

Massachusetts Technology Literacy Standards

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.¹ 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.

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.
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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,² 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.

² 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 MassGIS³, 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 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.

³ For more information, see MassGIS's Web page, GIS in Education, at <http://www.mass.gov/mgis/gisedu.htm>.

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.

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

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.⁴ 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."

⁴ 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.