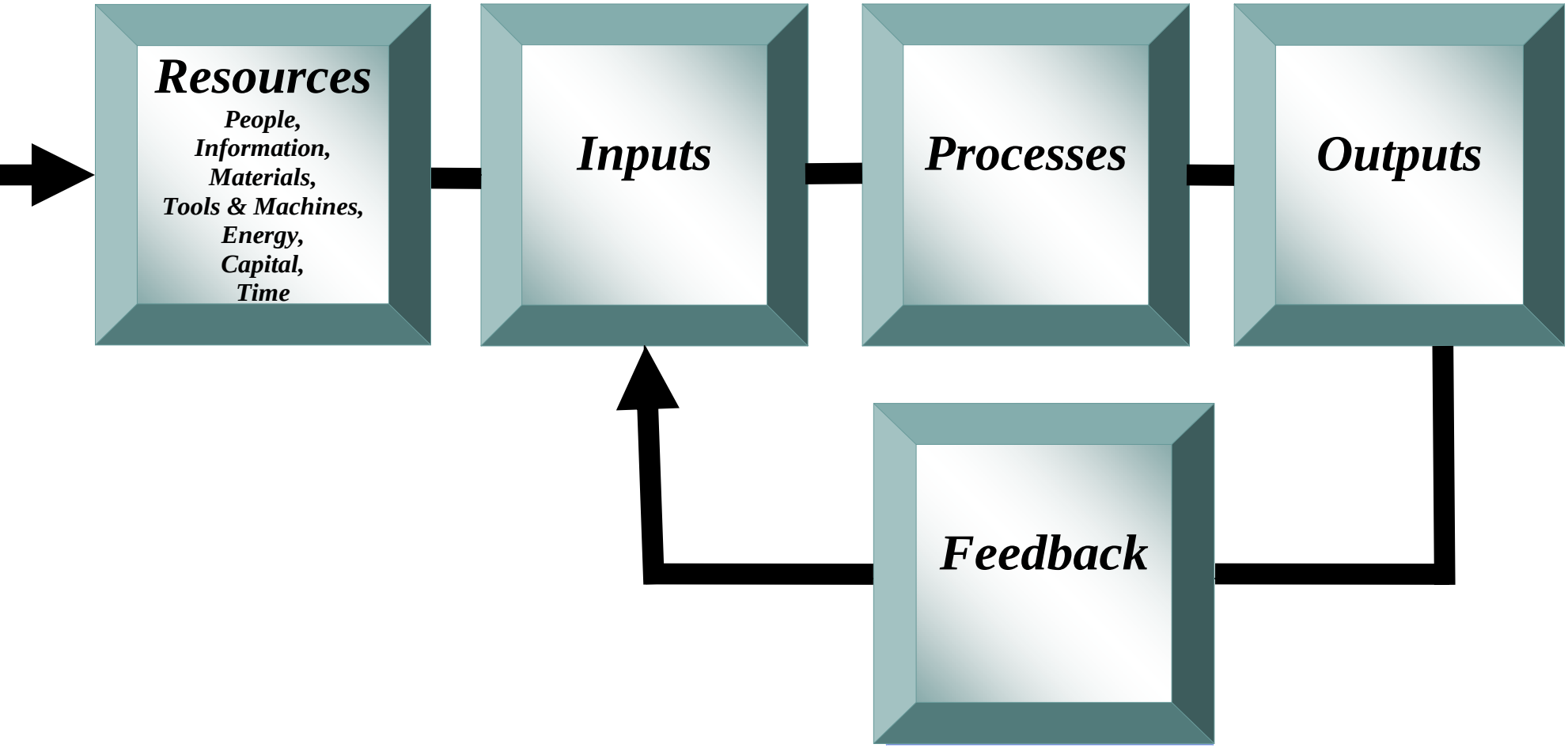
Technology Education
Resources

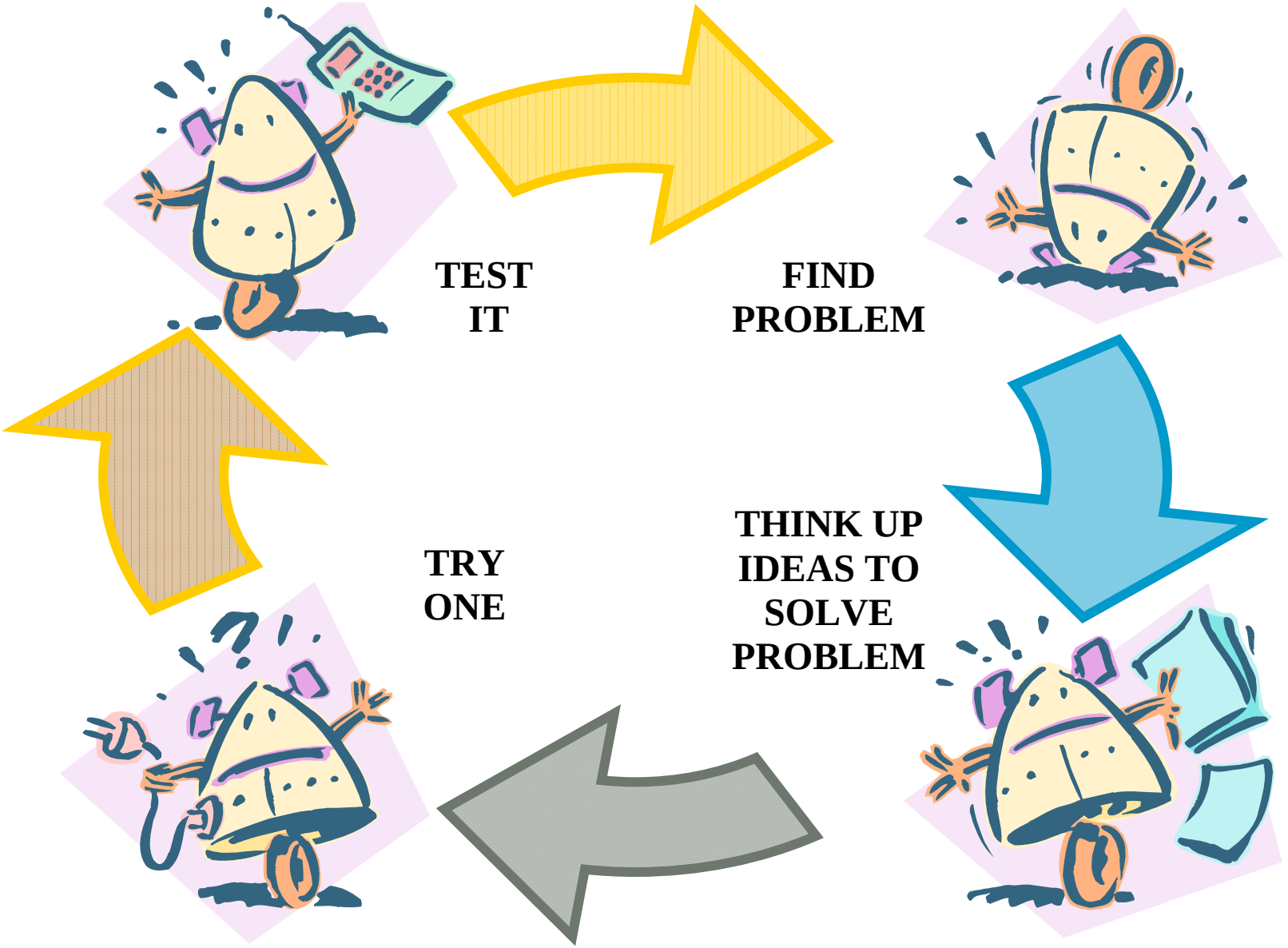
ITEA – International Technology Education Association	www.iteaconnect.org
DTEA – Delaware Technology Education Association	
TIDE – Technology, Innovation, Design, and Engineering	www.iteaconnect.org
EbD – Engineering by Design	www.iteaconnect.org
STEM – Science, Technology, Engineering, and Math	
TSA – Technology Student Association	www.tsaweb.org
National Career Clusters	www.careercluster.org
DEDOL – Delaware Department of Labor	www.delawareworks.com
Tech Prep of Delaware Department of Education	www.techprepdelaware.org
DACCTE – Delaware Advisory Council for Career & Technical Education	

