

Gardner Public Schools



Technology Plan Fiscal Years 2008-2013

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Benchmark 1: Commitment to a Clear Vision and Implementation Strategies

Benchmark 1-A: Vision and Goals

Gardner Public Schools is committed to providing students with the technology and information literacy skills needed for the 21st Century. It is our mission to integrate technology into curriculum and instruction to promote student achievement and produce lifelong learners able to succeed in today's information society both locally and globally.

Gardner Public Schools' goals are aligned with the Massachusetts Department of Elementary and Secondary Education (DESE) recommended benchmarks set forth in the *Local Technology Plan Guidelines (School Year 2007-2008 through 2010-2011)* ([Appendix 1](#)). Although it is unrealistic for us to attain our goals at a district-wide level by 2011 as recommended by the DESE, we plan to attain our goals by 2013. Our primary goals include incorporating a 5-year computer replacement strategy and providing professional development for each school as their equipment is updated. The foundation of our current plan, contingent upon funding and staffing, is as follows:

Table 1: Technology Plan Overview

School ¹	Technology Purchased ²	Technology Implemented	Professional Development	Teacher Integration & Literacy Assessments
GHS ³	FY2008-12	FY2009-13	FY2009-13	FY2011 and 2013
GMS	FY2008	FY2009	FY2009-11	FY2011
ESS	FY2009	FY2010	FY2010-12	FY2012
HMS	FY2010	FY2011	FY2010-13	FY2013
WSS	FY2011	FY2012	FY2011-13	FY2013

¹ GHS = Gardner High School; GMS = Gardner Middle School; ESS = Elm Street School; HMS = Helen Mae Sauter School; WSS = Waterford Street School

² Technology will be purchased at the end of a fiscal year (April-June) to insure a timely deployment of equipment for the beginning of the next school year.

³ Gardner High School maintains seven full and two half computer labs that will be replaced on an ongoing basis. Classroom computers are scheduled for replacement FY2012.

As we progress with upgrading our technology the goals of Gardner Public Schools strive to:

- ensure that all students have equal access and educational opportunities with respect to technology;
- maintain a minimum of a 5:1 student-to-computer ratio while upgrading computers and strategically placing Type A, B, and C computers where appropriate;
- provide the infrastructure for network and Internet access to accommodate communication and collaboration within our schools, throughout our community, and around the globe;
- provide professional development for staff to integrate technologies into the curriculum and develop engaging, authentic, and cultural experiences for students that are aligned with the *Massachusetts Technology Literacy Standards and Expectations, April 2008* ([Appendix 2](#));
- continue to enhance our student information database and other administrative software for guiding instruction and reporting purposes;
- maintain adequate staffing and funding to attain our technology goals.

Benchmark 1-B: Technology Planning Team

The core of our technology plan was developed by representatives from all five schools that determined the school's needs. Members of the technology planning team collaborated with additional representatives from the schools in workgroups/committees to assess and evaluate services and products before purchasing. Examples included a workgroup that evaluated our data and reporting needs before purchasing a new database, and a committee that evaluated the needs of Special Education students. Workgroups and committees will continue to advise as new technology and professional development is provided for their schools.

Benchmark 1-C: Needs Assessment

Needs were assessed by the Technology Planning Committee through DESE's *Technology Self-Assessment Tool* (TSAT) ([Appendix 3](#)), local surveys, and administrative and staff recommendations.

Benchmark 1-D: CIPA-compliant Acceptable Use Policy

Gardner Public Schools maintains a CIPA-compliant Acceptable Use Policy for students and teachers regarding the use of the Internet and our network systems to help ensure safe and ethical use of our schools' technology resources. The Acceptable Use Policies and forms are published on our website at www.gardnerk12.org. The district also maintains an Internet filter in compliance with the Children's Internet Protection Act (CIPA).

Benchmark 1-E: Budget

The schools' local operational budget allocates funding supporting the technology plan ([Appendix 4](#)). Local budget line items account for staffing, hardware, software, infrastructure, professional development, Internet and telecommunications services, security, and non-discounted portions of E-Rate funding. In addition to local funding, Gardner Public Schools allocates funding towards technology from Title IID, Title I, Foundation Reserve, other grants, and school PTO fundraising initiatives.

Benchmark 1-F: Evaluation

The Technology Subcommittee of the School Committee is an advisory group to the Technology Director and Superintendent of Schools regarding technology planning and evaluation. The Technology Subcommittee meets monthly to evaluate the progress of the schools' technology plan and reports to the full School Committee. Meeting monthly allows for ongoing monitoring and the flexibility to adapt the technology plan to take advantage of opportunities for advancement throughout the school year.

Benchmark 2: Technology Integration and Literacy

Benchmark 2-A: Technology Integration

The DESE measures technology integration by the percentage of instructional staff using technology for professional and instructional activities. Professional activities utilize technology outside of teaching time including administrative tasks, lesson planning, communications, and collaboration. Instructional activities focus on technology integration in curriculum and instruction and are based on the *Massachusetts Technology Literacy Standards and Expectations, April 2008*. Activities may include research, multimedia, simulations, data interpretation, communications, and collaboration.

The tables below represent DESE's recommended benchmarks to be reached by 2011, Gardner Public Schools' estimated current status, and our goals to be reached by 2013. Note that our estimates are district-wide. The intent is for each school to attain these goals as their technology is upgraded and professional development is provided (refer to [Table 1 in Benchmark 1-A](#)).

Table 2: Technology Used for Professional Activities

Outside Teaching Time: Instructional staff using technology for professional activities	DESE Recommended By 2011	GPS Current Status	GPS Goals By 2013
Staff use technology for professional activities nearly every day.	85%	62 %	85%
Staff use technology for professional activities about once a week.	-	17 %	-
Staff use technology for professional activities about once a month.	-	14 %	-
Staff use technology for professional activities rarely or never.	-	7 %	-

The GPS Current Status estimates are based on data from local surveys administered during the 2005-06 school year.

Table 3: Technology Used for Instructional Activities

Teaching and Learning: Instructional staff using technology for instructional activities	DESE Recommended By 2011	GPS Current Status	GPS Goals By 2013
Staff use technology for instruction nearly every day.	85%	35 %	-
Staff use technology for instruction about once a week.	-	25 %	85%
Staff use technology for instruction about once a month.	-	25 %	-
Staff use technology for instruction rarely or never.	-	15 %	-

The GPS Current Status estimates are based on data from local surveys administered during the 2005-06 school year.

Plans to increase the percentage of instructional staff using technology for professional and instructional activities include the following:

- implement Edline, a web-based grade book and parental/student portal system integrated with our district student information database. Teachers will use Edline on a daily/weekly basis for professional activities such as recording student attendance and assessments, lesson planning, and communicating and collaborating with parents and students.
- provide in-house and online professional development for productivity software (Word processing, spreadsheets, presentation software) and assessment tools such as Cognos for professional activities.
- provide in-house and online professional development for curriculum-based technologies mapped to the *Massachusetts Technology Literacy Standards and Expectations, April 2008*;
- provide access to computer labs for a *minimum* of 1 time per week for technology-based instructional activities.

Benchmark 2-B: Technology Literacy

The DESE measures student technology literacy by the percentage of students attaining proficiency in the *Massachusetts Technology Literacy Standards and Expectations, April 2008* by the eighth grade. Teacher Technology Literacy is measured by the percentage of teachers attaining proficiency as per the DESE's *Technology Self-Assessment Tool (TSAT)* ([Appendix 3](#)).

Table 4: Grade 8 Technology Literacy

Grade 8 mastering the skills listed in the <i>Massachusetts Technology Literacy Standards and Expectations, April 2008</i>	DESE Recommended By 2011	GPS Current Status	GPS Goals By 2013
Grade 8 students have mastered all or nearly all of the standards.	85%	45 %	85%
Grade 8 students have mastered half or more than half of the standards.	-	12 %	
Grade 8 students have mastered less than half of the standards.	-	43 %	

The GPS Current Status estimates are based on student assessments for the 2007-08 school year in Computer Applications courses.

Table 5: Teacher Technology Literacy

Technology level of teachers as defined by the TSAT Tool	DESE Recommended By 2011	GPS Current Status	GPS Goals By 2013
Teachers are at the Early Technology level	-	15 %	
Teachers are at the Developing Technology level	-	43 %	
Teachers are at the Proficient level	60%	35 %	60%
Teachers are at the Advanced level	-	7 %	

The GPS Current Status estimates are based on TSAT surveys administered during the 2005-06 school year.

Plans to attain our student and instructional staff technology literacy goals include the following:

- provide professional development focused on integrating technology in curriculum and instruction as per the *Massachusetts Technology Literacy Standards and Expectations, April 2008* at middle and elementary school levels;
- provide professional development on productivity software such as word processing, spreadsheets, email, and web-based communication tools at middle and elementary school levels;
- realign middle school scheduling to accommodate more students in Computer Applications and Technology in Education courses;
- provide access to computer labs for a *minimum* of 1 time per week for instructional activities based on the *Massachusetts Technology Literacy Standards and Expectations, April 2008* at middle and elementary school levels;.
- assess students using local surveys and grades on an annual basis;
- assess instructional staff using DESE's TSAT and/or local surveys as technologies and professional development are provided.

Benchmark 2-C: Staffing

Gardner Public School's district level Technology Department consists of a Director of Technology, Database Administrator, Network Administrator/Webmaster, and two Computer Technicians. The Director of Technology provides professional development on applications and curriculum integration while the remainder of the district technology staff provide follow-up support on hardware, productivity software, and content-based applications.

In the individual schools there are two paraprofessional lab instructors at the elementary level; one Computer Application instructor and one Technology in Education instructor at the middle school level; and three Computer Applications instructors and two Technology in Education instructors are at the high school level. These staff attend technology conferences and workshops to stay current with technologies and implement in their classrooms and schools.

The number of technology staff is not likely to increase in the near future as we have witnessed a decrease in district staff in the past few years due to budgetary restraints and we foresee additional cuts in the future given the current economic situation.

