not use a computer at home.



Home Computer Use of 8th and 10th Grade Students	
Possible responses	**Percent of students**
Do not have a computer at home	6%
Have a computer at home but do not use it	4%
Use home computer mainly for schoolwork	7%
Use home computer mainly for things other than schoolwork	41%
Use home computer for schoolwork and other things about equally	41%

Assistive Technologies and Universal Design

Technology offers many ways to assist students with disabilities, including learning disabilities.[14] For example, text-to-speech software allows students to hear text read on

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

the computer. Word processing software is helpful to students who have difficulty writing with a pencil or pen.

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*.[15]

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	5098	237
ELA-Reading or Language and Literature	6557	440
Mathematics	3283	399
Science and Technology/ Engineering	1442	94

For students with significant disabilities, the Department offers the option of submitting the MCAS Alternate Assessment (MCAS-Alt),[16] 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 2006, electronic portfolios were submitted for 606 students.

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

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

Use of MassONE

Use of MassONE continues to grow, with 109,866 user accounts as of March 2007. This represents a 20% increase over the past year. Currently, 36% of the accounts are held by educators, while 64% 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 survey and calendar tools to enhance their instruction.

Approximately one-third of the reporting districts used the online 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. These courses often make use of MassONE's curriculum tools: the Teaching and Learning Resources (TLR) and the lesson plan tool, which links to the state's curriculum standards database.

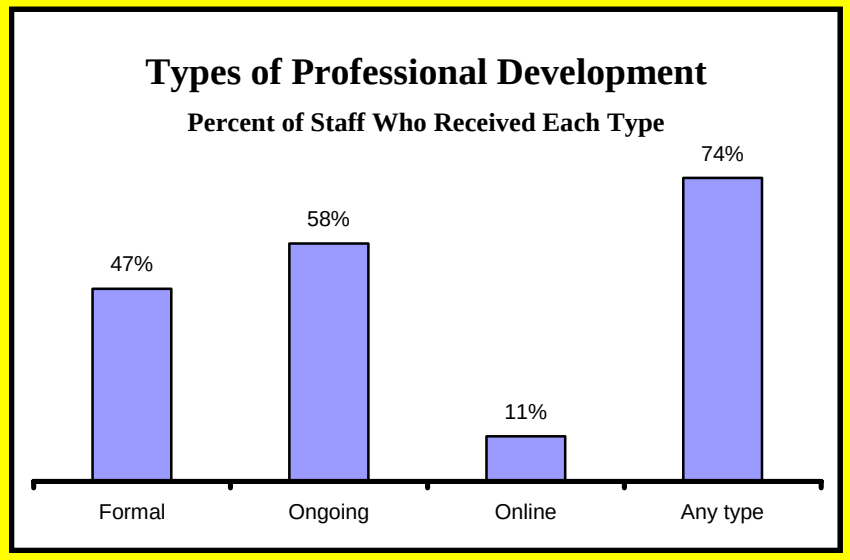
Educator Professional Development

According to numerous studies, technology is likely to impact student learning only when teachers receive adequate and appropriate professional development[17]. 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 2005-2006.

Types of 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 professional development such as coaching, mentoring, 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."

It is worth noting that the use of online professional development continues to grow. Although the percentage of educators receiving online professional development is still less than those receiving other types, 83% of districts reported some use of online professional development, a substantial increase over last year's 69%.



[17] 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 Professional Development Received	
Professional development type	**Percent of staff who received it**
Formal professional development	47%
Ongoing professional development	58%
Online professional development	11%
Any type of professional development	74%

Use of MassONE for Professional Development

In 2006, the Department of Education began using 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.

In February, Project FOCUS Academy, a federally funded professional development project, began offering online courses through MassONE, with a focus on helping students with disabilities. More than 100 participants from nine high schools have participated in the courses. Participants include classroom teachers, special education teachers, parents, and other district personnel. Three providers have developed courses for the project: CAST (Center for Applied Special Technology), ICI (Institute for Community Inclusion), and EDC (Educational Development Center). Although the courses are conducted primarily online, face-to-face meetings are used for the first and last classes to help reinforce the feeling of community. The courses also offer Internet-based voice conferencing and streaming narrated slide shows.

In the summer, MassONE was used for collaboration and sharing in the Department-sponsored content institutes for teachers. All of the institutes used MassONE's tools to enhance communication and collaboration among the participants. Each institute had its own workgroup, with a "home page" including an overview of institute, its course schedule, and contact information for the instructors. MassONE's online survey tool was used to create pre-and post-tests for each institute, enabling the Department to access aggregated data to analyze and report on the effectiveness of the institutes. In addition, most of the institutes used MassONE's discussion forums to continue their conversations beyond the walls of the classroom, and some institutes also used the Virtual Hard Drive to share documents.

In December, the Partnership for Technology Professional Development began providing courses with MassONE as the delivery system. The courses focus on the use of

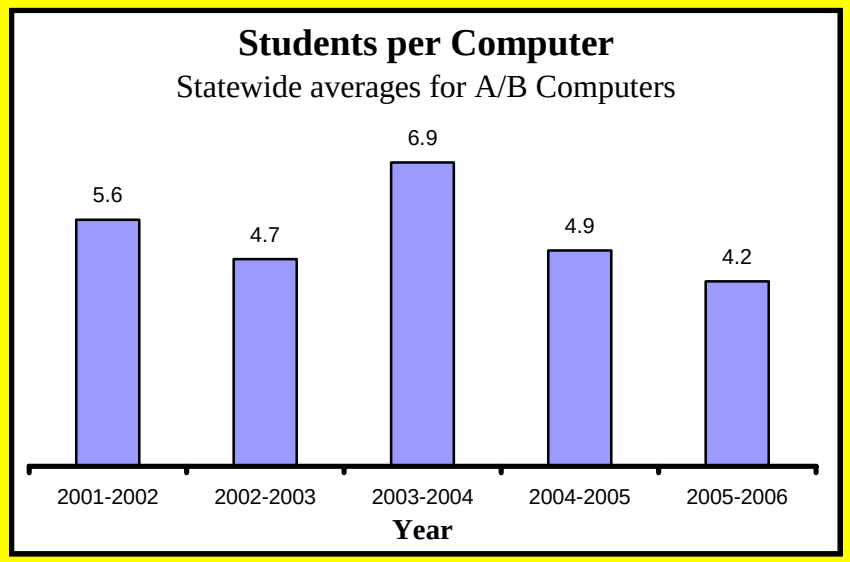
technologies to enhance learning for all students. Worcester Public Schools received a grant to plan and organize this project, in collaboration with the Department of Education and selected partners. The course providers include CAST, MESPA (Massachusetts Elementary School Principals' Association), and VHS (Virtual High School). With courses running three times during the 2006-2007 school year, the Department expects that approximately 300 educators will have participated by the end of the summer of 2007. A similar program, the Partnership for Online Professional Development, will begin in the fall of 2007, with course topics including the Massachusetts curriculum frameworks and instructional technology standards.

