SCCSD Industrial Technology Education

Program Standards

Revised 5/2007

THE NATURE OF TECHNOLOGY:

STANDARD 1: Students will develop an understanding of the characteristics and scope of Industrial Science/Technology Education.

BENCHMARKS: In order to comprehend the scope of Industrial Science/Technology Education, students in grade 7-8 should learn that -

- **A.** New products and systems can be developed to solve problems or to help do things that could not be done without the help of technology.
  For example, engines increase the speed at which people can travel, and pumps move water to locations where it is needed.
- **B.** The development of technology is a human activity and is the result of individual or collective needs and the ability to be creative.
  For example, from the time of the first gas cook stove in 1936 to the time of the microwave oven in 1967, the focus was on simplifying the process of cooking and reducing the time of food preparation
- **C.** Technology is closely linked to creativity, which has resulted in innovation.
  For example, the invention of the tea bag grew out of a packaging strategy to replace expensive tin containers.

BENCHMARKS: In order to comprehend the scope of Industrial Science/Technology Education, students in grade 9-12 should learn that -

- **A.** The nature and development of technological knowledge and processes are functions of the setting.
  For example, the tractor, plow, and hay bailer are designed specifically for use around farms, while the pick-up truck, tanker, and tractor-trailer are vehicles commonly used to move goods from farm to other areas.
- **B.** The rate of technological development and diffusion is increasing rapidly.
  For example, the first hand-held electronic calculator was designed to perform simple arithmetic.
- **C.** Inventions and innovations are the results of specific, goal-directed research.
  For example, years of research led to the design and development of a laser system used in atmospheric studies.

STANDARD 2: Students will develop an understanding of the core concepts of Industrial Science/Technology.

BENCHMARKS: In order to recognize the core concepts of Industrial Science/Technology, students in grade 7-8 should learn that –

- **A.** Technological systems include input, processes, output, and, at times, feedback.
  For example, the fuel level indicator of a car is a feedback system that lets the user know when the system needs additional fuel.
- **B.** An open-loop system has no feedback path and requires human intervention, while a closed-loop system uses feedback.

An example of an open-loop system is a microwave oven that requires a person to determine if the food had been heated to the required temperature. An example of a closed-loop system is the heating system in a home, which has a thermostat to provide feedback when it needs to be turned on and off.

C. Trade-off is a decision process recognizing the need for careful compromise among competing factors.

For example, when trade-offs are made, there is a choice or exchange for one quality or thing in favor of another.

D. Different technologies involve different sets of processes.

For example, data processing includes designing, summarizing, storing, retrieving, reproducing, evaluating, and communication, while the processes of construction include, designing, developing, evaluating, making and producing, marketing, and managing.

E. Controls are mechanisms or particular steps that people perform using information about the system that causes systems to change.

For example, a microprocessor may be used to control the performance of a microwave or traditional oven in cooking food to a desired temperature.

BENCHMARKS: In order to recognize the core concepts of Industrial Science/Technology, students in grade 9-12 should learn that –

A. The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.

For example, cruise control in an automobile, for example, automatically detects and controls the speed of the cart. Some delay in feedback or in functioning can cause a cycle to develop in a system.

B. Selecting resources involve trade-offs between completing values, such as availability, cost, desirability, and waste.

For example, some homes are very energy efficient, while others consume large amounts of energy.

C. Quality control is a planned process to ensure that a product, service, or system meets established criteria.

It is concerned with how well a product, service, or system conforms to specifications and tolerances required by the design.

D. Management is the process of planning, organizing, and controlling work.

Management is sometime called getting work done through teamwork.

STANDARD 3: Students will develop an understanding of the relationships among Industrial Science/Technology Education and the connections between technology and other fields of study.

BENCHMARKS: In order to appreciate the relationships among Industrial Science/Technology and other fields of study, students in grades 7-8 should learn that-

A. Technological systems often interact with one another.

For example, in automated manufacturing computer systems interact with manufacturing systems.

B. A product, system, or environment developed for one setting may be applied to another setting.

For example, a computerized pump based on biological laboratory design for the Mars Viking space probe was modified for use as an insulin delivery mechanism that provides diabetics with an automatic and precise way to control blood sugar.

