

K-12 Technology

# Benchmarks by Standard



# ACADEMIC CONTENT STANDARDS

## Benchmarks

### Standard 1: Nature of Technology

**Students develop an understanding of technology, its characteristics, scope, core concepts\* and relationships between technologies and other fields.**

Students learn that technology extends human potential by allowing people to do things more efficiently than they would otherwise be able to. Students learn that useful technological development is a product of human knowledge, creativity, invention, innovation, motivation and demand for new products and systems. They learn that the natural and human-made designed worlds are different, and that tools and materials are used to alter the environment. Students learn that the development of emerging technology is exponential, driven by history, design, commercialization, and shaped by creative/inventive thinking, economic factors and cultural influences.

***\*The core concepts of technology include systems, resources, requirements, optimization and trade-offs, processes and controls.***

By the end of the K-2 program:	By the end of the 3-5 program:
<p>A. Recognize the characteristics and scope of technology.</p> <p>B. Describe and give examples of technology's core concepts: systems, resources and processes.</p> <p>C. Describe the relationships among technologies, and the connections between technology and other fields of study.</p>	<p>A. Compare and discuss the characteristics of technology in our community.</p> <p>B. Identify, describe and discuss the core concepts of technology.</p> <p>C. Compare and discuss the relationships among technologies, and the connections between technology and other fields of study.</p>

**Notes:**

# ACADEMIC CONTENT STANDARDS

By the end of the 6-8 program:	By the end of the 9-12 program:
<ul style="list-style-type: none"><li>A. Analyze information relative to the characteristics of technology and apply in a practical setting.</li><li>B. Apply the core concepts of technology in a practical setting.</li><li>C. Analyze the relationships among technologies and explore the connections between technology and other fields of study.</li></ul>	<ul style="list-style-type: none"><li>A. Synthesize information, evaluate and make decisions about technologies.</li><li>B. Apply technological knowledge in decision-making.</li><li>C. Examine the synergy between and among technologies and other fields of study when solving technological problems.</li></ul>

**Notes:**

# ACADEMIC CONTENT STANDARDS

## Benchmarks

### Standard 2: Technology and Society Interaction

**Students recognize interactions among society, the environment and technology, and understand technology's relationship with history. Consideration of these concepts forms a foundation for engaging in responsible and ethical use of technology.**

Students learn that the interaction between society and technology has an impact on their lives and that technology may have unintended consequences which may be helpful or harmful. They learn that interaction of technology will affect the economy, ethical standards, environment and culture. Students evaluate the impact of products or systems by gathering and synthesizing information, analyzing trends and drawing conclusions. Students analyze technological issues and the implications of using technology. They acquire technological understanding and develop attitudes and practices that support ethical decision-making and lifelong learning.

<b>By the end of the K-2 program:</b>	<b>By the end of the 3-5 program:</b>
<ul style="list-style-type: none"><li>A. Identify responsible citizenship relative to technology and its use.</li><li>B. Recognize that technology has an interrelationship with the environment.</li><li>C. Describe and demonstrate how technology has had an influence on our world.</li><li>D. Collect information about products and discuss whether solutions create positive or negative results.</li></ul>	<ul style="list-style-type: none"><li>A. Define responsible citizenship relative to technology.</li><li>B. Investigate and explain the interrelationships between technology and the environment.</li><li>C. Explain and demonstrate the influence of technology throughout history.</li><li>D. Practice responsible use of technology, understand school district guidelines for technology use, and explore technology ownership.</li><li>E. Identify development patterns and examine the influence of technology on the world.</li></ul>

**Notes:**

# ACADEMIC CONTENT STANDARDS

By the end of the 6-8 program:	By the end of the 9-12 program:
<ul style="list-style-type: none"> <li>A. Analyze technologically responsible citizenship.</li> <li>B. Describe and explain the impact of technology on the environment.</li> <li>C. Describe how design and invention have influenced technology throughout history.</li> <li>D. Articulate intellectual property issues related to technology and demonstrate appropriate, ethical and legal use of technology.</li> <li>E. Assess the impact of technological products and systems.</li> </ul>	<ul style="list-style-type: none"> <li>A. Interpret and practice responsible citizenship relative to technology.</li> <li>B. Demonstrate the relationship among people, technology and the environment.</li> <li>C. Interpret and evaluate the influence of technology throughout history, and predict its impact on the future.</li> <li>D. Analyze ethical and legal technology issues and formulate solutions and strategies that foster responsible technology usage.</li> <li>E. Forecast the impact of technological products and systems.</li> </ul>

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# ACADEMIC CONTENT STANDARDS

## Benchmarks

### Standard 3: Technology for Productivity Applications

**Students learn the operations of technology through the usage of technology and productivity tools.**

Students use computer and multimedia resources to support their learning. Students understand terminology, communicate technically and select the appropriate technology tool based on their needs. They use technology tools to collaborate, plan and produce a sample product to enhance their learning and solve problems by investigating, troubleshooting and experimenting using technical resources.

