

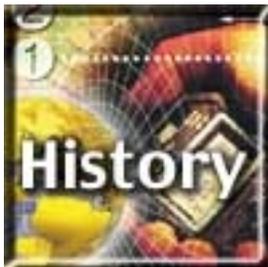
# Technology Education

## STANDARD 5

**Students will** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.



[MST Standards](#)



### **Alternate Assessment Standards for Students with Severe Disabilities**

Standard 1: [Engineering Design](#)

Standard 2: [Information Systems](#)

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Standard 5: [Tools](#)

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# Standard 5

## Technology Education

# Engineering Design

Students will: apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Engineering design is an iterative process involving **modeling** and **optimization** used to develop technological solutions to problems within given constraints.

**Performance Indicators--Students will:**

### Elementary

### Intermediate

### Commencement

- describe objects, imaginary or real, that might be modeled or made differently and suggest ways in which the objects can be changed, fixed, or improved

- investigate prior solutions and ideas from books, magazines, family, friends, neighbors, and community members

- generate ideas for possible solutions, individually and through group activity; apply age-appropriate mathematics and science skills; evaluate the ideas and determine the best solution; and explain reasons for the choices

- plan and build, under supervision, a model of the solution using familiar materials, processes, and hand tools

- discuss how best to test the solution; perform the test under teacher supervision; record and portray results through numerical and graphic means; discuss orally why things worked or didn't work;

- identify needs and opportunities for technical solutions from an investigation of situations of general or social interest

- locate and utilize a range of printed, electronic, and human information resources to obtain ideas

- consider constraints and generate several ideas for alternative solutions, using group and individual ideation techniques (group discussion, brainstorming, forced connections, role play); defer judgment until a number of ideas have been generated; evaluate (critique) ideas; and explain why the chosen solution is optimal

- develop plans, including drawings with measurements and details of construction, and construct a model of the solution, exhibiting a degree of craftsmanship

- in a group setting, test their solution against design

- initiate and carry out a thorough investigation of an unfamiliar situation and identify needs and opportunities for technological invention or innovation

- identify, locate, and use a wide range of information resources including subject experts, library references, magazines, videotapes, films, electronic data bases and online services, and discuss and document through notes and sketches how findings relate to the problem

- generate creative solution ideas, break ideas into the significant functional elements, and explore possible refinements; predict possible outcomes using mathematical and functional modeling techniques; choose the optimal solution to the problem, clearly documenting ideas against design criteria and constraints; and explain how human values, economics, ergonomics, and environmental considerations have influenced the solution

and summarize results in writing, suggesting ways to make the solution better

specifications, present and evaluate results, describe how the solution might have been modified for different or better results, and discuss tradeoffs that might have to be made

- develop work schedules and plans which include optimal use and cost of materials, processes, time, and expertise; construct a model of the solution, incorporating developmental modifications while working to a high degree of quality (craftsmanship)

- in a group setting, devise a test of the solution relative to the design criteria and perform the test; record, portray, and logically evaluate performance test results through quantitative, graphic, and verbal means; and use a variety of creative verbal and graphic techniques effectively and persuasively to present conclusions, predict impacts and new problems, and suggest and pursue modifications

# Standard 5 Technology Education

# Tools, Resources and Technological Processes

**Students will:** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological processes change energy, information, and material resources into more useful forms.

**Performance Indicators--Students will:**

**Elementary**

**Intermediate**

**Commencement**

- explore, use, and process a variety of materials and energy sources to design and construct things
- understand the importance of safety, cost, ease of use, and availability in selecting tools and resources for a specific purpose
- develop basic skill in the use of hand tools
- use simple manufacturing processes (e.g., assembly, multiple stages of production, quality control) to produce a product
- use appropriate graphic and electronic tools and techniques to process information

- choose and use resources for a particular purpose based upon an analysis and understanding of their properties, costs, availability, and environmental impact
- use a variety of hand tools and machines to change materials into new forms through forming, separating, and combining processes, and processes which cause internal change to occur
- combine manufacturing processes with other technological processes to produce, market, and distribute a product
- process energy into other forms and information into more meaningful information

- test, use, and describe the attributes of a range of material (including synthetic and composite materials), information, and energy resources
- select appropriate tools, instruments, and equipment and use them correctly to process materials, energy, and information
- explain tradeoffs made in selecting alternative resources in terms of safety, cost, properties, availability, ease of processing, and disposability
- describe and model methods (including computer-based methods) to control system processes and monitor system outputs