Benchmark 3: Technology Professional Development

Benchmark 3-A: High Quality Technology Professional Development

The DESE recommends that 85% of district staff participate in 45 hours of high-quality professional development by 2011. Plans include offering 45 hours of high-quality professional development within three years of each school receiving their new technology, providing technology staffing does not decrease. The majority of this will be instructional staff attending after-school or summer in-house workshops on a volunteer basis as in-school professional development time devoted to technology is limited, and funding to attend conferences is becoming limited due to budget constraints. A more realistic goal for Gardner Public Schools is that 65% of our staff will attend 45 hours of high-quality professional development by 2013 as outlined in the table below.

Table 6: Professional Development Schedule

School	Web-based Grade Books (5 hrs)	Parent/Student Portal (5 hrs)	Productivity/Curriculum-based Technologies (35 hrs)	Teacher Integration & Literacy Assessments
GHS	FY2009	FY2010	FY2009-13	FY2011 and 2013
GMS	FY2009	FY2010	FY2009-11	FY2011
ESS	FY2010	FY2011	FY2010-12	FY2012
HMS	FY2011	FY2012	FY2010-13 ¹	FY2013
WSS	FY2012	FY2013	FY2011-13	FY2013

¹ HMS (grades 1-3) Productivity/Curriculum-based Technologies professional development will be grouped by grade level, with grade 3 PD being grouped with ESS (grades 3-5) and grades 1 and 2 PD being grouped with WSS (Grades PK-2) for proper alignment with the grade K-2 and 3-5 standards as per the *Massachusetts Technology Literacy Standards and Expectations, April 2008*.

Benchmark 3-B: Technology Professional Development is Ongoing

Continued professional development is critical to staying abreast with technology and attaining our goals as stated throughout the benchmarks. The district provides ongoing high-quality technology professional development throughout the year via conferences, workshops, in-house training, online training, and on an individual needs basis. A few examples of professional development opportunities provided by the district include attending the Massachusetts Superintendent's Technology Leadership conference, MassCUE (Massachusetts Computer Using Educators) conferences, November Learning summer conference, and ISTE's (International Society for Technology in Education) annual conference. In-house workshops attended include SIS management software, Kurzweil, English in a Flash, Integrating SmartBoards into the curriculum, BoardMaker, Adobe Webpage Design, Google Earth, and Microsoft Office applications. Online training has been through IDE Portal, Voyager U, Geosketchpad, webinars, and various Universities.

Plans to attain our professional development include the following:

- move towards a train-the-trainer model to increase professional development opportunities and to collaborate on content specific technology integration methods as technology becomes available in the schools.

- Professional development workshops and follow-up assistance may include but are not limited to the following:
 - professional productivity applications: grade books, Cognos, word processing, spreadsheets, and presentation software;
 - multimedia technologies: projectors, interactive whiteboards, digital cameras, video cameras, webcams;
 - Web 2.0 tools: social book marking, podcasts, Wiki's, blogs;
 - local communications: email, web portal for parents and students;
 - communications beyond school walls: Skype (free online video conferencing), Taking IT Global (a global awareness web portal), and iEARN (International and Resource Network).
 - Limited participation in conferences and online opportunities due to foreseen budgetary constraints.

Benchmark 3-C and D: Needs-based Assessments

The TSAT and/or locally developed surveys will continue to be used to assess staff professional development needs as technology is updated in the schools. Administrators and teachers will also consider their own needs through self-assessment tools.

Benchmark 4: Accessibility of Technology

Benchmark 4-A: Hardware Access

When considering access to hardware several items are taken into account such as adequate computer replacement cycle; the ratio of students to computers; access to additional technology such as portable and/or handheld electronic devices, digital projectors, and electronic whiteboards; access to curriculum for all students including those with disabilities; and access is equitable to all.

The DESE recommends a computer replacement cycle of five years or less and a minimum of a 5:1 ratio of students to high-end Type A computers connected to the Internet. The DESE's current classification of computer types is as follows:

DESE Classification of Computers

Categories ¹	Type A (high-end)	Type B (average)	Type C (low-end)
Function	Multimedia computers capable of running virtually all current software, including the latest high-end video and graphics programs	Multimedia computers capable of running most software except for the latest high-end video and graphics programs	Multimedia computers capable of running most current productivity applications
Memory	1GB RAM or better	From 256 up to 1 GB RAM	Working computers that do not meet the specifications for Type B
Processor (Windows)	2 GHz CPU single processor or better, OR 1 GHz dual core	1- 2 GHz CPU	Working computers that do not meet the specifications for Type B
Processor (Macintosh)	G5 or better	G4 (or better running OSX)	Working computers that do not meet the specifications for Type B

¹ Computers must meet all specifications listed in the column to be counted as that column's Type computer.

All Gardner Public Schools' computers are connected to the Internet. Our student to computer ratio as of FY08 is as follows:

Gardner Public Schools' Ratio of Students per Type Computer

School	Type A	Type A/B	Type A/B/C
Gardner High School	20.0	7.29	3.48
Gardner Middle School	9.47	6.31	3.41
Elm Street School (Elementary)	518	259	4.28
Helen Mae Sauter (Elementary)	254	254	3.85
Waterford Street School (Elementary)	478	478	4.78
District Average	23.89	11.85	3.79

Upon completion of our planned five-year computer replacement cycle Gardner Public Schools will attain our goal of at least a 5:1 ratio of students to high-end Type A computers and implement additional multimedia technologies. We will also continue to incorporate technologies specific to special need students and insure that access is equitable to all students. Gardner Public Schools' plan is as follows:

Five-Year Computer and Technology Replacement Cycle

Highlighted items indicate implementation is complete to date.

School	Purchase FY08, Implement FY09
GHS	<ul style="list-style-type: none"> - Add New Computer Lab - New iMACs for Multimedia Lab - Upgrade Engineering Lab (1/2 Lab) - Upgrade 2 Library Labs - Add 1 Multimedia Cart/Floor¹ - Text-to-Speech Software for Increased Accessibility - Increase Access to Technology for Special Needs Students²
GMS	<ul style="list-style-type: none"> - New Classroom Computers - New Computers for Tech in Ed Lab - Add 1 Multimedia Cart/Floor - Text-to-Speech Software for Increased Accessibility - Increase Access to Technology for Special Needs Students

School	Purchase FY09, Implement FY10
GHS	- Parental Access to Student Grades and Coursework
GMS	- Parental Access to Student Grades and Coursework
ESS	<ul style="list-style-type: none"> - New Classroom Computers - New Computers for 1 of 2 Labs - Add 1 Multimedia Cart/Floor - Text-to-Speech Software for Increased Accessibility - Increase Access to Technology for Special Needs Students - Implement Gradebooks

School	Purchase FY10, Implement FY11
GHS	<ul style="list-style-type: none"> - 3D CAM Output for Engineering Lab - New Computers for Lab (TBD by GHS Tech Subcommittee)
ESS	- Parental Access to Student Grades and Coursework
HMS	<ul style="list-style-type: none"> - New Classroom and Lab Computers - Add 1 Multimedia Cart/Floor - Text-to-Speech Software for Increased Accessibility - Increase Access to Technology for Special Needs Students - Implement Gradebooks

School	Purchase FY11, Implement FY12
GHS	- New computers for Lab (TBD by GHS Tech Subcommittee)
ESS	- New Computers for 1 of 2 Computer Labs
HMS	- Parental Access to Student Grades and Coursework
WSS	<ul style="list-style-type: none"> - New Classroom and Lab Computers - Add 1 Multimedia Cart/Floor - Text-to-Speech Software for Increased Accessibility - Increase Access to Technology for Special Needs Students - Implement Gradebooks

School	Purchase FY12, Implement FY13
GHS	<ul style="list-style-type: none"> - New Classroom Computers - New computers for 2 Labs (TBD by GHS Tech Subcommittee)
GMS	- New Computers for Library
WSS	- Parental Access to Student Grades and Coursework

¹ Multimedia carts include projectors, computers, electronic whiteboards and multimedia equipment such as digital cameras, video cameras, and webcams.

² Portable devices such as AlphaSmarts and other technologies are implemented for increasing access to special needs students.

Benchmark 4-B: Internet Access

As recommended by the DESE, Gardner Public Schools provides Internet access to all classrooms and every computer is connected to the Internet. Access to the Internet is currently 4 MB. Plans include applying for E-Rate to provide redundancy throughout the district and increase Internet and point-to-point bandwidth to a minimum of 10 MB in FY 2010. Bandwidth to classrooms is at least 10/100 MB. As computers are replaced in individual schools, 10/100 MB switches will be replaced with 10/100/1 GB to accommodate for peak usage.

Benchmark 4-C: Networking (LAN/WAN)

Gardner Public Schools network cabling is all Cat 5 or Cat 5e to the classrooms supporting 10/100 Ethernet. We have servers providing secure file sharing, backups, email, web publishing, student database, nurses database, and Internet filtering.

Benchmark 4-D: Access to the Internet Outside the School Day

Below is a list of sites in the Gardner community where students and staff may access computers and the Internet outside the school day. These sites are published on our website.

Cyber Cafe'

8 Parker Street
Gardner, MA 01440
(978) 630-2975

Hours: Mon - Fri 9:00 AM - 4:00 PM

[Information on Cyber Cafe'](#)

Membership Fee and Other Rules are Applicable

8 Computers are Available

Heywood Memorial Library

55 West Lynde Street
Gardner, MA 01440
(978) 632-5298

Hours: Mon and Wed 9:00 AM - 8:00 PM

Tue, Thur, Fri 9:00 AM - 5:00 PM

Sat 9:00 AM - 1:00 PM

No Sat hours during July and Aug

5 Computers are Available

Mount Wachusett Community College

444 Green Street
Gardner, MA 01440
(978) 630-9125

[Click Here for Hours and for Additional Information](#)

30 Computers are Available

Benchmark 4-E: Staffing

At the district level, Gardner Public Schools employs a network administrator, two computer technicians, and a database administrator that is also a Microsoft Certified Systems Engineer (MCSE). At the school level, computer teachers and computer lab paraprofessionals also provide hardware and software technical support when possible. On average, we have one FTE (Full Time Equivalent Staff) to 209 computers. The DESE recommends one FTE to 200 computers. In FY06, the technology department implemented an online helpdesk for software and technical support. With this system our initial response time is within the day and on average 1.5 days from when a problem is reported to when it is fixed.