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.[18]

Computers

The Department's guidelines recommends that districts maintain a ratio of fewer than five students per high-capacity Internet-connected computer. In 2006, the ratio of students to high-capacity computers dropped from 4.9 to 4.2, which indicates that school districts are improving their ratios by purchasing new computers. The ratios have been declining since 2004, when Department updated the definition of a high-capacity computer[19], causing the statewide ratio of students to computers to rise in 2004.



[18] The *Local Technology Plan Guidelines (School Year 2007-2008 through 2010-2011*) are included in the Appendix of this report.

[19] "High-capacity 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).

Students per Computer *Statewide Averages for A/B Computers*	
School year	**Ratio of students to computers**
2001-2002	5.6
2002-2003	4.7
2003-2004	6.9
2004-2005	4.9
2005-2006	4.2

Having up-to-date computers and software is important, because newer software applications 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.

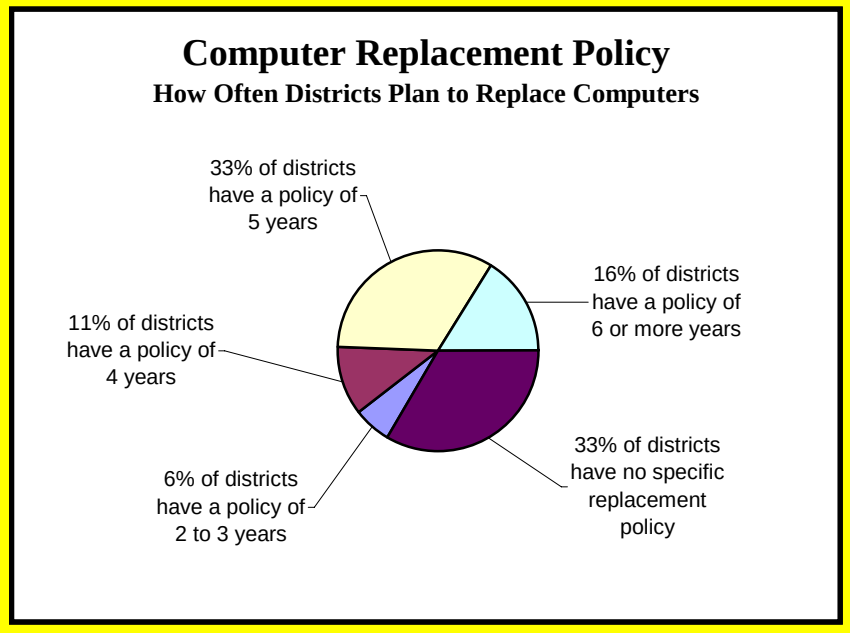
For school administrators, using older technology may result in difficulty accessing some of the Department's applications for submitting or accessing data. For teachers and students, older systems may preclude the use of some of the most innovative and engaging technology products, such as streaming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

The table below shows the penetration of Type A computers, the newest of the three categories defined by the Department in 2004.[20] These computers are defined as having "at least 256 RAM and a Pentium 4 processor or Macintosh G4 processor (or equivalent)."

[20] The Department defined the three categories of computers in May of 2004, after consulting with technology stakeholders across the state. For further information on how the categories are defined, see page 35 of this report.

Type A Computers *Student to Computer Ratios Across the State*	
Ratio of students to computers	**Percent of districts**
3 or better	14%
3 to 5	24%
5 to 20	52%
More than 20 (or no Type A computers)	11%

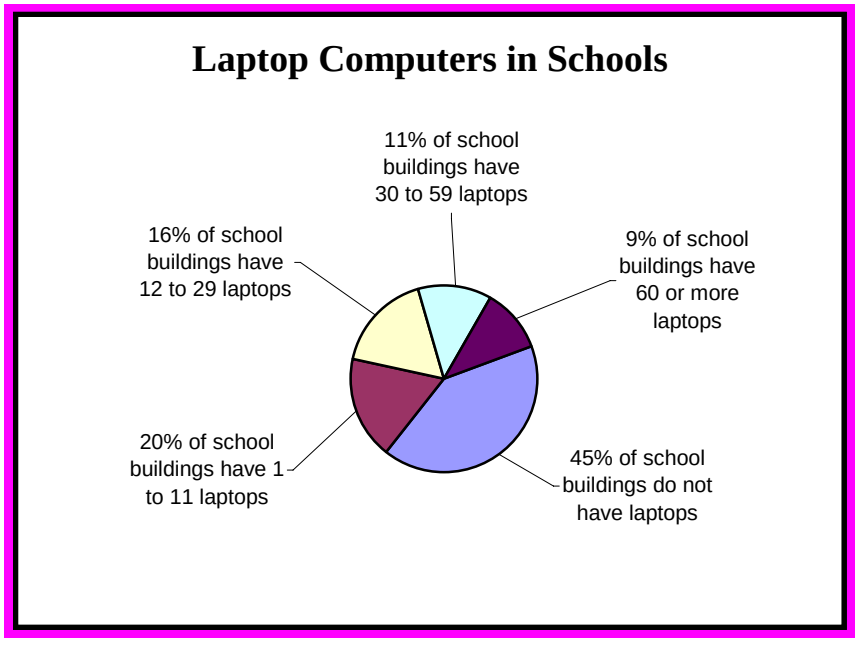
Having a computer replacement policy allows a district to plan for the expenditures needed in order to provide current technology. The percentage of districts that have such a policy has risen over the past year from 61% to 66%. The average replacement cycle for those districts was 5.0 years.