Technology Systems Model Overview

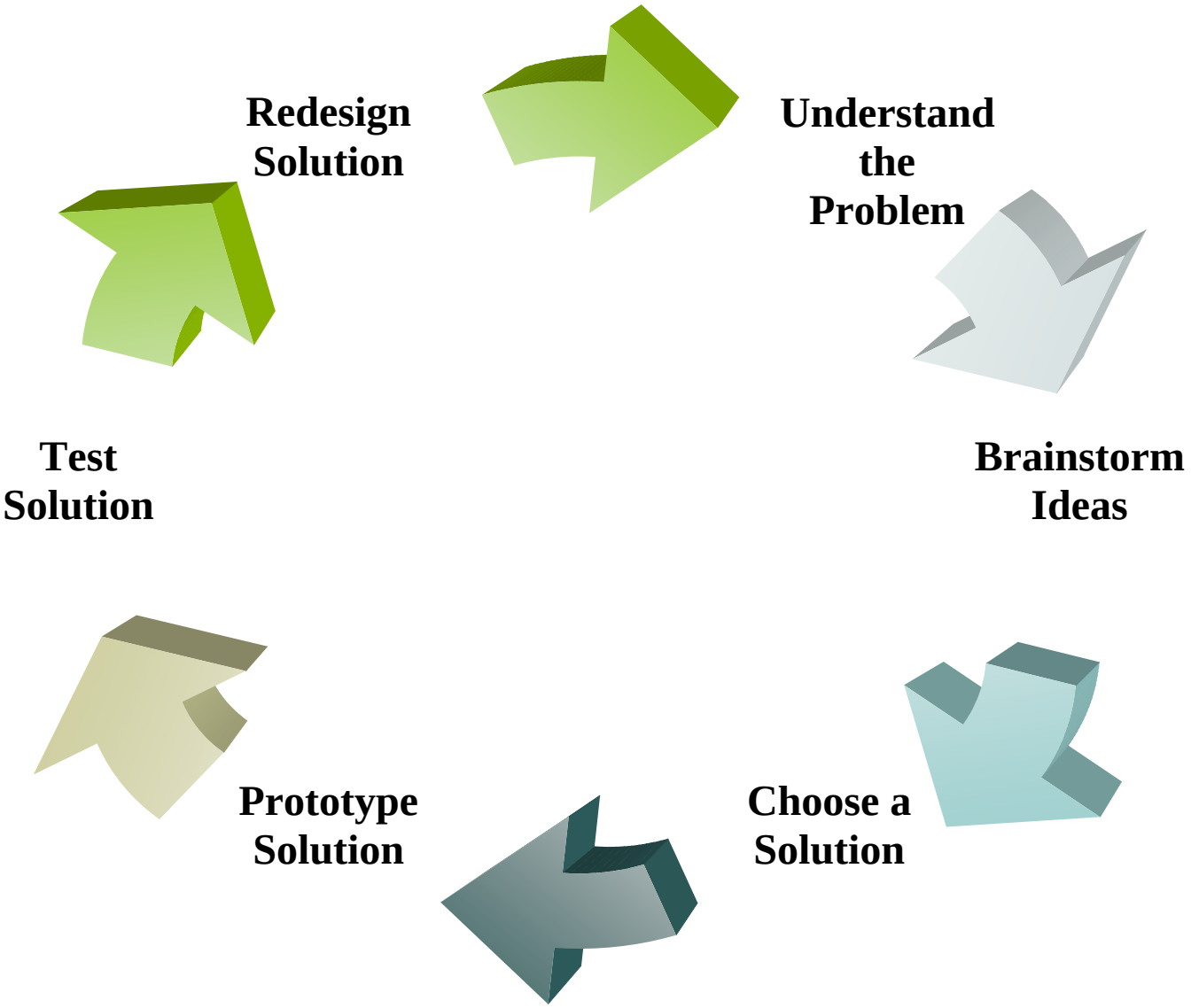


Elementary Design Process

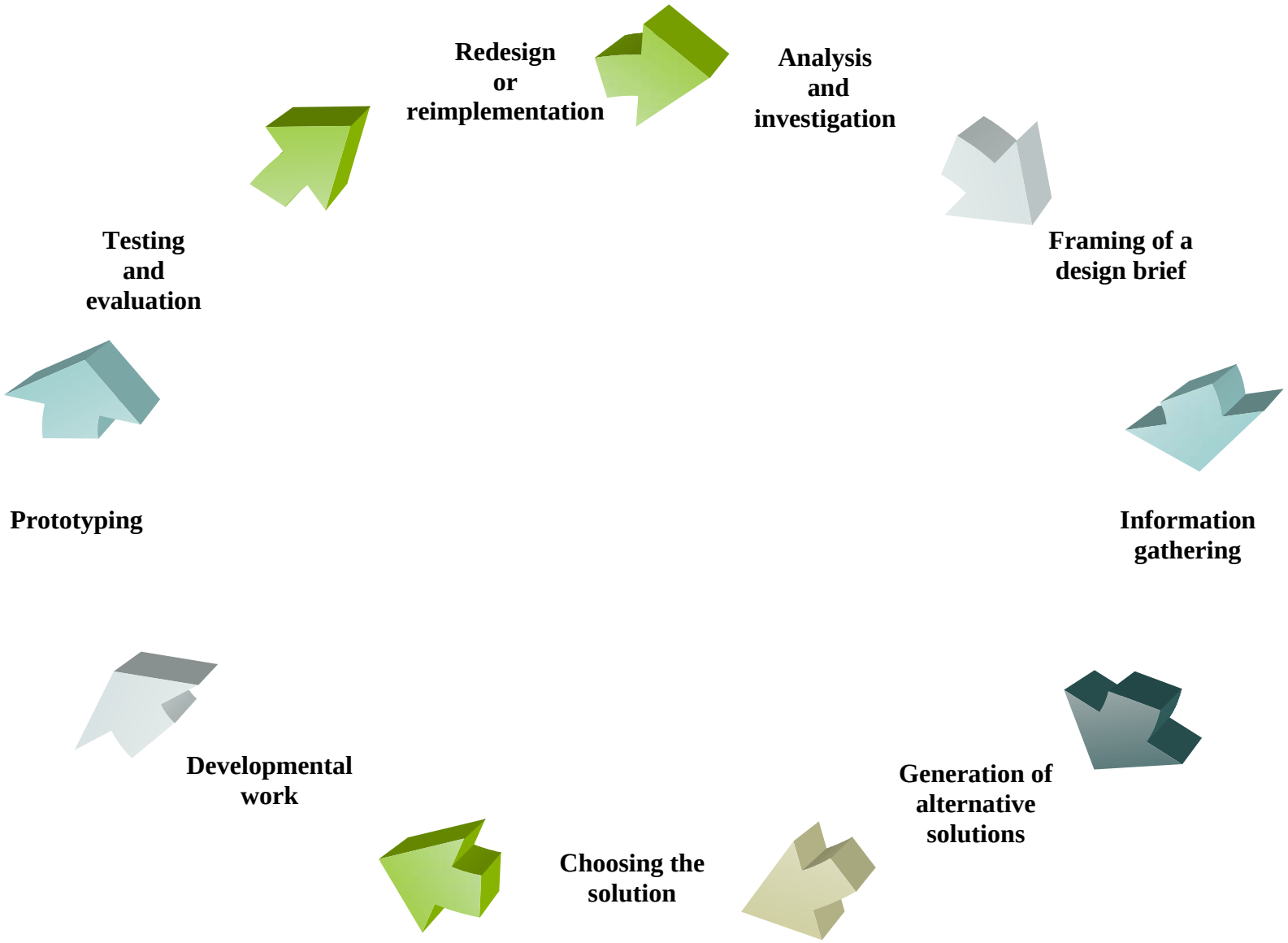
PROBLEM SOLVING!