C. Knowledge gained from other fields of study has a direct effect on the development of technological products and systems.

For example, skills learned in language arts are used in making design presentations. The concepts and principles of drawing are used in designing and rendering examples of technological products and systems. Scientific and

mathematical knowledge and principles influence the design, production, and operation of technological systems. Science concepts such as Ohm's Law, aerodynamic principles, and the periodic table of elements, are used in the development of new materials and design. Mathematical concepts, such as the use of measurement, symbols, estimation, accuracy, and the ides of scaling and proportions are the key to developing a product or system and being able to communicate design dimensions and proper function.

BENCHMARKS: In order to appreciate the relationships among Industrial Science/Technology Education, as well as with other fields of study, students in grades 9-12 should learn that-

A. Technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function.
For example, aerospace composite materials were used to design an advanced wheelchair that proved to be lightweight and easy to maneuver.

B. Technological ideas are sometimes protected through the process of patenting.
The purpose of a patent is to safeguard the investment of the inventor or creator and give credit where and when it is due.

C. Technological progress promotes the advancement of science and mathematics.
Likewise, progress in science and mathematics leads to advances in Industrial Science/Technology.

TECHNOLOGY AND SOCIETY:

STANDARD 4: Students will develop an understanding of the cultural, social, economic, and political effects of Industrial Science/Technology Education.

BENCHMARKS: In order to recognize the changes in society caused by the use of technology, students in grades 7-8 should learn that-

A. The use of technology affects humans in various ways, including their safety, comfort, choices, and attitude about technology's development and use.
For example, some might support the construction of a high-voltage electric transmission line because it would provide electricity to people in remote areas, while others who live near the path of the power line might not support it because of potential effects on their health and safety.

B. Technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in desirable or undesirable consequences.
For example, fossil fuels have both desired and undesired consequences.

C. The development and use of technology poses ethical issues.
For example, should we allow everyone to purchase a gun?

BENCHMARKS: In order to recognize the changes in society caused by the use of technology, students in grades 9-12 should learn that-

A. Changes caused by the use of technology can range from gradual to rapid and from subtle to obvious.
For example, when people listen to a classic album or watch television on their high-tech entertainment system, they are able to program segments of the album to play in a certain sequence or watch two television programs at once while they preview the highlights of a third and record a fourth.

B. Making decisions about the use of technology involves weighting the trade-offs between the positive and negative effects.
The construction and use of the interstate system require considering the benefits of providing a safe and quick mode of transportation, as well as the effects on the economy and society.

C. Ethical considerations are important in the development, selection, and use of technologies.

For example, medical advances for prolonging life and treating illness have triggered concerns about health care providers giving more attention to the best technological solution than to human values or needs.

D. The transfer of a technology from one society to another can cause cultural, social, economic, and political changes affecting both societies to varying degrees.

For example, the idea for developing flash freezing, a method to freeze foods that preserves the flavor, appearance, and nutritional value, was based on how the people of Labrador preserved their food.

STANDARD 5: Students will develop an understanding of the effects of technology on the environment.

BENCHMARKS: In order to discern the effects of technology on the environment, students in grades 7-8 should learn that-

A. The management of waste produced by technological systems is an important societal issue.

Recycling materials, such as glass, paper, and aluminum has decreased the waste that is sent to landfills, thereby reducing the need for new disposal sites.

B. Technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems.

For example, the use of bacteria in sewage treatment helps to clean waste prior to being released into rivers or lakes.

C. Decisions to develop and use technologies often put environmental and economic concerns in direct competition with one another.

For example, decisions on the use of nuclear power, wetland preservation, and placement of roads and highways are sometimes in direct conflict with many different viewpoints and interest.

BENCHMARK: In order to discern the effects of technology on the environment, students in grades 9-12 should learn that-

A. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.

For example, water treatment and filtering technologies can facilitate the reuse of water; wind and water erosion can be reduced by no-till farming; and aluminum containers can be recycled.

STANDARD 6: Students will develop an understanding of the role of society in the development and use of technology.

BENCHMARKS: In order to realize the impact of society on technology, students in grades 7-8 should learn-

A. Throughout history, new technologies have resulted from the demands, values, and interests of individuals, businesses, industries, and societies.