Computer Replacement Policy *How Often Districts Plan to Replace Computers*	
Replacement cycle	**Percent of districts**
2 to 3 years	6%
4 years	11%
5 years	33%
6 or more years	16%
do not have a policy for replacement	33%

Laptop Computers

The use of laptop computers continues to grow, with an increase of nearly 15% in the number of instructional laptops in use across the state. As the graph and table below illustrate, 59% of school building have at least one instructional laptop computer.



Laptop Computers in Schools	
Number of laptops in school	**Percent of school buildings**
none	41%
1 to 11	18%
12 to 29	17%
30 to 59	13%
60 or more	11%

Connectivity

Districts continue to make progress in connecting their classrooms to the Internet. In 2006, the average district had 99% of its classrooms connected and 97% of its computers connected to the Internet. In addition, 87% of districts reported that all of their classrooms were wired, which is up from 82% in the previous year.

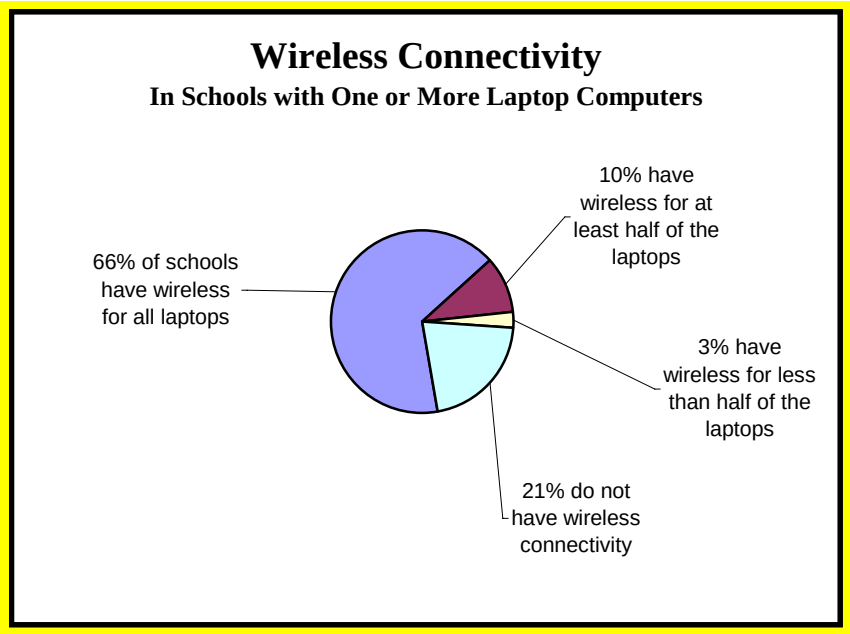
Average Connectivity in Districts	
School Year	**Percent of classrooms connected**
2001-2002	92%
2002-2003	94%
2003-2004	97%
2004-2005	98%
2005-2006	99%

Wireless

With an increased number of laptop computers in schools, the use of wireless connectivity has also grown. In 2005, 785 school buildings had wireless connectivity, while in 2006, 839 (or 48% of the total schools reporting) had it.

Wireless is more common in schools that have laptop computers. Of the 1028 school buildings with one or more laptops, 79% of the buildings have wireless connectivity.

Moreover, 94% of the buildings with 10 or more laptops have wireless. In addition, as the graph and table below illustrate, 59% of the buildings with laptop computers offered wireless connectivity for all of the laptops.



Wireless Connectivity

In Schools with One or More Laptop Computers

Laptops connected wirelessly	Percent of schools
All laptops	66%
At least half of all laptops	10%
Less than half of all laptops	3%
Do not have wireless	21%

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.[21]

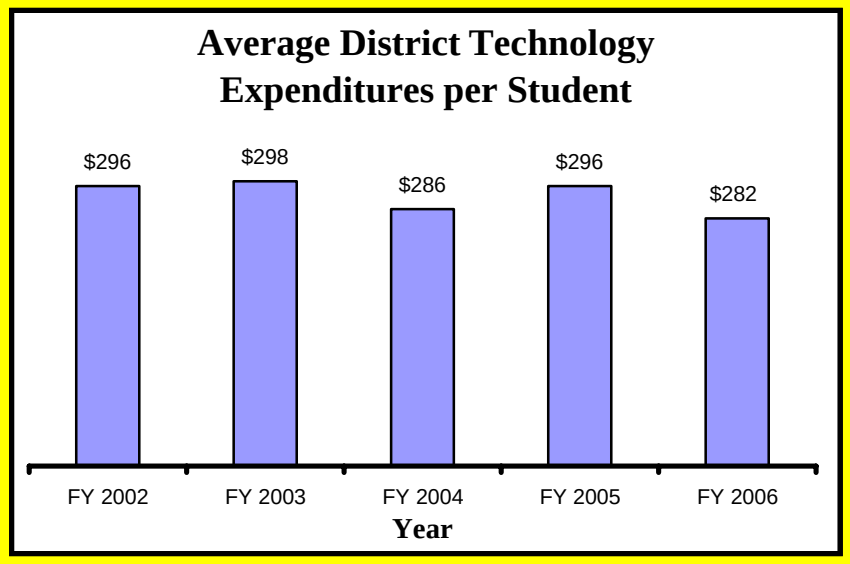
A state-approved technology plan is a requirement for eligibility for technology grants and E-rate discounts. To receive approval from the Department, a district needs to first develop a three- to five-year plan, which should then be posted on the district web site. Then the district must submit data to the Department annually to validate its implementation of the plan. For the school year 2005-2006, 312 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.[22] 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

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 2005-2006 the average per student spending on technology was $282, a decrease of nearly 5% from 2004-2005. These expenditures include monies from districts' operational budgets, municipals bonds, and grants from federal, state, local, and private sources.

[21] The *Local Technology Plan Guidelines (School Year 2007-2008 through 2010-2011)* are included in the Appendix of this report.
[22] Further information on E-rate is available at http://www.fcc.gov/learnnet .