Benchmark 5: E-Learning and Communications

Benchmark 5-A: Deliver Special Courses Through the Use of Technology

Instructional staff and administrators participate in online courses, workshops, and Webinars. Currently, Gardner High School students participate in online courses developed by local area high schools through a collaborative with Fitchburg State College. As schools receive updated computers we will implement Edline, providing teachers with the ability to create online websites and develop mixed teaching and learning environments with online and in-school opportunities. Gardner High School is considering piloting full online course(s) through Edline during FY10.

Benchmark 5-B and C: Beyond Our School Walls

Professional development will be provided and teachers will be encouraged to seek opportunities for students to communicate with professionals and participate in project-based learning beyond our school walls through the use of technology. Technologies may include but will not be limited to Web 2.0 tools, Skype and webcams, and web portals such as Taking IT Global and iEARN.

Benchmark 5-D: Website

Our website www.gardnerk12.org maintains up to date information for staff, students, parents, and the school community. At the end of the five-year replacement cycle, parents and students will have access to a secure web portal to obtain specific information regarding the student's grades, attendance, schedule, classwork/homework, and activities.

Benchmark 5-E: Electronic Archiving

Our current archiving solutions include maintaining email for one year for all district staff. We do not maintain student emails. Documents are backed-up nightly with the ability to retrieve documents up to three months prior to any given date. Gardner Public Schools' AUP informs all students and staff that any information generated on our computers and/or distributed through our network may be accessed by Administration and made public at any time.

Appendix 1 – DESE Local Technology Plan Guidelines

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) Chart¹ 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.

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

¹ Full text of the StaR Chart is available on the Department's web site (<http://www.doe.mass.edu/boe/sac/edtech/star.html>).

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 Integration²

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 Standards³).

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-

² The Massachusetts Department of Education defines technology integration as the daily use of technology in classrooms, libraries, and labs to improve student learning.

³ The Massachusetts Recommended K-12 Instructional Technology Standards are available on the Department's web site (<http://www.doe.mass.edu/edtech/standards.html>).

Assessment Tool (TSAT)⁴.

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.

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 development⁵ 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.⁶
- 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.⁷

⁴ 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).

⁵ High quality professional development is described in the Massachusetts 2001 State Plan for Professional Development (<http://www.doe.mass.edu/pd/stateplan/>).

⁶ Details are available on the Department's web site (http://www.doe.mass.edu/edtech/standards/sa_tool.html).

⁷ 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).

Benchmark 4

Accessibility of Technology

A. Hardware Access

1. The district has an average ratio of fewer than five students per high-capacity⁸, 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 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

⁸ 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.

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 law⁹, 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.

⁹ Information about state regulations is available from the state's Record Management Unit (<http://www.sec.state.ma.us/arc/arcrmu/rmuidx.htm>).

*Appendix 2 – Massachusetts Technology Literacy Standards
and Expectations, April 2008*



Massachusetts Technology Literacy Standards and Expectations

April 2008

Massachusetts Department of Elementary and Secondary Education
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**This document was prepared by the
Massachusetts Department of Elementary and Secondary Education**

Jeffrey Nellhaus
Acting Commissioner

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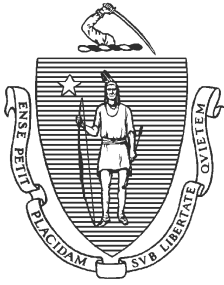
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Jeffrey Nellhaus
Acting Commissioner of Education

April 2008

Dear Colleagues,

I am pleased to present the *Massachusetts Technology Literacy Standards*. This document updates and defines what K–12 students should know and be able to do in order to use technology for learning. The Board of Elementary and Secondary Education voted to approve these standards on April 29, 2008.

I want to thank the Massachusetts Technology Leadership Council (MTLC) for convening a group of educators and business leaders to help the Department review and update our 2001 technology standards and expectations. I also want to thank the many educators across the state who provided their expertise and guidance.

In this revised document we have

- grouped specific technology skills under four grade spans;
- focused on 21st century skills; and
- devoted more attention to digital citizenship, ethics, society, and safety.

The goal of this document is to help students develop technology literacy skills to learn the content of the curriculum, as well as to be able to succeed and thrive in their adult lives. These skills will help them function effectively in a world where new technologies continue to emerge and information grows ever more abundant.

The teaching and learning of these skills should be integrated into the general curriculum, not taught in isolation. As students develop technology skills, they should apply these skills in their classroom, school, and life so that they will understand why these skills are important. An essential benefit of integrating the appropriate use of technology into the curriculum is that it can enhance the learning of the content without overburdening an already full curriculum.

We will continue our work with schools and districts to prepare students for the world of work, higher education, and lifelong learning using multiple technology tools. Thank you for your ongoing support and for your commitment to achieving the goals of education reform.

Sincerely,

Jeffrey Nellhaus
Acting Commissioner of Education

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Massachusetts Technology Literacy Standards

Introduction

In announcing our participation in the Partnership for 21st Century Skills, a national network of states, Governor Deval Patrick said, "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."¹⁰

The Partnership for 21st Century Skills states in its *Policymakers' Guide*, "To thrive in the world today, students need higher-end skills, such as the ability to communicate effectively beyond their peer groups, analyze complex information from multiple sources, write or present well-reasoned arguments about nuanced issues and develop solutions to interdisciplinary problems that have no one right answer. In this light, technology is a powerful springboard to higher-level learning."¹¹

This publication is designed to help today's students take advantage of the power of technology. It provides a set of guidelines for schools, describing what students should know and be able to do in order to use technology effectively for learning. These guidelines represent realistic, attainable activities that link to the content standards of the *Massachusetts Curriculum Frameworks*.

The Massachusetts Technology Literacy Standards incorporate the Information and Communication Technology (ICT) Literacy skills developed by the Partnership for 21st Century Skills; the National Educational Technology Standards for Students (NETS•S) developed by the International Society for Technology in Education (ISTE); as well as ISTE's 2007 draft NETS Refresh.¹² The Massachusetts Technology Literacy Standards fall into three broad categories:

Standard 1. Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.

This standard includes:

- proficiency in basic productivity tools such as word processing, spreadsheet, database, electronic research, e-mail, and applications for presentations and graphics;
- conceptual understandings of the nature and operation of technology systems; and
- learning and adapting to new and emerging technology tools.

¹⁰ The announcement is available online at

http://www.21stcenturyskills.org/index.php?option=com_content&task=view&id=328&Itemid=64

¹¹ *The Road to 21st Century Learning: A Policymaker's Guide to 21st Century Skills* (2003) is available online at

http://www.21stcenturyskills.org/images/stories/otherdocs/p21up_Policy_Paper.pdf

¹² See Appendix C and Appendix D.

Standard 2. Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

This standard

- relates to social, ethical, and human issues. It promotes positive attitudes toward the uses of technology, as well as responsible use of information. This standard also includes recognition of technology's impact on civic participation, the democratic process, and the environment;
- aims to ensure that students understand general rules for safe Internet practices, including how to protect their personal information on the Internet;
- is to help students develop an awareness of the personal image that they convey through the information they post on the Internet;
- aims to ensure that students understand federal and state laws regarding computer crimes; and
- supports students in exhibiting leadership for digital citizenship.

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

This standard:

- focuses on applying a wide range of technology tools to student learning and everyday life;
- aims to ensure that students will be able to use technology to process and analyze information;
- is to help students develop skills for effective technology-based communication;
- includes the use of technology to explore and create new ideas, identify trends, and forecast possibilities; and
- aims to provide students with an awareness of how technology is used in the real world.

Overview of Grade Spans

Although technology opens up exciting avenues for learning, computers should complement, rather than replace successful methods that teachers use to help students develop basic skills and understanding. The Massachusetts Department of Elementary and Secondary Education encourages the use of a wide range of tools, both traditional and technological, to help students gain those understandings. For example, although students may become fluent in keyboarding on a computer, they need to continue developing legible handwriting. By the same token, even though students might become highly skilled in electronic research, they should know how to find a book in the library. Throughout their school years, students will grow to regard technology as one of the many tools they can use to help them solve problems and improve their productivity and their capacity to learn as they move through life.

In this publication, specific technology skills are listed for each grade span. Although these proficiency expectations are recommended by the Department, local school districts make their own decisions about their students' technology proficiency. Local decisions should be based on the accessibility and availability of technology, as well as the developmental readiness of a district's students.

Based on the developmental readiness of the students, this document groups the technology skills in four grade spans:

- Grades K–2
- Grades 3–5
- Grades 6–8
- Grades 9–12

Skills/Knowledge Acquisition

Students can acquire the skills/knowledge enumerated in this document in a variety of ways:

- everyday classroom activities (gaining technology skills while learning the content of the curriculum – see page 18 to page 22)
- specific course work (e.g., taking a Web design course)
- independent study (e.g., supporting a specific project)
- an after-school activity (e.g., publishing a school newsletter)
- peer tutoring (e.g., a high school student coaching a middle school student)
- work at home (Although concerns regarding access to technology by less affluent families are well founded, Department surveys indicate a much higher presence of computers in the homes of low income and limited English proficient families than many educators presume; such surveys at the classroom and school level can be instructive.)

The teaching of technology literacy skills should not be separate from the curriculum. Integrating the appropriate use of technology into the curriculum should enhance the learning of the content. The example on page 23 is a good demonstration of how a school district provides students the technology skills they need, not as a discrete subject, but as “flowing through the curriculum.”

In this document, we focus on educational/instructional technology rather than on computer science or engineering standards.

Massachusetts Technology Literacy Standards

Grades K through 2 – Technology Exploratory Skills and Expectations

In the early grades, technology should not replace the manipulatives, pencil-and-paper, and other manual methods through which children acquire basic skills. The *Mathematics Curriculum Framework*, for example, stresses the importance of understanding basic arithmetic operations in elementary school. Given this context, the technology literacy standards for the earliest grade span allow the teacher flexibility in deciding when students are ready to use technology. For this reason, the competencies listed for K–2 are described as exploratory concepts and skills. These are skills that will be introduced and, in some cases, developed in elementary grades and mastered in middle and high school.