The development of the typewriter helped speed the preparation of documents for may businesses, while the development of the photocopying machine revolutionized the process of duplicating documents.

B. The use of inventions and innovations has led to changes in society and the creation of new needs and wants.

For example, the initial creation of radio, television, and sound systems has led to an ever-growing demand for entertainment and information.

C. Social and cultural priorities and values are reflected in technological devices.

For example, an unenthusiastic attitude toward the use of genetically engineered foods has affected the development of this technology, yet many

seed-producing companies are pressed to develop insect- and disease- resistant plants.

D. Meeting societal expectations is the driving force behind the acceptance and use of products and systems.

For example, with little regard to underlying technology, people expect buildings to provide shelter, bridges to span water, and dams to provide power and recreation.

BENCHMARKS: In order to realize the impact of society on technology, students in grades 9-12 should learn that-

A. Different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.

American transportation systems are closely linked to freedom and independence, whereas other cultures might place more value on the speed and convenience associated with mass transportation systems.

B. A number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads contribute to shaping the design of and demand for various technologies.

The general public may or may not be aware of the influences that shape technology or of how technological development will impact the environment.

STANDARD 7: Students will develop an understanding of the influence of technology on history.

BENCHMARKS: In order to be aware of the history of technology, students in grades 7-8 should learn that-

A. Many inventions and innovations have evolved by using slow and methodical processes of tests and refinement.

For example, during the development of the incandescent light bulb, Thomas Edison and a team of 20 highly skilled technical personnel performed more than 1,000 tests before they narrowed their ideas to one that worked.

B. The specialization of function has been at the heart of many technological improvements.

For example, the early steam engine was originally designed with a single chamber in which steam expanded and then was condensed – thus performing both of the two very different functions of the steam engine in the same place.

C. The design and construction for service or convenience have evolved from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.

For example, the purpose of Roman aqueducts was to provide a service by moving water from the surrounding hills to the city.

BENCHMARKS: In order to be aware of the history of technology, students in grades 9-12 should learn that -

A. Most technological development has been evolutionary, the result of a series of refinements to a basic invention.

For example, the development of the pencil was a long and tedious process.

B. The evolution of civilization has been affected by, and has in turn affected, the development and use of tools and materials.

For example, communication, agriculture, and transportation have evolved out of the political, economic, and social interests and values of the times.

C. The Industrial Revolution saw the development of continuous manufacturing, sophisticated transportation and communications systems, advanced construction practices, and improved education and leisure time.

Major developments of this period include the continuous-process flourmill, power loom and pattern-weaving loon, steam engine, electric motor, gasoline

and diesel engines, vulcanized rubber, airplane, telegraph, telephone, radio, and television.

D. The Information Age places emphasis on the processing and exchange of information.

The development of binary language, transistors, microchips, and as electronic numerical integrator and calculator (ENIAC) led to an explosion of computers, calculators, and communication processes to quickly move information from place to place.

DESIGN:

STANDARD 8: Students will develop an understanding of the attributes of design.

BENCHMARKS: In order to comprehend the attributes of design, students in grades 7-8 should learn that-

A. Design is a creative planning process that leads to useful products and systems.

The design process typically occurs in teams whose members contribute different kinds of ideas and expertise.

B. There is no perfect design.

All designs can be improved.

C. Requirements for a design are made up of criteria and constraints.

Criteria identify the desired elements and features of a product or system and usually relate to their purpose or function. Constraints, such as size and cost, establish the limits on a design.

BENCHMARKS: In order to comprehend the attributes of design, students in grades 9-12 should learn that-

A. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.

The design process is a systematic, iterative approach to problem solving that promotes innovation and yields design solutions.

B. Design problems are seldom presented in a clearly defined form.

Design goals and requirements must be established and constraints must be identified and prioritized during the time when designs are being developed.

C. The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.

The design process also involves considering how designs will be developed, produced, maintained, managed, used, and assesse

STANDARD 9: Students will develop an understanding of engineering design.

BENCHMARKS: In order to comprehend engineering design, students in grades 7-8 should learn that-

A. Design involves a set of steps, which can be performed in different sequences and repeated as needed.

Each design problem is unique and may require procedures or demand that the steps be performed in a different sequence.

B. Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.

After all of the ideas are recorded, the group selects the best ones, and then further develops them.

C. Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.

Historically, this process has centered on creating and testing physical models.

BENCHMARKS: In order to comprehend engineering design, students in grades 9-12 should learn that-

A. Establishing design principles are used to evaluate existing designs, to collect data, and to guide the design process.

The design principles include flexibility, balance, function, and proportion.

B. Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

The design process often involves a group effort among individuals with varied experiences, background, and interests.

C. A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.

Prototyping helps to determine the effectiveness of a design by allowing a design to be tested before it is built.

STANDARD 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

BENCHMARKS: In order to be able to comprehend other problem-solving approaches, students in grades 7-8 should learn-

A. Troubleshooting is a problem-solving method used to identify the cause of a malfunction in a technological system.

Once the cause of the problem has been identified, the next step is to repair and test it.

B. Some technological problems are best solved through experimentation.

This process closely resembles the scientific method.

BENCHMARKS: In order to be able to comprehend other problem-solving approaches, students in grades 9-12 should learn-

A. Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.

Product development of this type frequently requires sustained effort from teams of people having diverse backgrounds.

B. Technological problems must be researched before they can be solved.

When a problem appears, it is first necessary to learn enough about it to decide the best type of problem-solving method.

ABILITIES FOR A TECHNOLOGICAL WORLD:

STANDARD 11: Students will develop abilities to apply the design process.

BENCHMARK: As part of learning how to apply design processes, students in grades 7-8 should be able to-

A. Apply a design process to solve problems in and beyond the laboratory-classroom.

Identify and select a need, want, or problem to solve, which could result in a solution that could lead to an invention or an innovation.

BENCHMARKS: As part of learning how to apply design processes, students in grades 9-12 should be able to-

A. Identify the design problem to solve and decide whether or not to address it.

It is important to determine whether the design problem is worthy of being addressed or solved.

B. Evaluate final solutions and communicate observation, process, and results of the entire design process, using verbal and written means, in addition to three-dimensional models.

The final results should be compared to the original goals, criteria, and constraints.

STANDARD 12: Students will develop the abilities to use and maintain technological products and systems.

BENCHMARKS: As part of learning how to use and maintain technological products and systems, students in grades 7-8 should be able to-

A. Use information provided in manuals, protocols, or by experienced people to see and understand how things work.

This information in helpful in learning how to use a product and determining if it works properly.

B. Use tools, materials, and machines safely to diagnose, adjust, and repair systems.

Safety procedures should be learned through formal education.

C. Use computers and calculators in various applications.

Computers can be used to control production systems and to research answers to problems.

D. Operate and maintain systems in order to achieve a given purpose.

The understanding of how a system works is vital if one is to operate and maintain it successfully.

BENCHMARKS: As part of learning how to use and maintain technological products and systems, students in grades 9-12 should be able to-

A. Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.

Examples of such techniques include flow charts, drawings, graphics, symbols, spreadsheets, graphs, time charts, and World Wide Web pages.

B. Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.

Various items, such as digital meters or computer utility diagnostic tools, can be used in the maintenance of a system.

C. Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.

Monitoring the operation, adjusting the parts, cleaning, and oiling of a system represent examples of how a product or system can be properly maintained.

D. Operate systems so that they function in the way they were designed.

Using safe procedures and following directions is absolutely essential to ensuring an accident-free working environment.

STANDARD 13: Students will develop an understanding of and be able to select and use energy and power systems.

BENCHMARKS: In order to select, use, and understand energy and power technologies, students in grades 7-8 should learn that-

A. Energy is the capacity to do work.

Energy is required for a broad range of actions, from walking to running a diesel engine.

B. Energy can be used to do work, using many processes.

For example an internal combustion engine: gasoline vapor is combined with air and ignited with a spark plug; the spark plug explodes inside the cylinder

creating high pressure and temperature; the pressure acting on the piston pushes it down; the piston is connected to a piston rod that turns the crankshaft.

C. Power systems are used to drive and provide propulsion to other technological products and systems.

For example, a portable generator can be used to provide electricity to remote dwellings.