Average District Technology Expenditures per Student	
Year	**Average expenditure**
FY2002	$296
FY2003	$298
FY2004	$286
FY2005	$296
FY2006	$282

Providing funding for technology can be challenging, especially in times when budgets are tight. The Massachusetts STaR Chart[23] 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. For the 2005-2006 school year, through No Child Left Behind's Enhancing Education Through Technology program (Title IID), approximately $1.9 million was available for entitlement grants. A total of 301 districts applied for and received these grants.

The Enhancing Education Through Technology program also provided $1.9 million for competitive grants. The following competitive grants were awarded: 26 Technology Enhancement Competitive Grants, seven Technology for Data Driven Decisions Grants,

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

and one grant to coordinate the statewide Partnership for Technology Professional Development. Many of these grants included partner districts, increasing the total number of districts impacted by these projects.[24]

Districts continue to recognize the value of the federal E-rate[25] discount program; 84% of the districts that submitted data used it in 2005-2006. In 2005-2006 Massachusetts schools (public and private) received approximately $27 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 58 %.

Private funding was also available for some technology programs. In June of 2006 Microsoft announced a software donation believed to be the largest ever made to Massachusetts educational institutions. The gift provides Massachusetts public high schools and universities with full access to the resources of the Microsoft Developer Network Academic Alliance, which offers a suite of Microsoft's latest software development tools, including Visual Studio, .NET and the MSDN Library reference.[26]

Also, as a result of an anti-trust settlement with Microsoft Corporation, Massachusetts schools in low-income communities were eligible to receive up to $16 million in vouchers, allowing them to purchase a broad range of hardware, software, and technology services. These vouchers allow eligible schools to purchase technology products and services and receive reimbursement from Microsoft through February 21, 2009.[27]

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 69% of technology spending, a 7% jump since last year. On the other hand, spending for hardware and other capital expenses went down 7% since last year.

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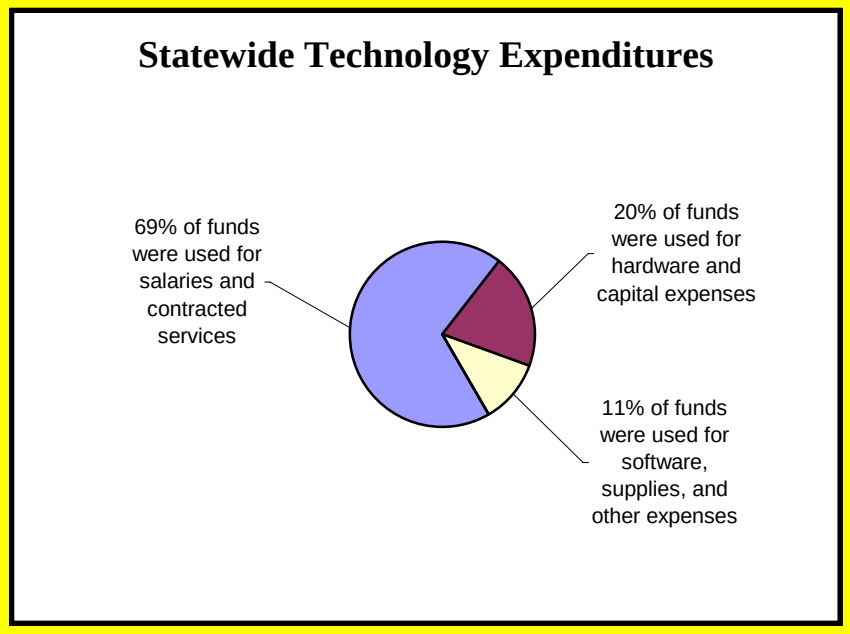
[24] Information on grants, including descriptions of funded projects, is available at http://www.doe.mass.edu/edtech/grants.html .

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

[26] For information on how to participate in this opportunity, contact Microsoft Corporation at mamsdnaa@microsoft.com .

[27] The Microsoft Settlement Administrator sent application forms to superintendents in eligible districts in 2005. Eligible districts were those with schools in which at least 50% of the students were eligible for free or reduced-price lunch. For more information, call the Microsoft Settlement Administrator at 1-888-230-0363 or see https://www.microsoftproductssettlement.com/massachusetts/ .

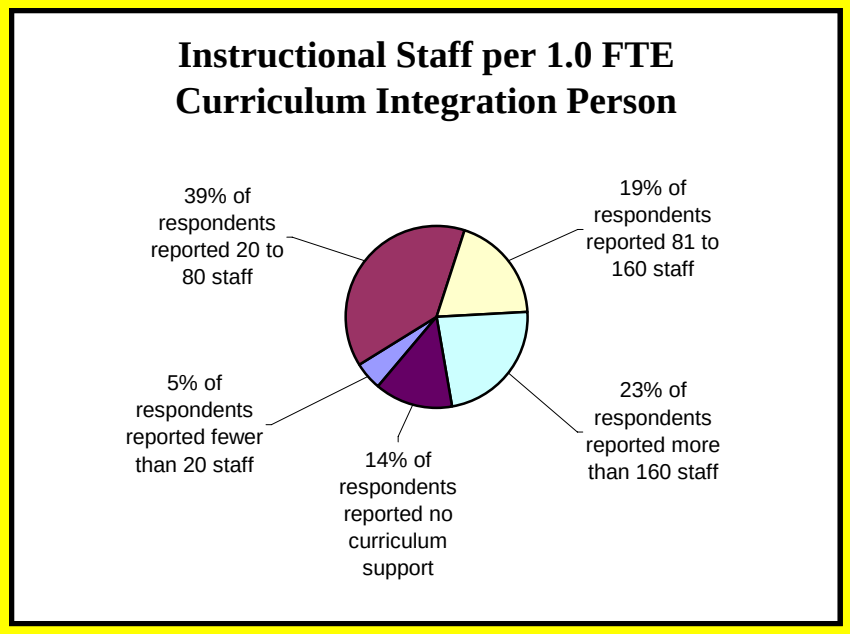


Statewide Technology Expenditures	
Expenditure category	**Percent of funds expended**
Salaries and contracted services	69%
Hardware and capital expenses	20%
Software, supplies, and other expenses	11%

Curriculum Integration Support

Since technology changes quickly and the number of available resources is immense, it is important for teachers to receive 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 44% of districts meet this recommendation for curriculum integration support, about the same as last year. On the other hand, 37% of the districts either had no support or had a full-time-equivalent person supporting more than 160 teachers, a slight improvement as compared to 2005. 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.