Standard 1. Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.

Exploratory Skills and Expectations

Basic Operations

- K-2: 1.1 Demonstrate beginning steps in using available hardware and applications (e.g., turn on a computer, launch a program, use a pointing device such as a mouse).
- K-2: 1.2 Explain that icons (e.g., recycle bin/trash, folder) are symbols used to signify a command, file, or application.
- K-2: 1.3 Identify, locate, and use letters, numbers, and special keys (e.g., space bar, Shift, Delete) on the keyboard.
- K-2: 1.4 Recognize the functions of basic file menu commands (e.g., New, Open, Close, Save, Print).

Word Processing and Desktop Publishing

- K-2: 1.5 Use a word processing application to write, edit, print, and save simple assignments.
- K-2: 1.6 Insert and size a graphic in a word processing document.

Database and Spreadsheet (Tables/Charts and Graphs)

- K-2: 1.7 Explain that computers can store and organize information so that it can be searched.
- K-2: 1.8 Use a simple computer graphing application to display data.

Internet and Multimedia

- K-2: 1.9 Explain that the Internet links computers around the world, allowing people to access information and communicate.
- K-2: 1.10 Demonstrate the ability to use tools in painting and/or drawing programs.

Standard 2. Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

Exploratory Skills and Expectations

Ethics

- K-2: 2.1 Follow classroom rules for the responsible use of computers, peripheral devices, and resources.
- K-2: 2.2 Explain the importance of giving credit to media creators when using their work in student projects.

Classroom/Society

- K-2: 2.3 Explain why there are rules for using technology at home and at school.
- K-2: 2.4 Identify the purpose of a media message (to inform, persuade, or entertain).
- K-2: 2.5 Describe how people use many types of technologies in their daily lives.

Health and Safety

- K-2: 2.6 Follow the school rules for safe and ethical Internet use. (Use of Internet in this grade span is determined by district policy.)
- K-2: 2.7 Demonstrate knowledge of ergonomics and electrical safety when using computers.
- K-2: 2.8 Explain that a password helps protect the privacy of information.

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

Exploratory Skills and Expectations

Research (Gathering and Using Information)

- K-2: 3.1 Use various age-appropriate technologies to locate, collect, and organize information.
- K-2: 3.2 Review teacher-selected Internet resources and explain why each resource is or is not useful.

Problem Solving

- K-2: 3.3 Use age-appropriate technologies (e.g., a simple graphing application) to gather and analyze data.

Communication & Collaboration

- K-2: 3.4 Use a variety of age-appropriate technologies (e.g., drawing program, presentation software) to communicate and exchange ideas.

Massachusetts Technology Literacy Standards

Grades 3 through 5 – Technology Standards and Expectations

By the end of fifth grade, all students should have the opportunity to become familiar with the tools they will be expected to use with proficiency. Through this exposure, they will have gained a positive view of technology as a tool for learning. For example, electronic sources such as multimedia encyclopedias and teacher-previewed Web sites can be used to gather information for a report. Additionally, there are many developmentally appropriate applications for children: interactive books, graphic organizers, and writing assistants, as well as mathematical and scientific tools. Such tools can enhance learning for all children, including those with disabilities; for example, multimedia reading software reinforces literacy skills by providing visual and auditory feedback to early readers. These tools can be integrated appropriately in an effective lesson plan.

Standard 1. Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.

Basic Operations

- G3-5: 1.1 Demonstrate basic steps in using available hardware and applications (e.g., log into a computer, connect/disconnect peripherals, upload files from peripherals).
- G3-5: 1.2 Select a printer, use print preview, and print a document with the appropriate page setup and orientation.
- G3-5: 1.3 Use various operating system features (e.g., open more than one application/program, work with menus, use the taskbar/dock).
- G3-5: 1.4 Demonstrate intermediate¹³ keyboarding skills and proper¹⁴ keyboarding techniques.

Word Processing/Desktop Publishing

- G3-5: 1.5 Use menu/tool bar functions in a word processing program (i.e., font size/style, line spacing, margins) to format, edit, and print a document.
- G3-5: 1.6 Copy and paste text and images within a document, as well as from one document to another.
- G3-5: 1.7 Proofread and edit writing using appropriate resources (e.g., dictionary, spell-checker, grammar resources).

Database

- G3-5: 1.8 Define the term “database” and provide examples from everyday life (e.g., library catalogues, school records, telephone directories).
- G3-5: 1.9 Define terms related to databases, such as “record,” “field,” and “search.”
- G3-5: 1.10 Do simple searches of existing databases (e.g., online library catalog, electronic encyclopedia).

¹³ By the end of eighth grade, students should have keyboarding skills between 25-30 wpm with fewer than 5 errors. In this grade span, districts determine the intermediate level so that students will reach this standard by the end of eighth grade.

Spreadsheet

- G3-5: 1.11 Demonstrate an understanding of the spreadsheet as a tool to record, organize, and graph information.
- G3-5: 1.12 Identify and explain terms and concepts related to spreadsheets (i.e., cell, column, row, values, labels, chart, graph).
- G3-5: 1.13 Enter/edit data in spreadsheets and perform calculations using simple formulas (+, -, *, /), observing the changes that occur.

Internet, Networking, and Online Communication

- G3-5: 1.14 Explain and use age-appropriate online tools and resources (e.g., tutorial, assessment, Web browser).
- G3-5: 1.15 Save, retrieve, and delete electronic files on a hard drive or school network.
- G3-5: 1.16 Explain terms related to the use of networks (e.g., username, password, network, file server).
- G3-5: 1.17 Identify and use terms related to the Internet (e.g., Web browser, URL, keyword, World Wide Web, search engine, links).
- G3-5: 1.18 Use age-appropriate Internet-based search engines to locate and extract information, selecting appropriate key words.

Multimedia and Presentation Tools

- G3-5: 1.19 Create, edit, and format text on a slide.
- G3-5: 1.20 Create a series of slides and organize them to present research or convey an idea.
- G3-5: 1.21 Copy and paste or import graphics; change their size and position on a slide.
- G3-5: 1.22 Use painting and drawing applications to create and edit work.

Standard 2. Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

¹⁴ It is a district's decision to determine whether touch-typing skills are needed. However, students should know the proper ergonomics when using the keyboard.

Ethics

- G3-5: 2.1 Explain and demonstrate compliance with school rules (Acceptable Use Policy) regarding responsible use of computers and networks.
- G3-5: 2.2 Explain responsible uses of technology and digital information; describe possible consequences of inappropriate use.
- G3-5: 2.3 Explain Fair Use Guidelines for the use of copyrighted materials (e.g., text, images, music, video) in student projects.

Society

- G3-5: 2.4 Identify ways in which technology is used in the workplace and in society.
- G3-5: 2.5 Work collaboratively online with other students under teacher supervision.
- G3-5: 2.6 Analyze media messages and determine if their purpose is to inform, persuade, or entertain.
- G3-5: 2.7 Explain that some Web sites and search engines may include sponsored commercial links.
- G3-5: 2.8 Explain how hardware and applications can enable people with disabilities to learn.

Health and Safety

- G3-5: 2.9 Recognize and describe the potential risks and dangers associated with various forms of online communications.
- G3-5: 2.10 Identify and explain the strategies used for the safe and efficient use of computers (e.g., passwords, virus protection software, spam filters, popup blockers).
- G3-5: 2.11 Demonstrate safe e-mail practices, recognition of the potentially public exposure of e-mail and appropriate e-mail etiquette (if the district allows student e-mail use).
- G3-5: 2.12 Identify cyber bullying and describe strategies to deal with such a situation.
- G3-5: 2.13 Recognize and demonstrate ergonomically sound and safe use of equipment.

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

Research

- G3-5: 3.1 Locate, download, and organize content from digital media collections for specific purposes, citing sources.
- G3-5: 3.2 Perform basic searches on databases (e.g., library card catalogue, encyclopedia) to locate information, using two or more key words and techniques to refine and limit such searches.
- G3-5: 3.3 Evaluate Internet resources in terms of their usefulness for research.
- G3-5: 3.4 Use content-specific technology tools (e.g., environmental probes, sensors, measuring devices, simulations) to gather and analyze data.
- G3-5: 3.5 Use online tools (e.g., e-mail, online discussion forums, blogs, and wikis) to gather and share information collaboratively with other students, if the district allows it.

Problem Solving

- G3-5: 3.6 With teacher direction, use appropriate technology tools (e.g., graphic organizer) to define problems and propose hypotheses.
- G3-5: 3.7 Use spreadsheets and other applications to make predictions, solve problems, and draw conclusions.

Communication

- G3-5: 3.8 Create projects that use text and various forms of graphics, audio, and video (with proper citations) to communicate ideas.
- G3-5: 3.9 Use teacher-developed guidelines to evaluate multimedia presentations for organization, content, design, presentation, and appropriate use of citations.
- G3-5: 3.10 Communicate with other students and other classes using appropriate technology, including e-mail if the district allows it.

Massachusetts Technology Literacy Standards

Grades 6 through 8 – Technology Standards and Expectations

By the completion of eighth grade, students should demonstrate competencies in using tools such as word processing, database, spreadsheet, Web browser, presentation, and graphics applications. Students should be familiar enough with the purpose and function of these technologies to enable them to select the appropriate tool for a task. Students should be able to identify various components of a computer system and be able to explain basic concepts of networking. Students should practice good file management skills and operate peripheral equipment independently.

Students should understand the legal, ethical, and safety issues concerning the use of e-mail, the Internet, and other online tools. Students should understand how to protect their personal identification and information on the Internet and be knowledgeable about general rules for safe Internet practices. In addition, students should develop an awareness of how they present themselves on the Internet.

By the end of eighth grade, students should have had ample opportunity to become fluent in the use of technology tools for research, problem solving, and communication across all curriculum areas. They should know how to communicate their learning with peers and other audiences through multimedia presentations, desktop-published reports, and other electronic media. They should have learned effective strategies for locating and validating information on the Internet. Moreover, students should understand why it is important to use multiple Web sites for their research, rather than relying on a single site for information.