Middle School Design Process



High School Design Process



Technology Education Acronyms

ACTE – Association for Career and Technical Education

ASCD – Association for Supervision and Curriculum Development

ASEE – American Society for Engineering Education

CTSO – Career and Technical Student Organization

EbD – Engineering by Design

FIRST – For Inspiration and Recognition of Science and Technology

JETS – Junior Engineering Technical Society

ITEA – International Technology Education Association

NAESP – National Association of Elementary School Principals

NASA – National Aeronautics and Space Administration

NASSP – National Association of Secondary School Principals

NCTM – National Council of the Teachers of Mathematics

NOCTI – National Occupational Competency Testing Institute

NSF – National Science Foundation

NSTA – National Science Teachers Association

PLTW – Project Lead the Way

STEM – Science, Technology, Engineering and Mathematics

STL – Standards for Technological Literacy

SWE – Society of Women Engineers

TIDE – Technology Innovation Design and Engineering

TSA – Technology Student Association

WIC – Women in Construction

WIT – Women in Technology

Technology Education Standards

Methodology of Technology Education

- Students will recognize **The Nature, Impacts, and Evolution of Technology** as they relate to the chronological human presence on Earth, as well as recognize the consequential influence of inventions and innovations that extend human capabilities.
- Students will effectively communicate technological solutions by using **Technology Education as an Interdisciplinary and Technological Link**.
- Students will develop and apply a practical understanding of **The Use and Management of Technological Resources and Systems.**
    - Technological resources: people, information, materials, tools and machines, energy, capital and time.
- Students will demonstrate technological problem solving by applying **The Design Process and The Systems Model.**
- Students will develop an operational awareness of **Technological Concepts** through focused invention and subsequent innovation.
- Students will explore technology-related skills, leadership skills, personal growth, and careers through opportunities provided by **Active Participation in the Technology Student Association (TSA).**

Technical & Practical Application of Technology Education

- Students will develop an understanding of **The Design Process** and be able to apply and transfer the related knowledge and skills to solve technological problems.
- Students will develop an understanding of **Agricultural, Bio-related, and Medical Technologies** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Information and Communication Technologies** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Drafting, Design, and CADD** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Energy, Power, and Transportation Technologies** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Construction and Manufacturing Technologies** and be able to apply and transfer the related knowledge and skills.

Appendix for Technology Education Standards:

Supporting Information for Methodologies and Technical and Practical Applications

Delaware Technology Education Practical Information to Support Standards

Standard Statement M1: Students will recognize **The Nature, Impacts, and Evolution of Technology** as they relate to the chronological human presence on Earth, as well as recognize the consequential influence of inventions and innovations that extend human capabilities.

	K-2	3-5	6-8	9-12
M1.01.01	Group discussions, cooperative group information sharing, pictures and/or models.	Cooperative group discussions to differentiate positive and negative impacts, e.g., students may identify ways in which humans pollute and restore the earth.		
M1.01.02				
M1.01.03				
M1.01 .04				
M1.01.05				
M1.01.06				
M1.01.07	What if there were no telephones or cars?			
M1.01.08	Fire, wood stove, oven gas grill, wheeled cart, horse drawn buggy, car, starship, cave, hut, log cabin, house, apartment, skyscraper.	Oral and written presentations, timelines and pictorial representations.		
M1.01.09				

Delaware Technology Education Practical Information to Support Standards

Standard Statement M2: Students will effectively communicate technological solutions by using **Technology Education as an Interdisciplinary and Technological Link.**

	K-2	3-5	6-8	9-12
M2.01.01	Language Arts: reading, oral presentation, labeling, writing of expressive and informative pieces using the writing process. Math: computation, graphing, measurement, geometry. Science: materials and their properties, energy, structures, tools and mechanisms. Social Studies: citizenship, economics, trade, mapping, natural resources and diversity in cultures. Visual and Performing Arts: sketching and music.	Language Arts: reading, oral presentation, labeling, writing of expressive and informative pieces using the writing process. Science: materials and properties, energy, structures, tools and mechanisms. Math: computation, graphing, measurement and geometry. Social Studies: citizenship, economics, trade, mapping, natural resources and diversity in cultures. Visual and Performing Arts. Sketching, music, painting, role-playing and sculpting.		
M2.01.02				
M2.01.03	Social situations, i.e., the playground, teams, family, math problems, science experiments.			
M2.01.04				
M2.01.05				

Delaware Technology Education Practical Information to Support Standards

<u>Standard Statement M3</u>: Students will develop and apply a practical understanding of **The Use and Management of Technological Resources and Systems.**

	K-2	3-5	6-8	9-12
M3.01.01				
M3.01.02	Does it sink or float? How might we join these materials? What could we use to cover this dome?			
M3.01.03				
M3.01.04				
M3.01.05				
M3.01.06				
M3.01.07				
M3.01.08				
M3.01.09				
M3.01.10				

Delaware Technology Education Practical Information to Support Standards

<u>Standard Statement M4</u>: Students will demonstrate technological problem solving by applying **The Design Process and The Systems Model.**

	K-2	3-5	6-8	9-12
M4.01.01	**N/A for Methodology 4**			
M4.01.02				
M4.01.03				
M4.01.04				
M4.01.05				
M4.01.06				
M4.01.07				

Delaware Technology Education Practical Information to Support Standards

Standard Statement M5: Students will develop an operational awareness of **Technological Concepts** through focused invention and subsequent innovation.