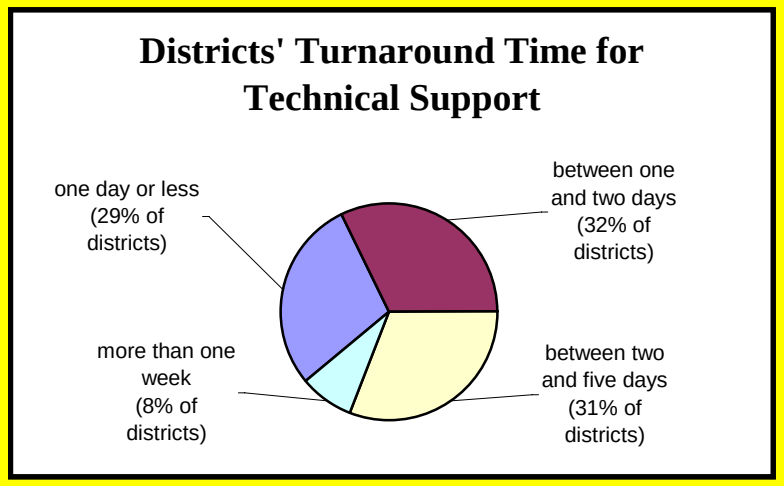


Instructional Staff per 1.0 FTE Curriculum Integration Person	
Staff supported by 1.0 FTE	**Percent of districts**
Fewer than 20 staff members	5%
20 to 80 staff members	39%
81 to 160 staff members	19%
More than 160 staff members	23%
Has no curriculum support	14%

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 2006, fewer than 20% of the reporting districts indicated that they had this level of support, a drop from the 26% that did so in 2005. On average, according to district data, a technical support person maintains approximately 439 computers, up from 413 in 2005.

Even with the increased number of computers to maintain, technical support personnel were able to resolve problems in 2.8 days, on average, according to district reports for 2005-2006, a considerable improvement over the previous year. In addition, just 8% of districts said that it took more than one week to resolve problems, which is down from 11% in the previous 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	32%
Between two and five days	31%
More than one week	8%

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

The Department is implementing a statewide Education Data Warehouse and Reporting System for use by district and Department staff. The initial phase involves 35 districts, which were selected and funded through the Title IID Technology Enhancement Competitive Grants Program. The Department has loaded four years of SIMS 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.

In addition, a subset of these 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.

Working with the legislature, the Department has secured a statewide software license, allowing all public school educators and policy makers in the Commonwealth to access the data warehouse. The state is funding the software licenses and centralized hosting of the warehouse. Costs to districts may include:

- Training for staff who will use the data warehouse
- Any 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.

The Department is working with the districts to validate the first round of reports based on state data. After this pilot project is successfully completed, additional districts will gradually be brought on board. The long-term goal of the pilot is to provide a powerful, standardized, and user-friendly system for reporting and analyzing education data to all Commonwealth school districts, at a substantially reduced cost.

Education Personnel Information Management System

For the first time in our state's history, the Department will collect demographic data and work assignment information on individual public school educational staff. This information will enable Massachusetts to comply fully with the No Child Left Behind Act by accurately reporting on highly qualified teachers. The Education Personnel Information Management System (EPIMS) data also will be used to perform greatly needed analysis on our educator workforce that, over time, will identify high need areas, evaluate current educational practices and programs, and assist districts with their recruiting efforts.

The Department will implement the EPIMS data collection on a mandatory basis for all districts in 2007, following a successful pilot collection in the fall of 2006. The first statewide EPIMS data collection period will be from October 1–December 31, 2007. EPIMS will replace the DSSR (District School Staffing Report), which currently reports similar information on an aggregate basis.

EPIMS represents a major change to the types of data being reported. Some of the EPIMS data elements may be stored in a district's human resource database, while other data elements may be stored in a student-scheduling database. Districts may well have to collect information in a different way or supplement the data they currently collect. It is important for districts to understand the EPIMS data requirements as soon as possible so they can begin to prepare for the fall collection.

Detailed information about the EPIMS data collection timeline and processes is available on the EPIMS web page (http://www.doe.mass.edu/infoservices/data/epims/). The online information includes presentations from the EPIMS informational meetings, the EPIMS Data Handbook and Appendices, a list of pilot districts, and vendor information. In addition, Department staff are available to assist districts with preparing for this significant data collection project. To request further information or schedule an on-site visit, districts can write to epims@doe.mass.edu.

Conclusion

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, and the MassONE portal. Moreover, most districts are working hard, using local resources, to keep up with the ever-changing technologies of the twenty-first century. These technologies have the power to enhance students' learning, engage them, and ultimately prepare them for the increasingly competitive world beyond school. For those districts that are able to meet the challenge, the potential rewards are great.

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[28] 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.

[28] 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[29]

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[30]).

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)[31].

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.

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[29] The Massachusetts Department of Education defines technology integration as the daily use of technology in classrooms, libraries, and labs to improve student learning.

[30] The Massachusetts Recommended K-12 Instructional Technology Standards are available on the Department's web site (http://www.doe.mass.edu/edtech/standards.html).

[31] 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).

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

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[32] 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.[33]

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.[34]

Benchmark 4
Accessibility of Technology

A. Hardware Access

1. The district has an average ratio of fewer than five students per high-capacity[35], 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.)

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[32] High quality professional development is described in the Massachusetts 2001 State Plan for Professional Development (http://www.doe.mass.edu/pd/stateplan/).

[33] Details are available on the Department's web site (http://www.doe.mass.edu/edtech/standards/sa_tool.html).

[34] 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).

[35] The Department defines 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.

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 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.