In summary, when students enter the ninth grade, they should be able to use technology to learn and enhance their understanding of academic subjects and the world around them. Technology should be incorporated into their everyday learning activities, both inside and outside the classroom.

Standard 1. Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.

Basic Operations

- G6-8: 1.1 Use features of a computer operating system (e.g., determine available space on local storage devices and remote storage resources, access the size and format of files, identify the version of an application).
- G6-8: 1.2 Identify successful troubleshooting strategies for minor hardware and software issues/problems (e.g., “frozen screen”).
- G6-8: 1.3 Independently operate peripheral equipment (e.g., scanner, digital camera, camcorder), if available.
- G6-8: 1.4 Identify and use a variety of storage media (e.g., CDs, DVDs, flash drives, school servers, and online storage spaces), and provide a rationale for using a certain medium for a specific purpose.
- G6-8: 1.5 Demonstrate keyboarding skills between 25-30 wpm with fewer than 5 errors. (For students with disabilities, demonstrate alternate input techniques as appropriate.)

Word Processing/Desktop Publishing

- G6-8: 1.6 Demonstrate use of intermediate features in word processing applications (e.g., tabs, indents, headers and footers, end notes, bullet and numbering, tables).
- G6-8: 1.7 Create, save, open, and import a word processing document in different file formats (e.g., RTF, HTML).

Database

- G6-8: 1.8 Describe the structure and function of a database, using related terms appropriately.
- G6-8: 1.9 Create a simple database, defining field formats and adding new records.
- G6-8: 1.10 Perform simple operations in a database (i.e., browse, sort, filter, search on selected criteria, delete data, enter data).
- G6-8: 1.11 Plan and develop database reports to organize and display information.

Spreadsheet

- G6-8: 1.12 Describe the use of spreadsheets to calculate, graph, organize, and present data in a variety of real-world settings.
- G6-8: 1.13 Create an original spreadsheet, using formulas.
- G6-8: 1.14 Use various number formats (e.g., scientific notation, percentages, exponents) as appropriate.
- G6-8: 1.15 Produce simple charts and graphs from a spreadsheet.
- G6-8: 1.16 Distinguish among different types of charts and graphs, and choose the most appropriate type to represent given data.
- G6-8: 1.17 Apply advanced formatting features to customize tables, charts, and graphs.

Internet, Networking, and Online Communication

- G6-8: 1.18 Use Web browsing to access information (e.g., enter a URL, access links, create bookmarks/favorites, print Web pages).
- G6-8: 1.19 Identify probable types and locations of Web sites by examining their domain names, and explain that misleading domain names are sometimes created in order to deceive people (e.g., .edu, .com, .org, .gov, .au).
- G6-8: 1.20 Explain and correctly use terms related to networks (e.g., LANs, WANs, servers, and routers) and Internet connectivity (e.g., DSL, T1, T3).
- G6-8: 1.21 Explain and correctly use terms related to online learning (e.g., IP address, post, thread, Intranet, discussion forum, drop box, account, password).
- G6-8: 1.22 Explain that some Web sites require the use of plug-ins and specific browser versions to access content.
- G6-8: 1.23 Use e-mail functions and features (e.g., replying, forwarding, attachments, subject lines, signature, and address book.) The use of e-mail is at the school district's discretion and may be a class-wide activity if students do not have individual accounts.

Multimedia

- G6-8: 1.24 Create a multimedia presentation using various media as appropriate (e.g., audio, video, animations, etc.).
- G6-8: 1.25 Use a variety of technology tools (e.g., dictionary, thesaurus, grammar-checker, calculator) to

Standard 2. Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

Ethics

- G6-8: 2.1 Explain ethical issues related to privacy, plagiarism, spam, viruses, hacking, and file sharing.
- G6-8: 2.2 Explain how copyright law protects the ownership of intellectual property, and explain possible consequences of violating the law.
- G6-8: 2.3 Explain fair use guidelines for using copyrighted materials (e.g., images, music, video, text) in school projects.
- G6-8: 2.4 Describe appropriate and responsible use of communication tools (e.g., chats, instant messaging, blogs, and wikis).

Society

- G6-8: 2.5 Identify and discuss the technology proficiencies needed in the workplace, as well as ways to prepare to meet these demands.
- G6-8: 2.6 Identify and describe the effect technological changes have had on society.
- G6-8: 2.7 Explain how technology can support communication and collaboration, personal and professional productivity, and lifelong learning.
- G6-8: 2.8 Analyze and explain how media and technology can be used to distort, exaggerate, and misrepresent information.
- G6-8: 2.9 Give examples of hardware and applications that enable people with disabilities to use technology.

Health and Safety

- G6-8: 2.10 Explain the potential risks associated with the use of networked digital information (e.g., Internet, mobile phones, wireless, LANs).
- G6-8: 2.11 Provide examples of safe and unsafe practices for sharing personal information via e-mail and the Internet.
- G6-8: 2.12 Explain why computers, networks, and information need to be protected from viruses, intrusion, and vandalism.
- G6-8: 2.13 Explain terms associated with the safe, effective, and efficient use of telecommunications/Internet (e.g., password, firewalls, spam, security, Acceptable Use Policy).
- G6-8: 2.14 Describe how cyber bullying can be blocked.

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

Research

- G6-8: 3.1 Explain and demonstrate effective searching and browsing strategies when working on projects.
- G6-8: 3.2 Collect, organize, and analyze digital information from a variety of sources, with attribution.
- G6-8: 3.3 Use a variety of computing devices (e.g., probeware, handheld computers, digital cameras, scanners) to collect, analyze, and present information for curriculum assignments.

Problem Solving

- G6-8: 3.4 Independently use appropriate technology tools (e.g., graphic organizer) to define problems and propose hypotheses.
- G6-8: 3.5 Use and modify databases and spreadsheets to analyze data and propose solutions.
- G6-8: 3.6 Develop and use guidelines to evaluate the content, organization, design, use of citations, and presentation of technologically enhanced projects.

Communication

- G6-8: 3.7 Plan, design, and develop a multimedia product to present research findings and creative ideas effectively, citing sources.
- G6-8: 3.8 Identify differences between various media and explain issues associated with repurposing information from one medium to another (e.g., from print to the Web).
- G6-8: 3.9 Use a variety of telecommunication tools (e.g., e-mail, discussion groups, Web pages, blogs, Web conferences) to collaborate and communicate with peers, experts, and other audiences (at district's discretion).

Massachusetts Technology Literacy Standards

Grades 9 through 12 – Technology Standards and Expectations

Throughout high school, as students take courses to prepare themselves for college and the world of work, they should acquire increasingly sophisticated technology skills. Depending on the pathways and courses they choose to take, high school students will become more adept with certain technology tools than others. Moreover, as the curriculum demands more complicated learning tasks, students will discover advanced capabilities in tools such as database and spreadsheet applications.

Starting in high school, students are selecting specific courses to prepare themselves for college and/or entry into the world of work. To accommodate the needs of high school students and teachers better, this publication lists technology skills for all the high school years together, rather than listing the skills by individual grade levels. Teachers should integrate the appropriate technology skills into their courses to help their students learn those subject areas and/or prepare for those careers.

During high school, students should have the opportunity to use more specialized technology tools that enhance their learning. These might include simulation software, geographic information systems, computer-aided design software, or any of a wide variety of content-specific tools. In addition, students should have the opportunity to learn how to write code in a commonly used programming language.

By the completion of high school, students should have developed an appreciation for the capabilities and capacities of technology, as well as an understanding of how these tools can be used for lifelong learning. In addition, students should be knowledgeable about the role technology plays in various fields of work, enabling them to better plan for their careers in the 21st century.

Standard 1. Demonstrate proficiency in the use of computers and applications, as well as an

understanding of the concepts underlying hardware, software, and connectivity.

Basic Operations

- G9-12: 1.1 Identify the platform, version, properties, function, and interoperability of computing devices including a wide range of devices that compute and/or manage digital media.
- G9-12: 1.2 Use online help and other support to learn about features of hardware and software, as well as to assess and resolve problems.
- G9-12: 1.3 Install and uninstall software; compress and expand files (if the district allows it).
- G9-12: 1.4 Explain effective backup and recovery strategies.
- G9-12: 1.5 Explain criteria for evaluating hardware and software appropriate for a given task (e.g., features, versions, capacity).
- G9-12: 1.6 Demonstrate keyboarding techniques,¹⁵ including the use of keyboard shortcuts, to complete assignments efficiently and accurately. (For students with disabilities, demonstrate alternate input techniques as appropriate.)
- G9-12: 1.7 Identify and assess the capabilities and limitations of emerging technologies.

¹⁵ By the end of eighth grade, students should have keyboarding skills between 25-30 wpm with fewer than 5 errors.

Word Processing/Desktop Publishing

G9-12: 1.8 Apply advanced formatting and page layout features when appropriate (e.g., columns, templates, and styles) to improve the appearance of documents and materials.

G9-12: 1.9 Use editing features appropriately (e.g., track changes, insert comments).

G9-12: 1.10 Identify the use of word processing and desktop publishing skills in various careers.

Database

G9-12: 1.11 Explain the importance of designing the structure of a database to meet its intended goals.

G9-12: 1.12 Duplicate the structure of a database without data.

G9-12: 1.13 Save database files in various formats.

G9-12: 1.14 Manipulate non-alphanumeric digital data (e.g., geospatial data from MassGIS¹⁶, images, audio) within a database.

G9-12: 1.15 Define the term “metadata,” and explain how metadata describes the structure and workings of an organization's use of information.

G9-12: 1.16 Use database features to create mailing labels, form letters, and perform mail merges.

G9-12: 1.17 Identify the use of database skills in various careers.

Spreadsheet

G9-12: 1.18 Define and use functions of a spreadsheet application (e.g., sort, filter, find).

G9-12: 1.19 Enter formulas and functions; use the auto-fill feature in a spreadsheet application.

G9-12: 1.20 Explain and use advanced formatting features of a spreadsheet application (e.g., reposition columns and rows, add and name worksheets).

G9-12: 1.21 Differentiate between formulas with absolute and relative cell references.

G9-12: 1.22 Use multiple sheets within a workbook, and create links among worksheets to solve problems.

G9-12: 1.23 Import and export data between spreadsheets and other applications.

