

Technology standards for sixth grade

Table of Contents

1. Engineering Design
2. Tools, Resources, and Technological Processes
3. Computer Technology
4. Technological systems
5. History and evolution of technology
6. Information technology
7. Impacts of Technology
8. Management of Technology

Note: each chapter is divided in : key idea | outlines | examples

1. Engineering Design

1.1. Key Idea:

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

1.2. Outlines:

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

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

1.2.3. 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

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

1.2.5. in a group setting, test their solution against design 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

1.2.6. recognize why an object or choice is not working properly

1.2.7. recognize how a defective simple object or device might be fixed

1.2.8. under supervision, manipulate components of a simple, malfunctioning device to improve its performance

1.2.9. design a structure or environment (e.g., a neighborhood) using modeling materials such as LEGO Duplo blocks, model vehicles, model structures, etc.)

1.3. Examples :

1.3.1. Reflect on the need for alternative growing systems in desert environments and design and model a hydroponic greenhouse for growing vegetables without soil

1.3.2. Brainstorm on the need for an adaptive device that will make life easier for a person with a disability, such as a device to pick up objects from the floor

1.3.3. Design a model vehicle to carry raw eggs and into a barrier without damaging the egg.

1.3.4. Assert the performance of a solution against various design criteria, enter the scores on a spreadsheet, and see how varying the solution might affected total score

2. Tools, Resources, and Technological Processes

2.1. 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.

2.2. Outlines:

2.2.1. Choose and use resources for a particular purpose based upon an analysis and understanding of their properties, costs, availability, and environmental impact

2.2.2. 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

2.2.3. combine manufacturing processes with other technological processes to produce, market, and distribute a product

2.2.4. process energy into other forms and information into more meaningful information

2.3. Examples

2.3.1. Choose and use resources to make a model of a building and explain their choice of materials based upon physical properties such as tensile and compressive strength, hardness and brittleness such as tensile and compressive strength, hardness and brittleness.

2.3.2. Choose materials based upon their acoustic properties to make a set of wind chimes

2.3.3. Use a torch to heat a steel rod to a cherry red color and cool it slowly to demonstrate how the process of annealing changes the internal structure of the steel and removes its brittleness

2.3.4. Change materials into new forms such as assembling a solar cooker

2.3.5. Change materials into new forms using separate processes such as drilling and sawing.

2.3.6. Process energy into other forms such as assembling a solar cooker using a parabolic reflector to convert light energy to heat energy

2.3.7. Process information such as sound into a computer (record, videotape)

3. Computer Technology

3.1. Outlines:

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

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

3.1.3. use computer hardware and software to draw 11111111111111

3.1.4. use a computer as a modeling tool

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

3.2. Examples:

3.2.1. use computer hardware and a basic computer aided design package to draw dimension plans for a

simple project

3.2.2. use a computer program, such as Car Builder, to model a vehicle to desired specifications

3.2.3. use temperature sensors to monitor and control the temperature of a model greenhouse model a computer controlled system, such as traffic lights, a merry go round, a vehicle using Lego or other modeling hardware interfaced to a computer.

4. Technological systems

4.1. Key Idea:

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

4.2. Outlines:

4.2.1. select appropriate technological systems on the basis of safety, function, cost, ease of operation, and quality of post-purchase support

4.2.2. assemble, operate, and explain the operation of simple open- and closed-loop electrical, electronic, mechanical, and pneumatic systems

4.2.3. describe how subsystems and system elements (inputs, processes, outputs) interact within systems

4.2.4. describe how system control requires sensing information, processing it, and making changes

4.3. Examples:

4.3.1. Assemble an electronic kit that includes sensors and signaling devices and functions as an alarm system

4.3.2. Use several open loop systems (without feedback control) such as a spray can, a bubble can machine or wind up toys.

4.3.3. Use a systems diagram to model a technological system, such as a model rocket, with the command inputs, resource input

4.3.4. Provide examples of modern machines where microprocessors receive information from sensors and serve as controllers.

5. History and evolution of technology

5.1. Key Idea:

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

5.2. Outlines:

5.2.1. describe how the evolution of technology led to the shift in society from an agricultural base to an industrial base to an information base

5.2.2. understand the contributions of people of different genders, races, and ethnic groups to technological development

5.2.3. 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)

5.3. Examples

5.3.1. construct models of technological devices that have significantly affected human progress and that illustrate how the evolution of technology has shifted the economic base of the country

5.3.2. develop a display of pictures or models of technological devices invented by people of various cultural backgrounds, along with photographs and short bios of the inventors.

5.3.3. make a poster explaining how an existing technology is the result of combining various technologies

6. Information technology

6.1. Key Idea:

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

6.2. Outlines:

- 6.2.1. use a variety of equipment and software packages to enter, process, display and communicate information in different forms using text, pictures, and sound.
- 6.2.2. access needed information from media, electronic data bases and community resources
- 6.2.3. use familiar communication systems to satisfy personal needs
- 6.2.4. choose and use resources for a particular purpose based upon an analysis and understanding of their properties, costs, availability, and environmental impact
- 6.2.5. 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
- 6.2.6. combine manufacturing processes with other technological processes to produce, market, and distribute a product
- 6.2.7. process energy into other forms and information into more meaningful information

7. Impacts of Technology

7.1. 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.

7.2. Outlines:

- 7.2.1. demonstrate that certain technologies have safety issues.
- 7.2.2. participate in the disposal of materials in a responsible way
- 7.2.3. describe how outputs of a technological system can be desired, undesired, expected, or unexpected
- 7.2.4. describe through examples how modern technology reduces manufacturing and construction costs and produces more uniform products

7.3. Examples:

- 7.3.1. use the automobile, for example, to explain desired (easier travel), undesired (pollution), expected

(new jobs created), unexpected (crowded highways and the growth of suburbs)

- 7.3.2. provide an example of an assembly line that produces products with interchangeable parts
- 7.3.3. compare the costs involved in producing a prototype of a product to the per product cost of a batch of 100.

8. Management of Technology

8.1. 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.

8.2. Outlines:

- 8.2.1. work cooperatively with others on a joint task
- 8.2.2. participate in planning an event or activity
- 8.2.3. manage time and financial resources in a technological project
- 8.2.4. 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
- 8.2.5. assume leadership responsibilities within a structured group activity

8.3. Examples:

- 8.3.1. make up and follow a project work plan, time schedule, budget and a bill of materials
- 8.3.2. analyze a child's toy and describe how it might have been better made at a lower cost
- 8.3.3. assume leadership on a team to play an audio or video communication system and use for an intended purpose (e.g. to inform, educate, persuade, entertain).