	K-2	3-5	6-8	9-12
M5.01.01	Sort and classify various materials; hard, soft, rough and/or smooth/ identify tools used in technology activities; scissors, ruler pencil, etc.			
M5.01.02	Construction and evaluation of the performance of wheeled vehicles to be used on a ramp that may be adjusted through a variety of angles. Design clothing to serve a variety of climate. Construction of transport vehicles for use on a specified surface, e.g., ice, rocks, sand, snow or asphalt.	Presentation; oral, written format graphics, charts and tables, model and prototypes.		
M5.01.03		Bicycle, toilet, garage door operating system.		
M5.01.04	An axle and wheel on a car, bike, skates, skateboard, tractor, or an inclined plane: used as ramps for skateboard, truck loading and Americans with Disabilities Act Requirements.	Research: books, internet, community resources.	Design briefs, Techno-logs.	
M5.01.05				

Delaware Technology Education Practical Information to Support Standards

M6. Standard Statement: Students will explore technology-related skills, leadership skills, personal growth, and careers through opportunities provided by **Active Participation in the Technology Student Association (TSA).**

	K-2	3-5	6-8	9-12
M6.01.01	**N/A for Methodology 6**			
M6.01.02				
M6.01.03				
M6.01.04				

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA 1: Students will develop an understanding of **The Design Process** and be able to apply and transfer the related knowledge and skills to solve technological problems.

	K-2	3-5	6-8	9-12
TPA1.01.01	**N/A for TPA 1**			
TPA1.01.02				
TPA1. 01.03				
TPA1. 01.04				
TPA1. 01.05				
TPA1. 01.06				
TPA1. 01.07				
TPA1. 01.08				
TPA1. 01.09				
TPA1. 01.10				
TPA1. 01.11				

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA2: Students will develop an understanding of **Agricultural, Bio-related, and Medical Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA2.01.01	Students will investigate how the process of planting, growing, maintaining, harvesting, and preserving are important in providing food.	Students will investigate and summarize how a farm may be considered as an example of an artificial ecosystem where plants, animals and soil all work together in the production of a product. They will explore how a small pond, either man-made or natural, is designed to use plants to provide food and shelter for aquatic life, which in turn use their waste products to support plant life. For example, students can construct an artificial ecosystem, such as a terrarium, to demonstrate how an artificial ecosystem functions.	New tools and machinery are designed to make work easier and more productive. Today, fewer people are involved in producing food, while more are needed for processing, packaging, and distribution. Students will participate in learning activities using and simulating these techniques.	Agricultural products are bought and sold by individuals, corporations, and financial institutions. Local, state, and federal governments regulate the marketing and safety of agriculture products and systems.
TPA2.01.02			Students identify products which can be recycled and determine how composting is the process used to recycle waste. For example, bio-fuels, such as ethanol or methane, can be made from recycled waste.	Students will study landscaping techniques as well as ways to establish environmental control of watersheds and wetlands.
TPA2.01.03	Students will determine that an ecosystem is the collection of organisms, such as plants and animals, in a shared physical environment. They will investigate how plants, animals, and their wastes interact with their environment is important in	Students will identify the processes and machinery used to plant and harvest a crop and the function each performs For example, propagating and growing requires tractors, plows, planting equipment, and irrigation systems. In contrasts, harvesting requires combines, mowers, balers, and shears.	Students will study that an artificial ecosystem acts as an environment using all the systems of life, such as food, water, shelter, and space. System management involves gathering data to plan, organize, and control processes, products, and systems. Operating a hydroponics or aquaculture system within a closed or open environment requires	Management of agriculture requires the consideration of such topics as the amount, orientation, and distribution of crops and other plants, the effects of pests, and the management of land and animals.

	order to know how to use them as natural devices for maintaining the environment. For example, how trees and grasses remove carbon dioxide from the air and generate oxygen.		total control and cultivation. Temperature, nutrients, light, air circulation, and monitoring are required in order for the system to function properly.	
TPA2.01.04				Students will learn that farmers use lasers to level their fields and the global positioning system (GPS) for precision farming. Farmers use pollination techniques to improve crop management techniques.
TPA2.01.05			Generic engineering is done in a laboratory that allows researchers to make controlled changes in genetic information and structure. Students will examine applications of genetic engineering looking at basic cell structure, genetic code, and genome projects.	DNA has resulted in methods for screening and diagnosis of disease states and disease predisposition through diagnostics. The potential for misuse should compel society to establish ethical mandates for regulating its uses.
TPA2.01.06			Students will investigate advances in the areas of gene and molecular therapeutics that have been made in the pharmaceutical industry with improved therapeutic drugs, the agricultural industry has developed herbicide-resistant, pesticide resistant, and climate-adapted crops, as well as the development of plant based alternative fuels.	Biological processes are used in combination with physical technologies to alter or modify materials, products, and organisms.
TPA2.01.07			Student will identify and explain how tools, such as thermometers, blood	Students will understand proper handling and management of hazardous materials