G9-12: 1.24 Create and use pivot tables.

G9-12: 1.25 Explain how various formatting options are used to convey information in charts or graphs.

G9-12: 1.26 Identify the use of spreadsheet skills in various careers.

Internet, Networking, and Online Communication

G9-12: 1.27 Use search engines and online directories. Explain the differences among various search engines and how they rank results.

G9-12: 1.28 Explain and demonstrate effective search strategies for locating and retrieving electronic

¹⁶ For more information, see MassGIS's Web page, GIS in Education, at <http://www.mass.gov/mgis/gisedu.htm>.

information (e.g., using syntax and Boolean logic operators).

G9-12: 1.29 Describe good practices for password protection and authentication.

G9-12: 1.30 Demonstrate a basic understanding of addressing schemes (e.g., IP addresses, DHCP, DNS).

G9-12: 1.31 Identify career options in network technologies.

Multimedia

- G9-12: 1.32 Identify technology tools (e.g., authoring tools) that can be used to create a multimedia product.
- G9-12: 1.33 Use a variety of applications to plan, create, and edit multimedia products (e.g., slide presentations, videos, animations, simulations, podcasts).
- G9-12: 1.34 Link information residing in different applications (e.g., linking a chart in a word-processing document to the spreadsheet where it was created).
- G9-12: 1.35 Identify career options in multimedia and software development.

Web Authoring

- G9-12: 1.36 Distinguish between effective and ineffective Web site designs; explain the reasons.
- G9-12: 1.37 Explain terminology related to Web page authoring (e.g., HTML, URL, links, browsers, plug-ins, Web servers).
- G9-12: 1.38 Use HTML or Web-authoring tools to create, edit, and publish well organized Web sites with effective navigation.
- G9-12: 1.39 Explain basic practices that contribute to a Web site's accessibility to people with disabilities (e.g., using alternative text, captioning, consistent structure).
- G9-12: 1.40 Explain how to test and debug Web files for quality assurance.
- G9-12: 1.41 Identify career options in Web design, development, and management.

Standard 2. Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

Ethics

- G9-12: 2.1 Demonstrate compliance with the school's Acceptable Use Policy.
- G9-12: 2.2 Explain issues related to the responsible use of technology (e.g., privacy, security).
- G9-12: 2.3 Explain laws restricting the use of copyrighted materials.
- G9-12: 2.4 Identify examples of plagiarism, and discuss the possible consequences of plagiarizing the work of others.
- G9-12: 2.5 Write correct in-text citations and reference lists for text and images gathered from electronic sources.
- G9-12: 2.6 Give examples of the appropriate and responsible use of communication tools (e.g., chats, instant messaging, blogs, wikis).
- G9-12: 2.7 Discuss misuse of technology for personal and commercial reasons (e.g., software piracy, unauthorized file sharing/downloading, virus spreading, and hacking); explain possible consequences.

Society

- G9-12: 2.8 Design and implement a personal learning plan that includes the use of technology to support lifelong learning goals.
- G9-12: 2.9 Evaluate the authenticity, accuracy, appropriateness, and bias of electronic resources, including Web sites.
- G9-12: 2.10 Analyze the values and points of view that are presented in media messages.
- G9-12: 2.11 Describe devices, applications, and operating system features that offer accessibility for people with disabilities.

Health and Safety

- G9-12: 2.12 Evaluate school and work environments in terms of ergonomic practices.
- G9-12: 2.13 Describe and use safe and appropriate practices when participating in online communities (e.g., discussion groups, blogs, social networking sites).
- G9-12: 2.14 Explain and use practices to protect one's personal safety online (e.g., not sharing personal information with strangers, being alert for online predators, reporting suspicious activities).
- G9-12: 2.15 Explain ways individuals can protect their technology systems and information from unethical users.

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

Research

- G9-12: 3.1 Devise and demonstrate strategies for efficiently collecting and organizing information from electronic sources.
- G9-12: 3.2 Compare, evaluate, and select appropriate electronic resources to locate specific information.
- G9-12: 3.3 Select the most appropriate search engines and directories for specific research tasks.
- G9-12: 3.4 Search for information within an electronic source (e.g., using the find command).

Problem Solving

- G9-12: 3.5 Explain and demonstrate how specialized technology tools can be used for problem solving, decision making, and creativity in all subject areas (e.g., simulation software, environmental probes, computer-aided design, geographic information systems, dynamic geometric software, graphing calculators, art and music composition software).

Communication

- G9-12: 3.6 Use a variety of media to present information for specific purposes (e.g., reports, research papers, presentations, newsletters, Web sites, podcasts, blogs), citing sources.
- G9-12: 3.7 Demonstrate how the use of various techniques and effects (e.g., editing, music, color, rhetorical devices) can be used to convey meaning in media.
- G9-12: 3.8 Use online communication tools to collaborate with peers, community members, and field experts as appropriate (e.g., bulletin boards, discussion forums, listservs, Web conferencing).
- G9-12: 3.9 Plan and implement a collaborative project with students in other classrooms and schools using telecommunications tools (e.g., e-mail, discussion forums, groupware, interactive Web sites, videoconferencing).
- G9-12: 3.10 Complete at least one online credit or non-credit course or tutorial; discuss the benefits and disadvantages of this method of learning.

Gaining Technology Skills While Learning the Content of the Curriculum

Anyone who has taken a training course in the use of a spreadsheet, for example, knows how quickly we forget the skills unless we can apply them in our work on a regular basis. Whether technology instruction takes place in the classroom or in the computer lab, it is important that students be able to apply their newly acquired skills to subject matter learning. For example, a student who has gathered data for a science project and needs to organize the data in a database will see a reason for learning about the features and function of a database. This is context-sensitive learning in which technology skills instruction is centered on the curriculum.

Initial technology skills instruction needs to be provided by someone who is proficient in the use of that technology tool. Although some teachers are skilled enough with technology to teach their students to use the tools within the context of the curriculum content, other teachers may not be prepared to do this. A possible solution is for a staff person with technology expertise (such as an instructional technology specialist, library teacher, or another classroom teacher acting as a mentor) to provide mentoring or to co-teach alongside the teacher.

As technology tools become an integral part of the learning environment, and as students gain the knowledge and skills to use them appropriately, new opportunities for learning open up. Dynamic geometric applets, for example, can help students visualize and understand complex mathematics concepts. Simulation software enables students to investigate models of real-world problems such as climate change and population growth. Basic tools such as spreadsheet and database applications can be applied across the curriculum to analyze and solve problems. Even basic word processing software can encourage students to organize their thoughts and revise their work.

The following scenarios show how technology can be applied in the classroom so that students acquire these skills while addressing the standards of the curriculum frameworks. The scenarios, which were originally published by the Massachusetts Department of Elementary and Secondary Education in its technology toolkit, were drawn from school districts that participated in Project MEET, from districts that received instructional technology grants from the Department, and from award-winning teachers.

Each scenario features a lesson unit on a specific curriculum topic. Several criteria were used to select these lesson units. First, the lesson needed to have a clear curriculum focus that was aligned with the state's *Curriculum Frameworks*. Second, the lesson had to integrate learning technology skills with learning the curriculum content. Third, the lesson also had to address the fact that students have varying abilities, backgrounds, and interests. Finally, the lesson needed to have a way to evaluate how much students had learned.

All of these scenarios, plus more, are available on the Department's Web site (<http://www.doe.mass.edu/edtech/practices/>). The online version includes links to sample student work, classroom photographs, videos, multimedia presentations, and digital artwork.

Integrated Learning Scenario #1

Reciprocating Art¹⁷ Grades 1-4 Art

Instructional objective: The student will be able to use the principles and elements of design to create artwork collaboratively with students in another country.

Project description: In this art project the teacher worked with a school in Japan so that American and Japanese students could collaborate to create unique artwork. A translator helped the teacher use e-mail and language translation software to communicate with the Japanese principal and determine the exchange process. Thirty-nine Japanese students and thirty-nine American students each created a background for a painting. They then exchanged artwork through regular mail and finished each other's paintings. The American students used technology to communicate with the Japanese students, creating a video to send messages in English and Japanese. The teachers communicated through e-mail. The completed artwork was sent back to the original schools through regular mail.

Evaluation: To evaluate the students' work, the teacher used peer review, artwork critique, and evaluation of the finished products.

Evidence of effectiveness: The students were deeply involved in the process of critiquing, comparing, and contrasting the artwork. Their families also valued the students' participation in the project. Many American families framed their child's work from this art exchange project. In fact, some have framed the correspondence from this project as well as the artwork and have placed them next to each other. Of course, all of the vocabulary had to be translated. The Japanese writing next to the American writing is a piece of art onto itself. Many families thought so as well. The idea of accepting cultural differences and knowing that one culture is not better than the next but can be learned from is important for the students to understand. This was accomplished through discussion and student activities.

Technology standards addressed

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity and innovation.

K-2: 3.4 Use a variety of age-appropriate technologies (e.g., drawing program, presentation software, etc.) to communicate and exchange ideas.

¹⁷ Robert Wilson at the Floral Street School in Shrewsbury Public Schools developed Reciprocating Art.

Integrated Learning Scenario #2

Becoming Scientists¹⁸ Grade 4 Science and Technology/Engineering

Instructional objective: At the conclusion of this unit, students will be able to demonstrate their understanding of the properties of light and sound through classroom instruction and authentic data collection activities.

Project description: This project involved the development of two science units that address the curriculum standards for the study of light and sound. Each unit followed the same format, integrating the use of science probes with the teaching unit. To ensure that students were highly motivated to conduct the investigations, the students were given fictitious scenarios presenting problems that could only be solved after sound and light data had been collected and analyzed. The result of integrating technology in this way was that students became deeply engaged in this authentic learning experience.

Evaluation: Student learning of the science content standards was evaluated using classroom quizzes and rubric scoring of their works. The technology benchmarks were evaluated by observation of student use of Palm handhelds and sensor use, the accuracy and organization of graphed information, and the use of word processing tools.

Evidence of effectiveness: The integration of data collection into the study of physics brings authenticity to the learning experience. The teachers and students have expressed overwhelming enthusiasm for these learning activities. At the conclusion of both units it became clear to the teaching staff that when learning becomes authentic, deeper understanding of the content is achieved.