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

E. 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[36], 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.

[36] 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 2006 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 2006 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 2005-2006 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 instructional computers on the Internet	Did the district receive E-rate?
Abby Kelley Foster Charter Public	6.1	6.1	100	96	no
Abington	6.8	4.8	100	100	yes
Acushnet	1.7	1.6	100	100	yes
Adams-Cheshire	5.4	4.5	100	100	yes
Agawam	6.7	5.0	94	92	yes
Amesbury	5.8	3.6	100	94	yes
Amherst	3.1	3.1	100	100	yes
Amherst-Pelham	2.8	2.8	100	100	yes
Andover	3.7	3.0	100	99	yes
Arlington	4.1	3.8	100	98	yes
Ashburnham-Westminster	3.6	3.3	100	100	yes
Ashland	3.9	3.8	100	100	yes
Assabet Valley	1.8	1.7	100	100	NA
Athol-Royalston	3.1	2.7	95	95	yes
Attleboro	5.1	4.5	100	82	yes
Auburn	3.4	3.4	87	100	yes
Avon	2.7	2.7	100	97	yes
Ayer	3.6	2.6	100	100	yes
Barnstable	6.7	3.4	100	100	yes
Barnstable Horace Mann Charter	2.6	2.6	100	100	yes
Bedford	2.4	2.2	100	100	yes
Belchertown	4.0	4.0	93	98	yes
Bellingham	4.1	2.9	100	100	yes
Belmont	6.1	5.0	100	100	yes
Benjamin Banneker Charter	2.5	2.5	100	51	yes
Benjamin Franklin Classical Charter	3.8	3.4	100	100	no
Berkley	4.5	4.1	100	76	no
Berkshire Arts And Technology Charter	1.6	1.6	100	100	yes
Berkshire Hills	2.8	2.8	100	100	no
Berlin	5.2	3.5	100	100	yes
Berlin-Boylston	4.6	4.4	100	100	yes
Beverly	5.2	4.0	99	100	yes
Billerica	12.0	6.0	100	100	yes
Blackstone Valley Reg	1.5	1.5	100	96	yes
Blackstone-Millville	3.4	3.4	100	100	yes
Boston	4.0	3.5	100	92	yes
Boston Collegiate Charter	8.9	8.7	100	100	no
Boston Renaissance Charter Public	7.9	3.5	100	96	yes
Bourne	2.6	2.4	100	100	no
Boxborough	3.4	3.4	100	100	yes
Boxford	3.7	3.6	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 instructional computers on the Internet	Did the district receive E-rate?
Boylston	4.7	4.4	100	100	yes
Braintree	6.8	6.1	75	88	yes
Brewster	3.3	2.5	100	83	no
Bridgewater-Raynham	5.5	5.1	100	99	no
Brimfield	6.0	3.7	100	56	yes
Bristol County Agr	3.2	3.2	100	100	no
Bristol-Plymouth Voc Tech	2.4	2.4	100	100	yes
Brockton	7.0	5.1	100	94	yes
Brookfield	9.3	3.2	100	51	yes
Brookline	2.8	2.8	99	100	no
Burlington	6.1	3.5	100	100	no
Cambridge	2.6	2.5	100	99	yes
Canton	3.0	2.7	100	100	no
Cape Cod Lighthouse Charter	2.8	2.8	100	100	no
Cape Cod Region Voc Tech	2.1	2.1	100	99	yes
Carlisle	4.3	3.5	95	97	yes
Carver	5.3	4.3	100	100	yes
Central Berkshire	4.5	3.5	100	95	yes
Chatham	1.5	1.5	100	100	no
Chelmsford	4.0	3.9	100	100	yes
Chelsea	3.4	3.2	100	100	yes
Chesterfield-Goshen	13.8	4.7	100	100	yes
Chicopee	3.7	3.4	100	100	yes
City On A Hill Charter Public	3.7	3.7	100	100	no
Clarksburg	3.2	3.2	100	100	yes
Clinton	3.7	2.7	100	100	yes
Cohasset	2.3	2.2	100	100	yes
Community Day Charter Public	3.9	3.9	100	100	no
Concord	2.0	2.0	100	100	yes
Concord-Carlisle	2.2	2.2	100	100	yes
Conway	3.4	3.4	100	100	yes
Danvers	3.8	3.8	100	99	yes
Dartmouth	4.6	3.3	100	100	yes
Dedham	2.3	2.3	100	100	yes
Deerfield	3.7	3.7	100	100	yes
Dennis-Yarmouth	4.5	3.5	100	100	yes
Dighton-Rehoboth	4.4	4.1	100	100	yes
Douglas	3.2	2.8	100	100	yes
Dover	2.2	2.2	100	100	yes
Dover-Sherborn	1.7	1.7	100	97	yes
Dracut	4.9	4.1	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 instructional computers on the Internet	Did the district receive E-rate?
Duxbury	4.4	3.6	100	100	yes
East Bridgewater	9.8	5.1	100	91	yes
East Longmeadow	4.4	2.9	100	100	yes
Eastham	2.2	2.2	100	100	no
Easthampton	3.4	3.3	100	100	yes
Easton	4.2	4.0	100	100	yes
Edgartown	2.7	2.5	100	91	yes
Erving	2.1	2.1	100	0	yes
Essex Agr Tech	2.6	2.5	98	98	yes
Everett	3.1	3.0	83	98	yes
Fairhaven	6.3	4.8	99	100	NA
Fall River	6.1	4.7	90	81	yes
Falmouth	4.1	3.8	100	100	yes
Farmington River Reg	2.2	2.2	100	100	yes
Fitchburg	7.8	5.9	97	96	yes
Florida	3.2	3.1	100	100	yes
Foxborough Regional Charter	5.4	4.9	100	100	yes
Framingham	3.2	2.9	100	100	yes