By the end of the K-2 program:	By the end of the 3-5 program:
<ul style="list-style-type: none"><li>A. Understand basic computer and multimedia technology concepts and terminology.</li><li>B. Demonstrate operation of basic computer and multimedia technology tools.</li><li>C. Use productivity tools to produce creative works.</li></ul>	<ul style="list-style-type: none"><li>A. Understand computer and multimedia technology concepts and communicate using the correct terminology.</li><li>B. Use appropriate tools and technology resources to complete tasks and solve problems.</li><li>C. Use productivity tools to produce creative works and prepare publications.</li></ul>

**Notes:**

# ACADEMIC CONTENT STANDARDS

<b>By the end of the 6-8 program:</b>	<b>By the end of the 9-12 program:</b>
<p>A. Demonstrate an understanding of concepts underlying hardware, software and connectivity.</p> <p>B. Select appropriate technology resources to solve problems and support learning.</p> <p>C. Use productivity tools to produce creative works, to prepare publications and to construct technology-enhanced models.</p>	<p>A. Integrate conceptual knowledge of technology systems in determining practical applications for learning and technical problem-solving.</p> <p>B. Identify, select and apply appropriate technology tools and resources to produce creative works and to construct technology-enhanced models.</p>

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## Benchmarks

### Standard 4: Technology and Communication Applications

**Students use an array of technologies and apply design concepts to communicate with multiple audiences, acquire and disseminate information and enhance learning.**

Students acquire and publish information in a variety of media formats. They incorporate communication design principles in their work. They use technology to disseminate information to multiple audiences. Students use telecommunication tools to interact with others. They collaborate in real-time with individuals and groups who are located in different schools, communities, states and countries. Students participate in distance education opportunities which expand academic offerings and enhance learning.

<b>By the end of the K-2 program:</b>	<b>By the end of the 3-5 program:</b>
A. Investigate the nature and operation of communication systems. B. Explore how information can be published and presented in different formats. C. Participate in group projects and learning activities using technology communications.	A. Identify the concepts and operations of communication systems. B. Develop, publish and present information in print and digital formats. C. Use technology communications to participate in online group collaborative interactive projects and activities.

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# ACADEMIC CONTENT STANDARDS

By the end of the 6-8 program:	By the end of the 9-12 program:
<p>A. Communicate information technologically and incorporate principles of design into the creation of messages and communication products.</p> <p>B. Develop, publish and present information in a format that is appropriate for content and audience.</p> <p>C. Select appropriate technology communication tools and design collaborative interactive projects and activities to communicate with others.</p>	<p>A. Apply appropriate communication design principles in published and presented projects.</p> <p>B. Create, publish and present information, utilizing formats appropriate to the content and audience.</p> <p>C. Identify communication needs, select appropriate communication tools and design collaborative interactive projects and activities to communicate with others, incorporating emerging technologies.</p>

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## Benchmarks

### Standard 5: Technology and Information Literacy

**Students engage in information literacy strategies, use the Internet, technology tools and resources, and apply information-management skills to answer questions and expand knowledge.**

Students become information-literate learners by utilizing a research process model. They recognize the need for information and define the problem, need or task. Students understand the structure of information systems and apply these concepts in acquiring and managing information. Using technology tools, a variety of resources are identified, accessed and evaluated. Relevant information is selected, analyzed and synthesized to generate a finished product. Students evaluate their information process and product.

<b>By the end of the K-2 program:</b>	<b>By the end of the 3-5 program:</b>
<p>A. State what information is, and show where it can be found.</p> <p>B. Use a simple research process model which includes deciding what to use, finding resources, using information and checking work to generate a product.</p> <p>C. Apply basic browser and navigation skills to find information from the Internet.</p>	<p>A. Describe types of information: facts, opinions, primary/secondary sources; and formats of information: number, text, sound, visual, multimedia; and use information for a purpose.</p> <p>B. Use technology to find information by applying a research process to decide what information is needed, find sources, use information and check work.</p> <p>C. Use the Internet to find, use and evaluate information.</p> <p>D. Identify, access and use electronic resources from both free and fee-based Internet sources.</p>

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# ACADEMIC CONTENT STANDARDS