			pressure machines, and heart monitors help determine if people are well and provide other health clues. For example, a heart monitor measures a person's heart rate. Many tools have been designed what is happening in the human body such as self-testing kits to determine glucose, sugar and pH levels are examples of such tools. This information helps determine if a person's health is stable or if they are developing an illness.	help to protect us from disease and unnecessary harm. The development of a risk-free environment is essential to long-term social impact.
TPA2.01.08	Students will investigate how vaccinations help build protection to disease and are often administered early in life and when given over a period of time have led to improved health and life. They will also investigate why some medicines require a long period of time before they become effective and require repeated doses, while others work in a short period of time and should only be used when needed.	Students will share how vaccines for such illnesses as polio, tetanus and mumps are used in the maintenance of good health, while medicines, such as those for the common cold, the flu, or pneumonia re used to help ease an illness and restore good health.	Students will investigate various developments and innovations in medical equipment are now used in the diagnosis and treatment of illnesses that previously were undiagnosed or untreatable. Immunology requires special technologies to develop and produce vaccines and biochemistry plays a role in analysis of a patient's diagnostics.	For example, the development of vaccines and drugs has helped to eradicate or cause remission of many serious illnesses. The development of various diagnostic tools allows for easier and more accurate diagnosis of illness. The use of specially designed equipment can also assist in maintaining daily health.
TPA2.01.09		Students will identify and describe how everyday products, such as toothbrushes, hairbrushes, and soap are used to promote healthy living (e.g., doctors, dentists, optometrists, and other health professionals use many technological tools to gather medical information about people's health.	Students will describe how products such as artificial limbs, wheel chairs, or crutches change to take advantage of new technologies and to improve upon previous designs.	Students will investigate how telemedicine represents a significant change in the delivery of medical care by increasing the number of doctors who can diagnose illness and offer treatment in unsafe and remote areas via computer, videoconference, or other technology.

Delaware Technology Education Practical Information to Support Standards

<u>Standard Statement TPA3</u>: Students will develop an understanding of **Information and Communication Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA3.01.01	Data includes such things as numbers, amounts, words, symbols, sounds and images.	Computers are a tool that can be used to record, store, access, and manipulate data.	The transmission of information is accomplished using various systems. These systems involve sending signals using various forms including, but not limited to electromagnetic waves, electronic means, and fiber-optic cable.	Examples of these are: two people talking to each other using a wireless device; a person inputting information into a computer; an error message on an electronic device; or a computer-controlled milling machine.
TPA3.01.02	Electronic devices can be used to improve communication worldwide.	Information processing is a growing career field.	All of these components are necessary for the sender and receiver to understand each other. Communications systems include input, processes, outputs, and sometimes feedback. Information is encoded using symbols and graphics.	For a telephone communication system, the encoder and decoder would be the phone, and the transmitter would be the transmission lines or airwaves.
TPA3.01.03	For example, icons used on a computer desktop to represent programs and folders.	Electronic devices are used to improve the process of communication.	These factors should be taken into account when the message is created and transmitted to a particular audience. Communication-technology systems enhance the ability of disabled people to communicate. For example, communication systems have been designed to enhance the ability of hearing impaired.	Visual messages can be developed through graphic communication. Examples of graphic communication systems include printing and photochemical processes. Electronic systems include methods of communication such as MP3 players, radio, television, the Internet, telephones, etc. Multimedia systems combine both graphic and electronic methods of communication. Some examples of systems include the Internet, high-definition television, e-mail, podcasting, and computers.
TPA3.01.04		In mathematics "+" and "-" are used to represent addition and subtraction; an	The international sign of "do not" is a circle with a line through it.	

		arrow is used on a map to represent direction, Symbols, measurements, and sketches represent information.		

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA4: Students will develop an understanding of **Drafting, Design, and CADD** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA4.01.01	**N/A for TPA 4**			
TPA4.01.02				
TPA4.01.03				
TPA4.01.04				
TPA4.01.05				

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA5: Students will develop an understanding of **Energy, Power, and Transportation Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA5.01.01	It is used to do work. An early source of energy for machines was provided by human or animal muscle and was converted from food that was eaten. A car engine changes chemical energy (gasoline0 to mechanical energy (motion). Many appliances in the home and school use electrical energy.	Forms of energy include thermal, radian (light), chemical, mechanical, electrical, and others. Some energy sources cost less than others, and some give off less pollution. Electrical energy is used in an electric motor, and solar cells can be used to transform solar energy to electrical energy to operate a calculator.	Energy is required for a broad range of action s, from walking to running a diesel engine. Energy is an important input to many technological systems. Work is the product of force multiplied by the distance through which the force acted. Work is measure in Newton-meters, or joules, in the metric system and foot-pounds in the English system.	In scientific terms, this is called the law of conservation of energy, which can be stated as: "The total energy of an isolated system does not change." Understanding scientific concepts and laws concerning energy is necessary in order to develop technologies for utilizing energy. These concepts and laws describe the nature of energy. Energy can be classified as either kinetic or potential. Kinetic energy is the energy a body has associated with its motion. Potential energy is energy a body has because of its position (if it can be acted upon by a force) or condition; it is often referred to as stored energy.
TPA5.01.02	Toys and appliances should be turned off when they are not being used. Many energy resources, often called fuels, that are used to heat and light our homes, run our cars, and cook our food are non-renewable. There is a limited supply of these resources, and the supply is being used up.	A well-designed tool, machine, product, or system minimizes energy losses. For example, machines should be designed to apply energy efficiently to do a useful task. Energy is an important resource in technology.	For example, electricity can be generated by using geothermal energy to turn a turbine, which subsequently turns a generator to produce an electrical voltage. Another example involves an internal combustion engine; gasoline vapor is combined with air and ignited with a spark plug 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.	Some forms of energy cannot be transported easily. In transporting or transmitting energy, losses from the source of energy to the destination occur. Many times, technology systems that use a great deal of energy are located near the energy source. An example of this is an electric-generating plant located near a source of energy, such as a coal mine. The combustion of fossil fuels (e.g., coal, natural gas, and petroleum) provides one of the largest sources of energy today.