D. Much of the energy used in our environment is not used efficiently.

Conservation is the act of making better use of energy.

BENCHMARKS: In order to select, use, and understand energy and power technologies, students in grades 9-12 should learn that-

A. Energy cannot be created nor destroyed; however, it can be converted from one form to another.

Understanding scientific concepts and laws concerning energy is necessary in order to develop technologies for utilizing energy.

B. Energy can be grouped into major forms; thermal, radiant, electrical, mechanical, chemical, nuclear, and others.

Some forms of energy cannot be transported easily. Many times technology systems that use a great deal of energy are located near the energy source.

C. It is impossible to build an engine to perform work that does not exhaust thermal energy to the surroundings.

No energy system can be 100% efficient.

D. Energy resources can be renewable or nonrenewable.

Examples of renewable resources are the sun and agricultural products, while nonrenewable resources include fossil fuels, such as coal, oil, and natural gas.

- **E.** Power systems must have a source of energy, a process, and loads.

Power systems convert energy from one form to another and may transfer energy from one place to another.

STANDARD 14: Students will develop an understanding of and be able to select and use information and communication technologies.

BENCHMARKS: In order to select, use, and understand information and communication technologies, students in grades 7-8 should learn that-

A. Information and communication systems allow information to be transferred from human to human, human to machine, and machine to human.

People create information and communication technology systems to gather data, manipulate, and communicate information more effectively.

B. Communication systems are made up of a source, encoder, transmitter, receiver, decoder, and destination.

A communication system is similar to other systems in that it includes input, processes, output, and sometimes feedback.

C. The use of symbols, measurements, and drawings promote clear communication by providing a common language to express ideas.

Technological systems use specialized symbols and terminology.

BENCHMARKS: In order to select, use, and understand information and communication technologies, students in grades 9-12 should learn that-

A. Information and communication technologies include the inputs, processes, and outputs associated with sending and receiving information.

All of these parts are necessary if information is to be shared and understood by the sender and receiver.

B. Information and communication systems allow information to be transferred from human to human, human to machine, machine to human, and machine to machine.

Examples of these are: a) two people talking to each other over the telephone, b) a person inputting data in a computer using a keyboard, c) an electric fax

machine providing a copy of a message to a person, and d) an automated system transferring financial records from one bank computer to another bank computer.

C. Information and communication systems can be used to inform, persuade, entertain, control, manage, and educate.

Examples of such include the Internet, telephones, television, radios, computers, and fax machines.

D. Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.

Data and information can be stored to be retrieved later. Storage devices include CD-ROMs, hard drives, flash memory, and memory chips.

E. There are many ways to communicate information, such as graphic and electronic means.

Examples of graphic systems include printing and photochemical processes, while examples of electronic systems are computers, DVD players, digital audiotapes, and telephones.

F. Technological knowledge and processes are communicated using symbols, measurements, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.

Emerging technologies often generate new symbols, measurement systems, and terminology. For example, ;-) is a symbol used in e-mail and on-line chat rooms to represent a wink.

STANDARD 15: Students will develop an understanding of and be able to select and use transportation technologies.

BENCHMARKS: In order to select, use, and understand transportation technologies, students in grades 7-8 should learn that-

A. Government regulations often influence the design and operation of transportation systems.

State agencies regulate the use of highway systems, set speed limits, and control other operating conditions.

B. Processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions are necessary for the entire transportation system to operate efficiently.

These processes may be used individually or in various combinations to move goods and people.

BENCHMARKS: In order to select, use, and understand transportation technologies, students in grades 9-12 should learn that-

A. Transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.

The transportation system includes the subsystems of aviation, rail transportation, water transportation, pedestrian walkways, and roadways.

B. Intermodalism is the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.

An example of intermodalism is a semi-truck container that is hauled on an ocean cargo ship from another country, transported to a railcar, and finally, attached to a semi-truck that travels a highway to deliver goods.

STANDARD 16: Students will develop an understanding of and be able to select and use manufacturing technologies.

BENCHMARKS: In order to select, use, and understand manufacturing technologies, students in grades 7-8 should learn that-

A. Manufacturing systems use mechanical processes that change the form of materials through the processes of separating, forming, combining, and conditioning them.