Francis W. Parker Charter Essential	3.6	3.6	100	100	yes
Franklin	5.2	2.9	100	100	yes
Franklin County	2.2	1.1	100	100	yes
Frontier	1.9	1.9	100	100	yes
Gardner	4.9	4.9	100	100	no
Gateway	1.6	1.6	100	100	yes
Georgetown	10.4	6.3	100	100	yes
Gill-Montague	3.1	3.1	100	98	yes
Gloucester	4.0	3.0	100	88	yes
Grafton	3.1	3.0	100	94	yes
Granby	6.3	4.5	100	100	yes
Granville	2.8	2.8	100	82	yes
Greater Fall River	2.0	2.0	100	98	yes
Greater Lawrence Rvt	2.3	2.1	100	100	yes
Greater Lowell Voc Tec	2.8	2.4	97	95	yes
Greater New Bedford	1.9	1.9	100	100	yes
Greenfield	3.1	3.1	98	94	no
Groton-Dunstable	3.8	3.1	100	100	yes
Hadley	3.4	3.1	100	100	no
Halifax	6.2	5.2	100	60	yes
Hamilton-Wenham	4.0	3.7	100	97	yes
Hampden-Wilbraham	4.7	3.6	100	100	yes
Hampshire	1.9	1.9	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 instructional computers on the Internet	Did the district receive E-rate?
Hancock	2.8	2.8	100	100	yes
Hanover	3.9	3.3	100	100	yes
Harvard	3.9	3.4	99	100	yes
Harwich	3.8	3.4	100	100	yes
Haverhill	17.6	10.4	86	100	no
Hawlemont	2.2	2.0	100	100	yes
Hill View Montessori Charter	8.7	8.7	100	100	no
Hingham	4.6	3.8	100	86	yes
Holbrook	10.9	5.3	100	100	yes
Holland	4.1	2.7	100	100	yes
Holliston	2.6	2.6	100	100	yes
Hopedale	4.4	4.4	100	100	yes
Hopkinton	3.2	3.1	100	95	yes
Hudson	2.7	2.6	100	100	yes
Ipswich	3.4	3.2	100	100	yes
Kingston	5.6	4.6	100	79	yes
Lawrence	3.4	3.4	78	96	yes
Lawrence Family Development Charter	4.8	4.5	100	100	no
Lee	1.9	1.9	100	100	yes
Leicester	3.9	3.4	100	100	yes
Lenox	3.8	3.0	100	88	yes
Leominster	3.9	3.5	100	94	yes
Leverett	2.7	2.4	100	100	yes
Lincoln-Sudbury	1.4	1.4	100	100	yes
Longmeadow	3.0	2.8	100	100	yes
Lowell Community Charter	3.6	3.6	100	100	yes
Ludlow	5.0	4.7	100	100	yes
Lunenburg	4.3	4.3	100	100	yes
Lynn	5.9	4.2	92	86	yes
Malden	3.4	3.0	100	100	yes
Manchester Essex Regional	3.9	3.4	100	100	no
Mansfield	8.2	5.7	100	100	yes
Marblehead	3.5	3.2	100	94	yes
Marion	2.5	2.5	100	100	yes
Marlborough	6.5	5.7	100	100	yes
Marshfield	4.6	4.6	100	100	yes
Marstons Mills East Horace Mann Charter	4.9	3.3	100	74	yes
Marthas Vineyard	2.0	1.8	100	97	yes
Masconomet	2.6	2.6	100	100	yes
Mashpee	5.9	5.6	100	100	yes
Mattapoisett	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 instructional computers on the Internet	Did the district receive E-rate?
Maynard	2.9	2.8	100	100	yes
Medfield	3.1	2.9	100	100	yes
Medford	2.2	2.2	98	99	yes
Medway	4.7	3.2	100	98	yes
Melrose	5.9	5.9	100	100	yes
Mendon-Upton	6.2	4.4	100	100	yes
Methuen	6.8	3.4	99	100	yes
Middleborough	2.6	2.5	100	100	yes
Middleton	6.2	3.8	100	96	no
Milford	6.9	5.5	99	70	yes
Millbury	3.9	3.9	100	100	yes
Millis	3.8	3.7	100	99	yes
Milton	3.7	3.6	100	99	yes
Minuteman Voc Tech	1.5	1.2	100	96	yes
Mohawk Trail	5.6	3.2	100	98	yes
Monson	3.0	3.0	100	100	yes
Montachusett Voc Tech Reg	2.0	2.0	100	100	yes
Mount Greylock	3.8	3.6	100	100	yes
Nantucket	1.6	1.6	100	97	no
Narragansett	6.7	4.6	98	100	yes
Nashoba	2.5	2.1	100	100	yes
Nashoba Valley Tech	2.5	1.9	100	100	yes
Natick	3.6	3.4	100	100	yes
Nauset	5.8	3.2	100	93	no
Needham	3.4	3.4	100	100	yes
New Bedford	3.7	3.0	93	94	yes
New Salem-Wendell	3.9	3.6	100	100	yes
Newburyport	3.4	2.6	100	100	yes
Newton	3.7	3.1	98	94	yes
Norfolk	4.4	3.6	100	100	yes
Norfolk County Agriculture	2.3	2.3	100	100	yes
North Adams	2.4	2.4	100	98	yes
North Andover	3.0	2.9	100	100	no
North Attleborough	6.0	3.4	100	100	yes
North Brookfield	1.6	1.4	100	100	yes
North Central Charter Essential	3.0	3.0	100	100	no
North Middlesex	5.2	4.5	100	95	yes
North Reading	4.2	3.8	98	89	yes
North Shore Reg Voc	1.5	1.5	100	100	yes
Northampton	5.7	4.6	100	100	yes
Northampton-Smith	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 instructional computers on the Internet	Did the district receive E-rate?
Northboro-Southboro	2.1	2.1	100	100	yes
Northborough	4.5	2.9	100	100	yes
Northbridge	3.6	3.0	99	99	yes
Northeast Metro Voc	3.0	3.0	96	97	no
Norton	8.5	4.2	100	100	yes
Norwell	2.9	2.4	100	100	yes
Norwood	4.8	4.8	100	100	yes
Oak Bluffs	2.7	2.7	100	100	yes
Old Rochester	2.1	2.0	100	100	yes