TPA5.01.03			Power is calculated by dividing the energy provided by the time taken to provide it. Common power measurements are kilowatt and horsepower. An example of the difference between the concept of energy (or work) and power can be seen in a student climbing a set of stairs. To climb from one floor of a building to another takes the same amount of energy to do the same work no matter how fast the student climbs. However, to climb twenty stairs in 10 seconds. Climbing faster requires the same amount of energy but more power – in the previous example three times more power.	This is one form of the second law of thermodynamics. No energy system can be 100 percent efficient. Large coal-fired, electric-generation systems strive for 40 percent efficiencies. That means that 60 percent of the energy from the coal is lost in the form of heating the environment rather than being turned into electrical energy. The law also has many wide-ranging consequences, such as the fact that there can be no perpetual motion machine.

TPA5.01.04			Conservation is the act of making better use of energy. Individuals can conserve energy by car pooling, driving the speed limit, and turning off lights. Builders can conserve energy by installing better insulation, and manufacturers can conserve energy by building more energy-efficient products. The rate at which energy is being used in the world is increasing. This rapid increase has created a concern that natural resources may be depleted in the future before other energy resources are available to replace them.	Examples of renewable resources are the sun and agricultural products, while nonrenewable resources include fossil fuels, such as coal, oil, and natural gas. Alternate and sustainable energy resources are being developed and tested in order to replace or supplement nonrenewable sources. For example, garbage can be used to produce methane gas and then burned for thermal energy. Also, corn can be fermented to produce ethanol (grain alcohol), which then can be used as a fuel. Power systems should be designed to conserve energy and to provide maximum efficiency without environmental degradation. For example, aircraft manufacturers are making more energy-efficient engines. Waste products associated with power systems can pollute the natural environment.
TPA5.01.05			A portable generator, for example, can be used to provide electricity to remote dwellings.	Usually feedback is part of this system. For example, the output of the system is sampled and provides a signal back to the input or process phase of the system in order to modify it. Power systems convert energy from one form to another and may transfer energy from one place to another. An example would be to burn coal in order to heat water and make steam, which turns a turbine and ultimately generates electricity.
TPA5.01.06	The roadway, vehicles, fuel, and controlling signs are just a few of the parts in a transportation system. Understanding how a transportation system works	The development of transportation systems has had a significant influence on where people live and work.	For example, the movement of a product from one part of the country to another may involve the person shipping the item, a delivery truck, a bus, plane, or train, and the people involved in controlling he product's	The transportation system includes the subsystems of aviation, transportation, water transportation, pedestrian walkways, and roadways. Each subsystem uses a wide array of devices, vehicles, and systems in order to move people and goods easily from one

	helps people and use it properly, such as walking on the left side of the street facing traffic when sidewalks are unavailable.		location, as well as those who made the road, the car, and the fuel.	mode to another.
TPA5.01.07	People's needs and wants influence the design of a transportation device, vehicle, fuel, and system. For example, cars replaced the horse and buggy because they allowed people to move faster. Goods are often moved in specially designed carriers, such as in refrigerated containers, on conveyor belts, or through piping systems.	For instances, and accident on a highway can throw a whole traffic pattern into chaos. Severe thunderstorms over Atlanta can result in the cancellation of airline flights up and down the east coast of North America.	Structural systems are the framework and body of a transportation vehicle or system. Propulsion systems provide the energy source, energy converter, and power transmitter to move a vehicle. Suspension systems connect or associate a vehicle with its environment. Guidance systems provide information to the operator of a vehicle. Control systems receive information from the guidance system to determine the changes in speed, direction, or altitude of a vehicle. Support systems provide life, legal, operational, maintenance, and economic support for safe and efficient operation.	An example of intermodalism is a truck container that is hauled on an ocean cargo ship from another country, transported to a railcar, and finally, attached to a truck that travels a highway to deliver goods. The same process is used by people who travel to all parts of the world using different modes of travel, from airplanes to ships to buses to trains or cars. Intermodalism provides a system that allows people to travel more efficiently and cheaply.
TPA5.01.08	People sometimes keep a log of what they must do to care for a vehicle, such as keeping it clean, rotating the tires, and looking for damage.		State agencies regulate the use of highway systems, set speed limits, and control other operating conditions. The Federal Aviation Administration regulates airspace and air safety and issues licenses to pilots.	For instance, people today can travel to foreign lands or to sites of interest hundreds of miles from home as quickly as they used to take a relatively short trip into town in a wagon 200 years ago.
TPA5.01.09			These processes may be used individually or in various combinations to move goods and people. For example, a conveyor system uses many of these processes	For example, the development of an intelligent transportation system – smart highways with electronic message boards, for instance – require the use of coordinated subsystems to determine capacity of lanes,

			to move boxes of goods in states from one location to another.	traffic flow, and potential congestion problems. Unintelligent transportation systems, such as walkways and bicycle paths, attract individuals and groups of people through innovative designs that capitalize on natural settings and provide convenience.