Separating includes cutting, sawing, shearing and tearing. Forming includes bending, shaping, stamping, and crushing. Combining includes gluing, welding, riveting, and using fasteners. Conditioning involves processing material, such as by heating or cooling, to improve their structures. Tempering metals is an example of conditioning.

B. Manufactured goods may be classified as durable and non-durable.

These classifications are based on the life expectancy of a product or system. Durable goods include automobiles, kitchen appliances, and power tools, while non-durable goods include toothbrushes, disposable diapers, and automobile tires.

C. The manufacturing process includes the designing, development, making, and servicing of products and systems.

This process includes the use of materials (natural and synthetic), hand tools (e.g., hammers and scissors), human-operated machines (e.g., drills, sanders, and sewing machines), and automated machines (computer-controlled).

D. Chemical technologies are used to modify or alter chemical substances.

The products of chemical technologies include synthetic fibers, pharmaceuticals, plastics, and fuels.

E. Materials must first be located before they can be extracted from the earth through such processes as harvesting, drilling, and mining.

Because few materials occur in nature in a usable state, they must be changed into new forms before they can be used as inputs in the manufacturing process.

F. Marketing a product involves informing the public about it as well as assisting in selling and distribution.

Marketing entails assessing what the public wants and then advertising and selling products to the buyers.

BENCHMARKS: In order to select, use, and understand manufacturing technologies, students in grades 9-12 should learn that-

A. Servicing keeps products in goods operating condition.

Servicing processes include installing, diagnosing and troubleshooting, recalling, maintaining, repairing, altering and upgrading, and retrofitting.

B. Materials have different qualities and may be classified as natural, synthetic, or mixed.

Examples of materials found in nature are wood, stone, and clay. Synthetic materials are human-made, such as plastics, glass, and steel.

C. Durable goods are designed to operate for a long period of time, while non-durable goods are designed to operate for a short period of time.

Examples of durable goods are steel, furniture, and stoves. Non-durable goods, or consumable goods, include food, batteries, and paper.

D. Manufacturing systems may be classified into types, such as customized production, batch production, and continuous production.

Customized production meets the specific needs and wants of an individual or small group by producing a single item or small quantities of goods. Batch production generates parts to be assembled later into larger products. Continuous production makes items on an assembly line or processing plant.

E. The interchangeability of parts increases the effectiveness of manufacturing processes.

Components of a product or system must be interchangeable.

F. Chemical technologies provide a means for humans to alter or modify materials and to produce chemical products.

Chemical technologies have been used to improve the health and well being of humans, plants, and animals.

G. Marketing involves establishing a producer's identity, conducting research on its potential, advertising it, distributing it, and selling it.

Marketing should be considered from the design stage of a product to its final sale.

STANDARD 17: Students will develop an understanding of and be able to select and use construction technologies.

BENCHMARKS: In order to select, use, and understand construction technologies, students in grades 7-8 should learn that-

A. The selection of design for structures is based on factors such as building laws and codes, style, convenience, cost, climate, and function.

Building laws and codes are part of the city or county regulations for construction.

B. Structures rest on foundations.

The structures determine the type of foundation needed.

C. Some structures are temporary, while others are permanent.

Many times temporary structures are built to aid the construction of permanent structures.

D. Buildings generally contains a variety of subsystems.

These subsystems include waste disposal, water, electrical, structural, climate control, and communications.

BENCHMARKS: In order to select, use, and understand construction technologies, students in grades 9-12 should learn that-

A. Infrastructure is the underlying base or basic framework of a system.

An infrastructure often includes the basic building, services, and installations needed in order for society or government to function, such as transportation, communication, water, energy, and public information systems.

B. Structures are constructed using a variety of processes and procedures.

In some cases, the procedure used depends on the type of material available.

C. The design of structures includes a number of requirements.

One of the most important design constraints with structures is function.

D. Structures require maintenance, alteration, or renovation periodically to improve them or to alter there intended use.

Structures must be designed and constructed to provide for maintenance. Most structures are comprised of a variety of systems, each of which commonly requires maintenance.

E. Structures can include prefabricated materials.

Certain kinds of materials are appropriate for some prefabricated structures and parts of structures, while others are not.