

STANDARDS & BENCHMARKS

GRADES 9-12

Standard #1 Students will develop an understanding of the characteristics and scope of technology

J. The nature and development of technological knowledge and processes are functions of the setting.

L. Inventions and innovations are the results of specific, goal directed research.

Standard #2 Students will develop an understanding of the core concepts of technology

W. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.

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

AA. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development.

CC. New technologies create new processes.

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

Standard #3 Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study

G. Technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function.

I. Technological ideas are sometimes protected through the process of patenting.

Standard #4 Students will develop an understanding of the cultural, social, economic, and political effects of technology.

H. Changes caused by the use of technology can range from gradual to rapid, and from subtle, to obvious.

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

Standard #5 Students will develop an understanding of the effects of technology on the environment

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

I. With the aid of technology, various aspects of the environment can be monitored to provide information for decision-making.

K. Humans devise technologies to reduce the negative consequences of other technologies.

Standard #6 Students will develop an understanding of the role of society in the development and use of technology

D. Throughout history, new technologies have resulted from the

demands, values, and interests of individuals, business, industries, and societies.

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

Standard #7 Students will develop an understanding of the influence of technology on history

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

I. Throughout history, technology has been a powerful force in reshaping the social, cultural, political, and economic landscape.

K. The Iron Age was defined by the use of iron and steel as the primary materials for tools

L. The Middle Ages saw the development of many technological devices that produced long-lasting effects on technology and society.

K. The rate of technological development and diffusion is increasing rapidly.

M. Most development of technologies these days is driven by the profit motive and the market.

X. Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.

Z. Selecting resources involves trade-offs between competing values, such as availability, cost, desirability, and waste.

BB. Optimization is an ongoing process of methodology of designing or making a product and is dependent on criteria and constraints.

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

FF. Complex systems have many layers of controls and feedback loops to provide information.

H. Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies.

J. Technological progress promotes the advancement of science and mathematics.

I. Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.

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

H. When new technologies are developed to reduce the use of

resources, considerations of trade-offs are important

J. The alignment of technological processes maximizes performance and reduces negative impacts on the environment.

L. Decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment.

E. The use of inventions and innovations has led to changes in

society and the creation of new needs and wants.

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

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

J. Early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.

M. The Renaissance, a time of rebirth of the arts and humanities, was also an important development in the history of

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

technology.

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

(2)

GRADES 9-12

National Standards & Benchmarks

Standard #8 Students will develop an understanding of the attributes of design

H. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a 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.

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

J. The design needs to be continually checked and critiqued and the ideas of the design must be refined and improved.

K. Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.

Standard #9 Students will develop an understanding of engineering design

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

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

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

L. The process of engineering design takes into account a number of factors.

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

I. 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.

K. Not all problems are technological, and not every problem can be solved using technology.

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

L. Many technological problems require a multidisciplinary approach.

Standard #11 Students will develop abilities to apply the design process

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

O. Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.

Q. Develop and produce a product or system using a design process

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

N. Identify criteria and constraints and determine how these will affect the design process.

P. Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.

Standard #12 Students will develop abilities to use and maintain technological products and systems

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

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

P. Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.

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

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

Standard #13 Students will develop abilities to assess the impact of products and systems

J. Collect information and evaluate its quality.

K. Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.

L. Use assessment techniques, such as trend analysis

M. Design forecasting techniques to evaluate the results of altering natural systems.

Standard #14 Students will develop an understanding of and be able to select and use medical technologies.

K. Medical technologies include prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.

M. The sciences of biochemistry and molecular biology have made it possible to manipulate the genetic information found in living creatures.

L. Telemedicine reflects the convergence of technological advances in a number of fields, including medicine, telecommunications, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.

Standard #15 Students will develop an understanding of and be able to select and use agricultural and related biotechnologies

K. Agriculture includes a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemical, and other useful products.

L. Biotechnology has applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic

M. Conservation is the process of controlling soil erosion, reducing sediment in waterways, conserving water, and improving water quality.

engineering.

N. The engineering design and management of agricultural systems require knowledge of artificial ecosystems and the effects of technological development on flora and fauna.

(3)

GRADES 9-12

National Standards & Benchmarks

Standard #16 Students will develop an understanding of and be able to select and use energy and power technologies

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

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

N. Power systems must have a source of energy, a process, and loads

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

M. Energy resources can be renewable or nonrenewable

Standard #17 Students will develop an understanding of and be able to select and use information and communication technologies

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

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

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

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

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

P. There are many ways to communicate information, Such as graphic and electronic means.

Standard #18 Students will develop an understanding of and be able to select and use transportation technologies

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

L. Transportation services and methods have led to a population that is regularly on the move.

M. The design of intelligent and non-intelligent transportation systems depends on many processes and innovative ideas.

K. 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.

Standard #19 Students will develop an understanding of and be able to select and use manufacturing technologies

L. Servicing keeps products in good operating condition.

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

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

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

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

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

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

Standard #20 Students will develop an understanding of and be able to select and use construction technologies

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

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

M. Structures require maintenance, alteration, or renovation periodically to improve them or to alter their intended use.

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

N. Structures can include prefabricated materials