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA6: Students will develop an understanding of **Construction and Manufacturing Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA6.01.01	Products can be made faster, cheaper, and better through the use of technology. People have different roles in the manufacturing and construction processes. If people work together, they can produce much more than if they work alone to make the same product.	Raw materials, which come directly from nature or are created by humans (synthetic), are essential inputs in the manufacturing and construction systems. Whether making a toy or a house preplanning is essential.	Separating includes cutting, sawing, shearing and tearing. Forming includes bending, shaping, stamping, and crushing. Combining includes gluing, welding, riveting, and using fasteners (e.g., nuts, bolts, and screws). Conditioning involves processing materials, such as by heating or cooling, to improve their structures. Tempering metals is an example of conditioning.	Infrastructure might include roads, sewers, and utilities while maintenance would include repairing, altering, upgrading, and retrofitting.
TPA6.01.02		When enterprises produce goods that people need and want, they will spend money to purchase them. This cycle provides jobs and helps the economy.	These classifications are based on the life expectancy of a product or system. Automobiles and homes are durable while toilet paper and tarps are nondurable.	Examples of materials found in nature are wood, stone, and clay. Synthetic materials are human made, such as plastics, glass, and steel. Composite materials are a combination of natural and synthetic materials, such as plywood, paper, and wool-polyester blends of fabric.
TPA6.01.03	Designers and engineers anticipate what people want and need with the intention that products will be bought. Some things are designed to be thrown away, while others are made to last a long time.	Many products are composed of standardized parts, which reduces the cost of making them thus making it easier to service and repair the products.	The manufacturing and construction processes include 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). Building codes and manufacturing standards are published by professional or governmental organizations.	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 in a processing plant**.** Examples include manufactured homes, sheds, firearms, and clothing.

Delaware Technology Education Practical Information to Support Standards

TPA6.01.04			Subsystems can include waste disposal, heating and cooling, transportation of goods and materials, quality control, and safety.	Components of a product or system must be interchangeable. Since manufacturing and construction have become global, international standards for the interchangeability of parts have emerged.
TPA6.01.05			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 manufacturing and construction. For example lumber is processed from trees and plastics are processed from petroleum.	Emerging technologies have been used to improve the health and well-being of humans, plants, and animals. Examples could include recycling industrial and consumer waste.
TPA6.01.06			Marketing entails assessing what the public wants and then advertising and selling products to the buyers**.**	Marketing should be considered from the design stage of a product to its final sale. Large corporations typically have their own marketing departments, whereas smaller companies with limited resources may contract with a marketing firm.

TPA6.01.07	Buildings are designed, built, and maintained by people. Special materials are used to make buildings. Historically people tended to use materials available in their communities for building materials. With the advent of modern ways to convert natural materials into building materials and improved transportation systems, special materials are now available, including lumber, stone brick, and plywood.	Special areas are designated for schools stores, parks, houses, apartments, manufacturing plants and offices. Sidewalks, trails, roads, and bridges provide routes for people to move throughout the community. In addition to building materials – sand, gravel, lumber, and brick – specialized tools and machines and large amounts of money – are needed in the construction industry as well as time, energy, land, and people.	One of the most important design constraints with structures is function. One of the most important design constraints with structures is function. For example, the function of houses is to provide safe and pleasant shelter for families, whereas the primary function of a bridge is to carry loads over barriers or obstructions. Other important constraints include appearance, strength, longevity, maintenance, and available utilities.	Building laws and codes are part of the city or county regulations or construction.
TPA6.01.08	The way the parts are arranged or put together to form a whole determines the type of structure. Some common structures include buildings, which protect people and goods, and roads and bridges which support transportation.	Weather and usage cause deterioration in any structure.	The structures determine the type of foundation needed. Foundations can be made from such materials as concrete, steel, and wooded poles.	In some cases, the procedure used depends on the type of material available. For example, welds, bolts, and rivets are used to assemble metal framing materials. Sometimes procedures are selected as a function of cost, skills, and preference of the worker or the level of quality desired. Citizens should be equipped to evaluate the appropriateness of procedures used.
TPA6.01.09		Some are simple, while others are complex. For example, a plumbing system provides water and eliminates sewage, and a heating and cooling system maintains comfortable temperatures in summer and winter. Other technologies are an integral part of a building as well. For example, the telephone is a part of communications technology. When building a house or office building, one	Many times, temporary structures are built to aid the construction of permanent structures. For example, scaffolding is often assembled to support workers who lay bricks, and forms are used as containers to hold poured concrete. There are many different types of interior and exterior building materials. These materials include brick, rock, stone, siding, log,	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. For example, because electrical and telephone systems typically need to be upgraded in office buildings, easy access must be included in the original design process (renovating a hotel to serve as a nursing home, for

		part of the whole process is installing telephone lines so that the people who live or work in that structure can communicate with the outside world.	wood, brick veneer, plywood metal, wallboard, concrete, glass, and straw, and mud. Certain kinds are appropriate for some prefabricated structures and parts of structures while others are not. For example, wood, concrete, and steel are commonly used as prefabricated frames for houses, bridges, and buildings. One important quality variable concerns the type and quality of materials used and the support loads required. Prefabricated sections of buildings can be set in place to reduce costs and a wide range of options at different costs is typically available.	example). Sometimes, alterations and renovations are necessary because a structure has become outdated or is in need of repair.