By the end of the 6-8 program:	By the end of the 9-12 program:
<p>A. Evaluate the accuracy, authority, objectivity, currency, coverage and relevance of information and data sources.</p> <p>B. Use technology to conduct research and follow a research process model which includes the following: developing essential question; identifying resources; selecting, using and analyzing information; synthesizing and generating a product; and evaluate both process and product.</p> <p>C. Develop search strategies, retrieve information in a variety of formats and evaluate the quality and appropriate use of Internet resources.</p> <p>D. Select, access and use appropriate electronic resources for a defined information need.</p>	<p>A. Determine and apply an evaluative process to all information sources chosen for a project.</p> <p>B. Apply a research process model to conduct research and meet information needs.</p> <p>C. Formulate advanced search strategies, demonstrating an understanding of the strengths and limitations of the Internet, and evaluate the quality and appropriate use of Internet resources.</p> <p>D. Evaluate choices of electronic resources and determine their strengths and limitations.</p>

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# ACADEMIC CONTENT STANDARDS

## Benchmarks

### Standard 6: Design

**Students apply a number of problem-solving strategies demonstrating the nature of design, the role of engineering and the role of assessment.**

Students recognize the attributes of design; that it is purposeful, based on requirements, systematic, iterative, creative, and provides solution and alternatives. Students explain critical design factors and/or processes in the development, application and utilization of technology as a key process in problem-solving. Students describe inventors and their inventions, multiple inventions that solve the same problem, and how design has affected their community. They apply and explain the contribution of thinking and procedural steps to create an appropriate design and the process skills required to build a product or system. They critically evaluate a design to address a problem of personal, societal and environmental interests. Students systematically solve a variety of problems using different design approaches including troubleshooting, research and development, innovation, invention and experimentation.

<b>By the end of the K-2 program:</b>	<b>By the end of the 3-5 program:</b>
<ul style="list-style-type: none"><li>A. Identify problems and potential technological solutions.</li><li>B. Understand that changes in design can be used to strengthen or improve an object.</li><li>C. Explore how products are invented and repaired.</li></ul>	<ul style="list-style-type: none"><li>A. Describe and apply a design process to solve a problem.</li><li>B. Describe how engineers and designers define a problem, creatively solve it and evaluate the solution.</li><li>C. Understand the role of troubleshooting in problem-solving.</li></ul>

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By the end of the 6-8 program:	By the end of the 9-12 program:
<ul style="list-style-type: none"><li>A. Evaluate the aesthetic and functional components of a design and identify creative influences.</li><li>B. Recognize the role of engineering design and of testing in the design process.</li><li>C. Understand and apply research, innovation and invention to problem-solving.</li></ul>	<ul style="list-style-type: none"><li>A. Identify and produce a product or system using a design process, evaluate the final solution and communicate the findings.</li><li>B. Recognize the role of teamwork in engineering design and of prototyping in the design process.</li><li>C. Understand and apply research, development and experimentation to problem-solving.</li></ul>

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### Standard 7: Designed World

Students understand how the physical, informational and bio-related technological systems of the designed world are brought about by the design process. Critical to this will be students' understanding of their role in the designed world: its processes, products, standards, services, history, future, impact, issues and career connections.

Students learn that the designed world consists of technological systems\* reflecting the modifications that humans have made to the natural world to satisfy their own needs and wants. Students understand how, through the design process, the resources: materials, tools and machines, information, energy, capital, time and people are used in the development of useful products and systems. Students develop a foundation of knowledge and skills through participation in technically oriented activities for the application of technological systems. Students demonstrate understanding, skills and proficient use of technological tools, machines, instruments, materials and processes across technological systems in unique and/or new contexts. Students identify and assess the historical, cultural, environmental, governmental and economic impacts of technological systems in the designed world.

*\*The technological systems areas include energy and power technologies, transportation technologies, manufacturing technologies, construction technologies, information and communication technologies, medical technologies and agricultural and related biotechnologies.*

By the end of the K-2 program:	By the end of the 3-5 program:
A. Develop an understanding of the goals in physical technologies. B. Develop an understanding of the goals of informational technologies. C. Develop an understanding of the goals of bio-related technologies.	A. Develop an understanding of how physical technologies enhance our lives. B. Recognize appropriate modes of technical communication across technological systems. C. Develop an understanding of how bio-related technologies improve our lives.

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By the end of the 6-8 program:	By the end of the 9-12 program:
<p>A. Develop an understanding of, and be able to, select and use physical technologies.</p> <p>B. Develop an understanding of, and be able to, select and use informational technologies.</p> <p>C. Develop an understanding of how bio-related technologies have changed over time.</p>	<p>A. k Classify, demonstrate, examine, and appraise energy and power technologies.</p> <p>B. Classify, demonstrate, examine and appraise transportation technologies.</p> <p>C. Classify, demonstrate, examine and appraise manufacturing technologies.</p> <p>D. Classify, demonstrate, examine and appraise construction technologies.</p> <p>E. Classify, demonstrate, examine and appraise information and communication technologies.</p> <p style="padding-left: 40px;">F. Classify, demonstrate, examine and appraise medical technologies.</p> <p>G. Classify, demonstrate, examine and appraise agricultural and related biotechnologies.</p>

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