# Standard 5

## Technology Education

# Computer Technology

**Key Idea:** Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

**Students will:** Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Performance Indicators--Students will:**

### Elementary

### Intermediate

### Commencement

- identify and describe the function of the major components of a computer system

- use the computer as a tool for generating and drawing ideas

- control computerized devices and systems through programming

- model and simulate the design of a complex environment by giving direct commands

- assemble a computer system including keyboard, central processing unit and disc drives, mouse, modem, printer, and monitor

- use a computer system to connect to and access needed information from various Internet sites

- use computer hardware and software to draw and dimension prototypical designs

- use a computer as a modeling tool

- use a computer system to monitor and control external events and/or systems

- understand basic computer architecture and describe the function of computer subsystems and peripheral devices

- select a computer system that meets personal needs

- attach a modem to a computer system and telephone line, set up and use communications software, connect to various online networks, including the Internet, and access needed information using email, telnet, gopher, ftp, and web searches

- use computer-aided drawing and design (CADD) software to model realistic solutions to design problems

- develop an understanding of computer programming and attain some facility in writing computer programs

# Standard 5

## Technology Education

# Technology Systems

**Students will:** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

**Performance Indicators--Students will:**

### Elementary

### Intermediate

### Commencement

- identify familiar examples of technological systems that are used to satisfy human needs and wants, and select them on the basis of safety, cost, and function
- assemble and operate simple technological systems, including those with interconnecting mechanisms to achieve different kinds of movement
- understand that larger systems are made up of smaller component subsystems

- select appropriate technological systems on the basis of safety, function, cost, ease of operation, and quality of post-purchase support
- assemble, operate, and explain the operation of simple open- and closed-loop electrical, electronic, mechanical, and pneumatic systems
- describe how subsystems and system elements (inputs, processes, outputs) interact within systems
- describe how system control requires sensing information, processing it, and making changes

- explain why making tradeoffs among characteristics, such as safety, function, cost, ease of operation, quality of post-purchase support, and environmental impact, is necessary when selecting systems for specific purposes
- model, explain, and analyze the performance of a feedback control system
- explain how complex technological systems involve the confluence of numerous other systems

# Standard 5 Technology Education

# History & Evolution of Technology

**Students will:** Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Technology has been the driving force in the evolution of society from an agricultural to an industrial to an information base.

**Performance Indicators--Students will:**

## Elementary

- identify technological developments that have significantly accelerated human progress

## Intermediate

- describe how the evolution of technology led to the shift in society from an agricultural base to an industrial base to an information base
- understand the contributions of people of different genders, races, and ethnic groups to technological development
- describe how new technologies have evolved as a result of combining existing technologies (e.g., photography combined optics and chemistry; the airplane combined kite and glider technology with a light-weight gasoline engine)

## Commencement

- explain how technological inventions and innovations have caused global growth and interdependence, stimulated economic competitiveness, created new jobs, and made other jobs obsolete

## Standard 5

# Technology Education

# Impacts of Technology

**Students will:** Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Technology can have positive and negative impacts on individuals, society, and the environment and humans have the capability and responsibility to constrain or promote technological development.

**Performance Indicators--Students will:**

### Elementary

- describe how technology can have positive and negative effects on the environment and on the way people live and worker

### Intermediate

- describe how outputs of a technological system can be desired, undesired, expected, or unexpected
- describe through examples how modern technology reduces manufacturing and construction costs and produces more uniform products

### Commencement

- explain that although technological effects are complex and difficult to predict accurately, humans can control the development and implementation of technology.
- explain how computers and automation have changed the nature of work
- explain how national security is dependent upon both military and nonmilitary applications of technology

# Standard 5 Technology Education

# Management of Technology

**Key Idea:** Project management is essential to ensuring that technological endeavors are profitable and that products and systems are of high quality and built safely, on schedule, and within budget.