Technology standards addressed

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

G3-5: 3.4 Use content-specific technology tools (e.g., environmental probes, sensors, measuring devices, simulations) to gather and analyze data.

G3-5: 3.6 Use spreadsheets and other applications to make predictions, solve problems, and draw conclusions.

G3-5: 3.8 Create projects that use text and various forms of graphics, audio, and video (with proper citations) to communicate ideas.

¹⁸ Becoming Scientists was developed by a team of educators at the Bernardston Elementary School in the Pioneer Valley Regional School District: Mary Leyden, Marge Bruno, Chris Hershiser, and Wendy Abramson.

Integrated Learning Scenario #3

SELECT Math¹⁹ Grade 7 Mathematics

Instructional objective: Students will be able to identify and distinguish between part-to-part and part-to-whole ratios and recognize situations in which ratios are a useful form of comparison.

Project description: This investigation focused on the part-to-part and part-to-whole meaning of fractions. Students informally explored rates and ratios using proportional reasoning to determine how to combine orange juice concentrate and water to make enough orange juice for a given number of people. The students used virtual manipulatives, such as online fraction circles and visual models, to help them solve problems and check their solutions.

Evaluation: To evaluate students' progress in meeting the mathematics standards, the teacher assessed the students' ability to represent a ratio graphically and to write part-to-part and part-to-whole ratios from a graphical representation. To evaluate the students' progress in meeting the technology standards, the teacher checked whether the students were able to independently access the Web site, use the mouse, and enter the data. The teacher also evaluated how efficiently the students were able to use Microsoft Word's drawing tools to represent each given mixture.

Evidence of effectiveness: The students were excited about using the technology, and they were focused on how they could use the technology to evaluate the orange juice recipes. In their minds the technology was doing the work for them. The teacher made references throughout the year to the orange juice problems because the strategies students used truly stayed with them. Every student felt successful solving these problems when they used the technology.

Technology standards addressed

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

G6-8: 3.3 Use a variety of computing devices (e.g., probeware, handheld computers, digital cameras, scanners) to collect, analyze, and present information for curriculum assignments.

¹⁹ SELECT Math was developed by Susan Young and Jim Coffey of Boston Public Schools.

Integrated Learning Scenario #4

Africa²⁰ Grade 6 Social Studies

Instructional objective: The students will be able to determine, through research and comparison, which African countries are developed and which are developing.

Project description: This Africa unit integrated research, technology, art, and music to reach its goals. After studying the continent of Africa, each student chose a country to study in depth. Students researched their countries and entered their data into a shared spreadsheet, which the class used to sort and rank the countries by various attributes. The students used what they learned to create PowerPoint projects, which were shared using SMARTBoard technology. During the time that students were researching Africa, the art and music teachers provided activities to help make students more aware of African customs. In art class, students discussed and constructed African masks, while in music class they explored African drumming.

Evaluation: The PowerPoint presentations and spreadsheets were graded first as rough copy outlines and later as finished products. The teacher informally assessed each student's ability to judge which stage of development a country was in and used data to argue the case for the country he or she studied. The teacher also evaluated each student's ability to collect data on a specific country, add the data to a spreadsheet, and sort the data across several fields.

Evidence of effectiveness: The use of technology for this unit allowed students to produce higher quality work in a shorter period of time. Having computers available at virtually any time allowed the students to work on their projects during periods of down time. The fact that the projects would be presented to the class motivated the students to do their most careful work. Some of the PowerPoint presentations were shared with parents as well. Having the ability to burn CDs and take digital pictures allowed teachers to share the students' works with their parents.

Technology standards addressed

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

G6-8: 3.2 Collect, organize, and analyze digital information from a variety of sources, citing sources.

G6-8: 3.5 Use and modify databases and spreadsheets to analyze data and propose solutions.

G6-8: 3.7 Plan, design, and develop a multimedia product to effectively present research findings and creative ideas, citing sources.

²⁰ Africa was developed by a team of educators in the Manchester-Essex Regional School District: Paul B. Clark, Becky Baun, Anne Wood, and Kathleen Lorenzo.

Integrated Learning Scenario #5

The Greyhound® Bus Depot²¹ Grades 10-12 English Language Arts

Instructional objective: Students will use the Web to research the historical and cultural contexts for the literature they are studying and then write a travelogue or travel brochure presenting their findings.

Project description: In this online lesson, students were asked to take an imaginary bus trip to the time and place in which the story, poem, or play they were studying was written. When the students read a Kabuki play, for example, they ventured back to seventeenth-century Japan; when they read the stories of Isaac Bashevis Singer, they toured late nineteenth- and early twentieth-century Poland. Students were first asked to find as much information online as they could on their own; however, search sites were provided for students who were having trouble finding the information. Students were asked to look for historical events, cultural events, and movements, and to pay attention to the food and fashions of the time. The students were then asked to write a travelogue or travel brochure to present their findings and make a connection to the work of literature the class was reading. The unit also included a short lesson on assessing the validity of Web sites and online information.

Evidence of effectiveness: Students often commented that this assignment helped them understand the literature a bit more deeply and that it added to their appreciation of the text. In their written analysis of the literature, the teacher found references to details learned in this assignment and an appreciation for nuances in the text that required an understanding of the historical and cultural contexts.

Technology standards addressed

Standard 2. Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

G9-12: 2.5 Write correct in-text citations and reference lists for text and images gathered from electronic sources.

G9-12: 2.9 Evaluate the authenticity, accuracy, appropriateness, and bias of electronic resources, including Web sites.

Standard 3. Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

G9-12 3.1 Devise and demonstrate strategies for efficiently collecting and organizing information from electronic sources.

G9-12 3.3 Select the most appropriate search engines and directories for specific research tasks.

G9-12: 3.6 Use a variety of media to present information for specific purposes (e.g., reports, research papers, presentations, newsletters, Web sites, podcasts, blogs), citing sources.

²¹ The Greyhound Bus Depot was developed by J.W. Wilson of Wareham High School and Virtual High School.

District-Wide Implementation of the Standards

Teaching the Technology Standards²² Grades PreK-12

District Goals: Nauset does not view technology as a separate subject, but “flowing through the curriculum.” The district's goal is to provide students the skills they need to be able to determine and use the appropriate technology for the task at hand, to be able to locate and evaluate information that targets the purpose of their task, and to be able to communicate effectively both the process and content of their research to a specific audience.

Standards Implementation and Assessment: Nauset teachers use a unit-design process called an "Effective Teaching Unit Design" to develop their curriculum units. The Instructional Technology Specialists (ITS) in the district select units that target the age-appropriate technology standards, develop project-based assessments, and plug them into the unit-design format. The classroom teacher then has access to a unit with the technology and information literacy standards already populated, the learning experiences outlined, resources identified, and both an exemplar and a rubric for assessment of the project-based assessment included. In this way, Nauset is moving towards its goal of having an appropriate technology component in each unit. Doing so helps ensure that students are attaining the technology and information literacy skills they need in the content areas.

Nauset is comprised of four elementary school districts and one grade 6-12 regional school district. Each elementary school has an ITS, who co-plans with the classroom teacher and co-delivers the technology-infused portion of the lesson. Students meet either once a week or once every two weeks formally with the two teachers. Also, there are open computer lab times in which classroom teachers can provide additional enhancements to the lesson. At the middle school, students in each grade receive technology instruction from the ITS for one full term each school year. At the high school, there are required courses in electronic research in the freshman year, a tech-investigation class during sophomore year, and a variety of other technology-specific courses, as well as the widespread use of technology to support the subject areas.

Grades K-8 ITS have traditionally reported student's mastery of the standards using a spreadsheet. In the 2007-2008 school year, because of the draft update of the Massachusetts technology standards, Nauset has implemented three student self-assessments. There will be more formal assessment of the technology skills for students in grades 5, 8, and 12 by the ITS.

²² This piece was written by Kathleen Schrock, Administrator for Technology in Nauset Public Schools.

Appendix A

Acknowledgments

This document was developed with the support of many experts.

Technology Standards Update Committee		
Name	Title	Organization
Deborah Boisvert	Director	BATEC, UMass Boston
Donna Boivin	CIO	Springfield Public Schools
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Carol A. Vallone	Chairman	Massachusetts Technology Leadership Council, Education Foundation
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The following organizations and educators provided input to this document:

- CAST, Inc.
- Educational Technology Advisory Council (ETAC)
- Educators from Massachusetts Public Schools who attended the roundtable meetings on January 16, 2007 at Blackstone Valley Regional Vocational High School
- Educators from Massachusetts Public Schools who attended the roundtable meeting on January 19, 2007 at the Meline Kasparian Professional Development Center, Springfield
- MassCUE, Inc. (Massachusetts Computer Using Educators)
- BATEC (Boston Area Advanced Technological Education Connections)
- Representatives from the Board of the Massachusetts Technology Leadership Council

Appendix B

Development of this Document

In October 2001, the Massachusetts Department of Education published the *Massachusetts Recommended PreK-12 Technology Literacy Standards* to define what Massachusetts K-12 students should know and be able to do in order to use technology for learning. Since then, continuing technological advances have led to new opportunities, new challenges, and new risks. As a result, the Department has updated the original document to include the knowledge and skills that students are likely to need now and in the future.

Another reason the Department has revised the document is that, under No Child Left Behind's Title IID, Enhancing Education Through Technology Program, every state is required to include the following performance measure in its data collection from local school districts:

“The percentage of eighth-grade students that meet their state’s technology literacy standards.”
(According to Sec. 2402 of NCLB)

Beginning in 2007, Massachusetts reported the number of students who have met the technology standards as part of the Annual Mandatory Collection of Elementary and Secondary Education Data for the Education Data Exchange Network (EDEN).

In May 2006, the Massachusetts Technology Leadership Council (MTLC) brought together a group²³ of educators from higher education, K-12 school districts, and educational organizations to help the Department review and update the original document.