Orange	2.5	2.5	100	100	yes
Orleans	2.9	2.9	100	100	no
Oxford	5.4	5.4	100	100	yes
Palmer	6.1	4.1	100	100	yes
Pathfinder Voc Tech	1.9	1.9	100	100	yes
Peabody	6.6	4.7	94	100	yes
Pelham	1.7	1.7	100	100	yes
Pembroke	4.1	3.2	100	100	yes
Pentucket	7.3	5.5	83	84	no
Petersham	3.3	3.2	86	100	no
Pioneer Valley	2.3	2.3	98	100	yes
Pioneer Valley Performing Arts Charter Public	5.7	5.7	100	96	yes
Pittsfield	3.0	3.0	100	96	yes
Plainville	2.1	2.1	100	100	yes
Plymouth	5.1	2.3	100	100	yes
Plympton	2.7	2.7	100	100	yes
Prospect Hill Academy Charter	5.1	5.1	100	100	no
Provincetown	1.8	1.2	100	100	yes
Quabbin	7.1	6.1	100	100	yes
Quaboag Regional	3.3	2.8	100	96	yes
Quincy	4.3	3.7	95	100	yes
Ralph C Mahar	1.5	1.5	100	100	yes
Randolph	17.1	4.4	100	96	yes
Reading	5.0	4.7	100	90	no
Revere	3.7	3.5	100	100	yes
Richmond	3.1	2.7	100	100	yes
Rising Tide Charter	3.3	3.3	100	100	yes
River Valley Charter	5.5	4.9	100	95	no
Rochester	3.7	3.5	100	100	NA
Rockland	6.8	4.5	100	100	yes
Rockport	3.0	2.8	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 instructional computers on the Internet	Did the district receive E-rate?
Rowe	2.4	1.4	100	98	yes
Roxbury Preparatory Charter	2.1	2.1	100	100	yes
Sabis International Charter	13.6	13.6	32	97	no
Salem	2.9	2.5	78	68	yes
Saugus	7.3	4.6	99	76	yes
Savoy	4.5	2.7	80	100	yes
Scituate	3.8	3.5	100	100	yes
Seekonk	2.8	2.5	100	100	yes
Seven Hills Charter	3.2	3.2	100	100	yes
Sharon	4.0	3.8	100	100	yes
Shawsheen Valley Voc Tech	2.1	1.9	100	100	yes
Sherborn	3.5	3.5	100	100	yes
Shirley	3.4	2.8	100	100	no
Shrewsbury	3.4	3.2	100	99	no
Shutesbury	3.1	2.8	100	100	yes
Silver Lake	2.9	2.9	100	100	yes
Smith Leadership Academy Charter	3.8	3.8	100	100	yes
So Middlesex Voc Tech Reg	1.9	1.9	100	98	yes
Somerset	3.4	2.9	100	100	yes
Somerville	3.6	2.7	100	100	yes
South Hadley	5.6	5.2	100	100	no
South Shore Charter Public	3.2	3.2	100	100	no
South Shore Reg Voc Tech	2.2	2.2	100	100	yes
Southampton	4.6	4.6	100	100	yes
Southborough	3.1	2.1	100	100	yes
Southbridge	60.2	4.6	100	72	yes
Southeastern Reg Voc Tech	1.4	1.4	100	98	yes
Southern Berkshire	2.1	2.1	100	100	yes
Southern Worcester Cty Vt	2.5	2.5	100	100	yes
Southwick-Tolland	5.1	4.0	98	100	yes
Spencer-E Brookfield	3.8	3.2	100	98	yes
Springfield	3.6	2.5	85	90	yes
Stoneham	3.8	3.8	100	100	yes
Stoughton	2.6	2.6	100	99	yes
Sturbridge	6.4	4.7	100	92	yes
Sudbury	3.7	3.6	100	100	yes
Sunderland	3.3	3.3	100	100	yes
Sutton	3.2	2.2	100	100	yes
Swampscott	3.5	3.3	100	100	yes
Swansea	7.7	5.6	100	100	yes
Tantasqua	3.2	2.8	92	90	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 instructional computers on the Internet	Did the district receive E-rate?
Taunton	2.8	2.8	100	100	yes
Tewksbury	7.5	3.9	100	100	yes
Tisbury	2.8	1.9	100	100	yes
Topsfield	3.2	2.8	100	98	no
Tri County	4.8	1.8	100	100	yes
Triton	5.6	2.8	100	100	yes
Truro	2.4	2.4	100	100	no
Tyngsborough	3.5	3.3	100	97	yes
Up-Island Regional	1.6	1.6	100	100	yes
Upper Cape Cod Voc Tech	1.6	1.6	100	100	yes
Uxbridge	8.5	7.4	100	100	yes
Wachusett	4.1	3.1	100	98	yes
Wakefield	5.0	5.0	100	100	yes
Wales	3.4	2.8	100	100	yes
Walpole	3.0	2.7	87	94	yes
Waltham	3.5	3.4	94	97	yes
Ware	4.3	3.1	100	100	yes
Wareham	4.2	3.0	100	100	yes
Watertown	3.0	2.4	100	100	yes
Wayland	3.0	2.8	100	99	no
Webster	3.4	3.4	100	100	yes
Wellesley	3.3	3.0	100	100	yes
Wellfleet	2.1	1.9	100	100	no
West Boylston	2.7	2.4	100	100	yes
West Springfield	4.0	3.4	100	76	no
Westborough	3.3	2.8	100	100	yes
Westfield	5.0	3.1	99	98	yes
Westford	4.0	3.7	100	100	yes
Westhampton	4.0	3.6	100	85	yes
Weston	2.9	2.5	100	100	yes
Westport	4.1	3.9	100	100	yes
Westwood	3.7	3.2	100	100	yes
Weymouth	3.8	3.8	99	99	yes
Whately	1.8	1.8	100	100	yes
Whitman-Hanson	3.5	3.5	100	98	yes
Williamsburg	2.8	2.7	100	97	yes
Williamstown	2.8	2.8	100	100	no
Wilmington	5.0	5.0	100	100	yes
Winchendon	10.8	4.7	100	100	yes
Winchester	5.2	5.0	100	100	yes
Woburn	3.3	3.2	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 instructional computers on the Internet	Did the district receive E-rate?
Worcester	3.3	3.3	100	100	yes
Wrentham	2.0	2.0	100	100	yes