**Students will:** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

## Performance Indicators--Students will:

### Elementary

- participate in small group projects and in structured group tasks requiring planning, financing, production, quality control, and follow-up
- speculate on and model possible technological solutions that can improve the safety and quality of the school or community environment

### Intermediate

- manage time and financial resources in a technological project
- provide examples of products that are well (and poorly) designed and made, describe their positive and negative attributes, and suggest measures that can be implemented to monitor quality during production
- assume leadership responsibilities within a structured group activity

### Commencement

- develop and use computer-based scheduling and project tracking tools, such as flow charts and graphs
- explain how statistical process control helps to assure high quality output
- discuss the role technology has played in the operation of successful U.S. businesses and under what circumstance they are competitive with other countries
- explain how technological inventions and innovations stimulate economic competitiveness and how, in order for an innovation to lead to commercial success, it must be translated into products and services with marketplace demand
- describe new management techniques (e.g., computer-aided engineering, computer-integrated manufacturing, total quality management, just-in-time manufacturing), incorporate some of these in a

technological endeavor, and explain how they have reduced the length of design-to-manufacture cycles, resulted in more flexible factories, and improved quality and customer satisfaction

- help to manage a group engaged in planning, designing, implementation, and evaluation of a project to gain understanding of the management dynamics

# STANDARD 1

## **Analysis, Inquiry and Design**



# **Engineering Design**

Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers and develop solutions.

**Key Idea:** Engineering design is a repetitive process involving modeling and optimization, finding the best solution within given constraints which is used to develop technological solutions to problems within given constraints.

## **ALTERNATE ASSESSMENT**

### **Performance Indicators--Students:**

- activate devices
  - recognize why an object or choice is not working properly
  - recognize how a defective simple object or device might be fixed
  - under supervision, manipulate components of a simple, malfunctioning device to improve its performance
  - design a structure or environment (e.g., a neighborhood) using modeling materials such as LEGO Duplo blocks, model vehicles, model structures, etc.)
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## STANDARD 2

### **Analysis, Inquiry and Design**



## **Information Systems**

**Students will** use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers and develop solutions.

**Key Idea:** Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

## **ALTERNATE ASSESSMENT**

### **Performance Indicators--Students:**

- use a variety of equipment and software packages to enter, process, display and communicate information in different forms using text, pictures, and sound
  - access needed information from media, electronic data bases and community resources
  - use familiar communication systems to satisfy personal needs
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# STANDARD 5

## Technology Education Engineering Design

### **Analysis, Inquiry and Design**

**Students will** use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers and develop solutions.



**Key Idea:** Engineering design is a repetitive process involving modeling and optimization, finding the best solution within given constraints which is used to develop technological solutions to problems within given constraints.

## **ALTERNATE ASSESSMENT**

### **Performance Indicators--Students:**

- recognize that an object or choice is not working properly
  - communicate how a defective simple object or device might be fixed
  - under supervision, manipulate components of a simple, malfunctioning device to improve its performance
  - tell how the device or object has been improved
  - design a structure or environment (e.g., a neighborhood) using modeling materials such as LEGO Duplo blocks, model vehicles, model structures, etc.)
  - describe the design in words or drawings
-

# STANDARD 5

## Tools, Resources, and Technological Processes

### Technology Education



**Students will** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Technological tools, materials and other resources should be selected on the basis of safety, cost, availability, appropriateness and environmental impact; technological processes change energy, information and material resources into more useful forms.

## ALTERNATE ASSESSMENT

### Performance Indicators--Students:

- use a variety of materials and energy sources to construct things
  - assemble components using a fastening process
  - process materials into more useful forms
  - understand the importance of safety and ease of use in selecting tools and resources for a specific purpose
  - develop basic skills in the use of hand tools
  - use simple manufacturing processes (e.g., assembly, multiple stages of production, quality control) to produce a product
-

# STANDARD 5

## Computer Technology

### Technology Education



**Students will** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

## ALTERNATE ASSESSMENT

### Performance Indicators--Students:

- use the computer as a tool
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# STANDARD 5

## Technological Systems

### Technology Education



**Students will** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy or other systems.

## ALTERNATE ASSESSMENT

### **Performance Indicators--Students:**

- identify and operate familiar systems
  - assemble simple systems
-

# STANDARD 5

## Impacts of Technology

### Technology Education



**Students will** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

**Key Idea:** Technology can have positive and negative impacts on individuals, society and the environment. Humans have the capability and responsibility to constrain or promote technological development.

## ALTERNATE ASSESSMENT

### **Performance Indicators--Students:**

- demonstrate that certain technologies have safety issues
  - participate in the disposal of materials in a responsible way
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# STANDARD 5

## Management of Technology

### Technology Education

**Students will** apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.



**Key Idea:** Project management is essential to ensuring that technological endeavors are profitable and that products and systems are of high quality and built safely, on schedule and within budget.

## ALTERNATE ASSESSMENT

### **Performance Indicators--Students:**

- work cooperatively with others on a joint task
  - participate in planning an event or activity
-