The working group reviewed, compared, and evaluated a number of national, state, and local standards documents in order to ensure that the Massachusetts standards would be as comprehensive as possible. The group first looked at the 2001 Massachusetts standards, which were based on those published in 1998 by the National Educational Technology Standards (NETS) Project.²⁴ Next the group examined standards from other states. The group also studied the newly updated standards developed by the Boston and Springfield Public Schools. Because technology and media are closely intertwined, the group looked at recommendations from the Center for Media Literacy and the Massachusetts School Library Association. A draft of the revised *Massachusetts Technology Literacy Standards* was developed in September 2006.

In October 2006, the Department shared the draft of the updated standards with a small number of business representatives from the Massachusetts Technology Leadership Council. In addition, educators across the Commonwealth had an opportunity to review and comment on the draft at two roundtable discussion meetings in January of 2007. Educators also submitted additional comments and suggestions to the Department using electronic feedback forms and e-mail. The Massachusetts Department of Elementary and Secondary Education has incorporated these recommendations into this current version.

In January 2007, ISTE announced a draft of its updated NETS standards, called the “Refreshed ISTE NETS for Students,”²⁵ which describes “what students should know and be able to do to learn effectively

²³ See Appendix A for a list of the members of the working group and other contributors, e.g. CAST.

²⁴ NETS is an initiative of the International Society for Technology in Education (ISTE) and the U.S. Department of Education

²⁵ See Appendix C for the alignment of the *Massachusetts Technology Literacy Standards* with Refreshed ISTE NETS Draft.

and live productively in an increasingly digital world." The Department has incorporated the new NETS standards into the state standards.

Appendix C

Comparing the Updated K-12 State Standards to the Refreshed ISTE NETS•S

As a general frame of reference for developing these standards, we continue to use the *Technology Foundation Standards for Students*, developed by the National Educational Technology Standards (NETS) Project. In January 2007, ISTE announced a draft revision of the NETS. We have incorporated the "Refreshed ISTE NETS" into this document.

The goal of the NETS Project is to develop national standards for educational technology. The framework for the Refreshed ISTE NETS includes:

1. Creativity and Innovation
2. Communication and Collaboration
3. Research and Information Fluency
4. Critical Thinking, Problem Solving, and Decision Making
5. Digital Citizenship
6. Technology Operations

In 2001, the Massachusetts Department of Education collapsed the six NETS standards into three standards. In this document, the Department once again incorporated the new NETS•S standards into the three standards of the *Massachusetts Technology Literacy Standards and Expectations* as follows:

UPDATED MASSACHUSETTS TECHNOLOGY LITERACY STANDARDS	CORRESPONDING NETS FOUNDATION STANDARDS	CORRESPONDING REFRESHED ISTE NETS
Standard 1	Standards 1 and 3	Standards 1, 2, 3, and 4
Standard 2	Standard 2	Standard 5
Standard 3	Standards 3, 4, 5, and 6	Standard 6

Appendix D

21st Century Skills

In addition to the *National Educational Technology Standards (NETS)* and the models of other states, this updated version of the Massachusetts K-12 Technology Literacy Standards also incorporates the recommendations of the Partnership for 21st Century Skills.²⁶ The Partnership's *Framework for 21st Century Learning* includes six key elements:

1. Core subjects as identified by the No Child Left Behind Act of 2001.
2. 21st century content that includes global awareness; financial, economic, business and entrepreneurial literacy; civic literacy; and health and wellness awareness.
3. Learning and thinking skills that include critical thinking and problem solving, communication skills, creativity and innovation skills, collaboration skills, contextual learning skills, and information and media literacy skills.
4. Information and communications technology (ICT) literacy, enabling students to learn, think critically, solve problems, use information, communicate, innovate, and collaborate.
5. Life skills that include leadership, ethics, accountability, personal productivity, personal responsibility, people skills, self-direction, and social responsibility.
6. 21st century assessments that measure the core subjects, 21st century content, learning and thinking skills, ICT literacy, and life skills. The use of modern technologies in assessment is recommended to "increase efficiency and timeliness."

²⁶ The Partnership for 21st Century Skills (<http://www.21stcenturyskills.org/index.php>) is a tax-exempt 501 (c) 3 organization that includes approximately 26 member organizations. The Partnership's original work was supported by a two-year grant from the U.S. Department of Education.

Appendix 3: DESE's Technology Self-Assessment Tool

Appendix 4 – Gardner Public Schools’ Five-Year Technology Budget

Gardner Public Schools' Five-Year Technology Budget

The following estimated budget is contingent upon local funding available, as well as grant and E-rate funding.

Benchmarks 1: Technology Integration and Literacy

Year	Description/Function	Local Budget	Title IID, Other Grants	E-Rate Reimb (Edline -Web Hosting Portion Only ¹)
FY2008	GHS & GMS Gradebooks,	\$ 2,700	\$ 0	\$ 0
FY2009	GHS & GMS Gradebooks,	\$ 2,700	\$ 0	\$ 0
FY2010	GHS, GMS, ESS Gradebooks, GHS & GMS Edline Parent Portal	\$ 6,550	\$ 0	\$ 2,700
FY2011	GHS, GMS, ESS, HMS Gradebooks, GHS, GMS, ESS Edline Parent Portal	\$ 9,150	\$ 0	\$ 4,050
FY2012	GHS, GMS, ESS, HMS, WSS Gradebooks, GHS, GMS, ESS, HMS Edline Parent Portal	\$ 11,750	\$ 0	\$ 5,400
FY2013	GHS, GMS, ESS, HMS, WSS Gradebooks, District Level Edline Parent Portal	\$ 11,450	\$ 0	\$ 6,500

¹ Calculated on an estimated 60% E-Rate Discount

Benchmarks 2: Professional Development

Year	Description/Function	Local Budget	Title IID, Other Grants	E-Rate Reimb (Edline -Web Hosting Portion Only)
FY2008	Professional Development based on need	\$ 11,400	\$ 5,650	\$ 0
FY2009	Professional Development based on need	\$ 2,700	\$ 5,500	\$ 0
FY2010	Professional Development based on need	\$ 0	\$ 4,000	\$ 0
FY2011	Professional Development based on need	\$ 2,500	\$ 3,500	\$ 0
FY2012	Professional Development based on need	\$ 3,000	\$ 3,000	\$ 0
FY2013	Professional Development based on need	\$ 3,500	\$ 2,500	\$ 0

Benchmark 3: Accessibility to Technology (Hardware)

Year	Description/Function	Local Budget	Title IID, Other Grants	E-Rate Reimb
FY2008	GHS & GMS Computers and Technologies	\$ 163,000	\$ 0	\$ 0
FY2009	ESS Technologies	\$ 115,000	\$ 0	\$ 0
FY2010	HMS & GHS Computers and Technologies	\$ 95,500	\$ 0	\$ 0
FY2011	WSS & GHS Computers and Technologies	\$ 148,000	\$ 0	\$ 0
FY2012	GMS & GHS Computers and Technologies	\$ 85,600	\$ 0	\$ 0
FY2013	TBD	--	--	--

Benchmark 3: Accessibility to Technology (Internet and Network Bandwidth)

Year	Description/Function	Local Budget	Title IID, Other Grants	E-Rate Reimb (Telecomm & Internet Access Only)
FY2008	Telecommunications and Internet Access		\$ 0	
FY2009	Head-end Switches & FatPipes for redundancy throughout District	\$ 49,000	\$ 0	\$ 0
FY2010	GHS & ESS computer lab switches, Telecommunications and Internet Access	\$ 17,000	\$ 0	\$17,250
FY2011	HMS computer lab switches, Telecommunications and Internet Access	\$ 14,500	\$ 0	\$17,250
FY2012	WSS computer lab switches, Telecommunications and Internet Access	\$ 17,000	\$ 0	\$17,250
FY2013		--	--	--

Benchmark 4: E-Learning and Communications

Year	Description/Function	Local Budget	Title IID, Other Grants	E-Rate Reimb
FY2008	--	\$ 0	\$ 0	\$ 0
FY2009	--	\$ 0	\$ 0	\$ 0
FY2010	GHS & GMS iEARN or Taking IT Global	\$ 0	\$ 1,000	\$ 0
FY2011	GHS & GMS iEARN or Taking IT Global ESS iEARN	\$ 500	\$ 1,000	\$ 0
FY2012	GHS & GMS iEARN or Taking IT Global ESS & HMS iEARN	\$ 1,000	\$ 1,000	\$ 0
FY2013	GHS & GMS iEARN or Taking IT Global ESS, HMS, WSS iEARN	\$ 1,500	\$ 1,000	\$ 0

Appendix 5: DESE Teacher Technology Use Survey

Teacher Technology Use Survey

1. During the 2007-2008 school year, how often did you use technology for professional activities such as lesson planning, administrative tasks, communications, and collaboration?

- nearly every day
- about once a week
- about once a month
- rarely or never

2. During the 2007-2008 school year, how often did you use instructional technology with students for activities such as research, multimedia, simulations, data interpretation, communications, and collaboration?

- nearly every day
- about once a week
- about once a month
- rarely or never

3. Have you assessed your own technology skills using the *Technology Self-Assessment Tool*

(available on the web site of the Massachusetts Dept. of Education and on MassONE)? If you did not take the TSAT, skip question 5.

- yes no

4. If you took the TSAT in 2007-2008, what level are you at?

- Early technology
- Developing technology
- Proficient
- Advanced

5. During the 2007-2008 school year, how many hours of technology professional development did you take? _____ hours

6. During the 2007-2008 school year, did you receive informal professional development from a technology expert in your school (including support such as coaching, mentoring, and co-teaching)? yes no

7a. Did you take professional development workshops or courses via distance learning during the 2007-2008 school year? yes no

7b. If so, what format was used? (Check all that apply.)

- online, web-based
- online through MassONE
- videoconferencing

8a. During the 2007-2008 school year, did you teach distance learning courses to students or staff **in your district** as part of your employment with your district? yes no

8b. If so, which of the following did you teach?

- courses for students
- professional development workshops and/or credit courses for teachers and administrators

9a. During the 2007-2008 school year, did you teach distance learning courses to students or staff **in other districts** as part of your employment with your district? yes no

9b. If so, which of the following did you teach?

- courses for students
- professional development workshops and/or credit courses for teachers and administrators

Thanks!