

<p>television, fiber optics).</p> <ul style="list-style-type: none"> • Identify graphic reproduction methods. • Describe appropriate image generating techniques (e.g., photography, video). <p>B. Demonstrate the ability to communicate an idea by applying basic sketching and drawing techniques.</p>	<p>graphic object designed and produced to communicate a thought or concept.</p> <ul style="list-style-type: none"> • Apply basic technical drawing techniques to communicate an idea or solution to a problem. • Apply the appropriate method of communications technology to communicate a thought. <p>B.</p>	<p>specific problem.</p> <ul style="list-style-type: none"> • Apply and analyze advanced communication techniques to produce an image that effectively conveys a message (e.g., desktop publishing, audio and/or video production). • Illustrate an understanding of a computer network system by modeling, constructing or assembling its components. <p>B.</p>	<p>evaluate a message designed and produced using still, motion and animated communication techniques.</p> <ul style="list-style-type: none"> • Describe the operation of fiber optic, microwave and satellite informational systems. • Apply various graphic and electronic information techniques to solve real world problems (e.g., data organization and analysis, forecasting, interpolation). <p>B.</p>
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3.6. Technology Education

3.6.4. GRADE 4

3.6.7. GRADE 7

3.6.10. GRADE 10

3.6.12. GRADE 12

Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.

<p>Know physical technologies of structural design, analysis and engineering, finance, production, marketing, research and design.</p> <ul style="list-style-type: none"> • Identify and group a variety of construction tasks. • Identify the major construction systems present 	<p>Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.</p> <ul style="list-style-type: none"> • Use knowledge of material 	<p>Apply physical technologies to structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.</p> <ul style="list-style-type: none"> • Describe and classify common 	<p>Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems.</p> <ul style="list-style-type: none"> • Apply knowledge of construction
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<p>in a specific local building.</p> <ul style="list-style-type: none"> • Identify specific construction systems that depend on each other in order to complete a project. • Know skills used in construction. • Identify examples of manufactured goods present in the home and school. • Identify basic resources needed to produce a manufactured item. • Identify basic component operations in a specific manufacturing enterprise (e.g., cutting, shaping, attaching). 	<p>effectiveness to solve specific construction problems (e.g., steel vs. wood bridges).</p> <ul style="list-style-type: none"> • Differentiate among the different types of construction applications (e.g., microwave tower, power plants, aircrafts). • Explain basic material processes that manufactured objects undergo during production (e.g., separating, forming, combining). • Evaluate a construction activity by specifying task analyses and necessary resources. 	<p>construction by their characteristics and composition.</p> <ul style="list-style-type: none"> • Compare and contrast specific construction systems that depend on each other in order to complete a project. • Evaluate material failure common to specific applications. • Demonstrate knowledge of various construction systems by building or interpreting models. • Select and apply the necessary resources to successfully conduct a manufacturing enterprise. 	<p>technology by designing, planning and applying all the necessary resources to successfully solve a construction problem.</p> <ul style="list-style-type: none"> • Compare resource options in solving a specific manufacturing problem. • Analyze and apply complex skills needed to process materials in complex manufacturing enterprises. • Apply advanced information collection and communication techniques to successfully convey solutions to specific construction problems.
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3.6. Technology Education

3.6.4. GRADE 4

3.6.7. GRADE 7

3.6.10. GRADE 10

3.6.12. GRADE 12

Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.

<ul style="list-style-type: none"> • Identify waste and pollution resulting 	<ul style="list-style-type: none"> • Explain the relationships among the basic resources needed in the production process for a specific manufactured object. • Explain the 		<ul style="list-style-type: none"> • Assess the
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<p>from a manufacturing enterprise.</p> <ul style="list-style-type: none"> • Explain and demonstrate the concept of manufacturing (e.g., assemble a set of papers or ball point pens sequentially, mass produce an object). • Identify transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting. • Identify and experiment with simple machines used in transportation systems. • Explain how improved transportation systems have changed society. 	<p>difference between design engineering and production engineering processes.</p> <ul style="list-style-type: none"> • Analyze manufacturing steps that affect waste and pollutants. • Explain transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting. • Identify and explain the workings of several mechanical power systems. • Model and explain examples of vehicular propulsion, control, guidance, structure and suspension systems. • Explain the limitations of land, marine, air and space transportation systems. 	<ul style="list-style-type: none"> • Apply concepts of design engineering and production engineering in the organization and application of a manufacturing activity. • Apply the concepts of manufacturing by redesigning an enterprise to improve productivity or reduce or eliminate waste and/or pollution. • Evaluate the interrelationship of various transportation systems in the community. • Analyze the impacts that transportation systems have on a community. 	<p>importance of capital on specific construction applications.</p> <ul style="list-style-type: none"> • Analyze the positive and negative qualities of several different types of materials as they would relate to specific construction applications. • Analyze transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting. • Analyze the concepts of vehicular propulsion, guidance, control, suspension and structural systems while designing and producing specific complex transportation systems.
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3.7. Technological Devices

3.7.4. GRADE 4	3.7.7. GRADE 7	3.7.10. GRADE 10	3.7.12. GRADE 12
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Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.

Explore the use of basic tools, simple materials and	Describe the safe and appropriate use	Identify and safely use a variety of tools,	Apply advanced tools, materials and techniques to
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<p>A.</p> <p>techniques to safely solve problems.</p> <ul style="list-style-type: none"> • Describe the scientific principles on which various tools are based. • Group tools and machines by their function. • Select and safely apply appropriate tools and materials to solve simple problems. 	<p>A.</p> <p>of tools, materials and techniques to answer questions and solve problems.</p> <ul style="list-style-type: none"> • Identify uses of tools, machines, materials, information, people, money, energy and time that meet specific design criteria. • Describe safe procedures for using tools and materials. • Assess materials for appropriateness of use. 	<p>A.</p> <p>basic machines, materials and techniques to solve problems and answer questions.</p> <ul style="list-style-type: none"> • Select and safely apply appropriate tools, materials and processes necessary to solve complex problems. • Apply advanced tool and equipment manipulation techniques to solve problems. 	<p>A.</p> <p>answer complex questions.</p> <ul style="list-style-type: none"> • Demonstrate the safe use of complex tools and machines within their specifications. • Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution. • Evaluate and use technological resources to solve complex multi-step problems.
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3.7. Technological Devices				
3.7.4. GRADE 4		3.7.7. GRADE 7	3.7.10. GRADE 10	3.7.12. GRADE 12
Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.				
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B. Select appropriate instruments to study materials. • Develop simple skills to measure, record, cut and fasten. • Explain appropriate		B. Use appropriate instruments and apparatus to study materials. • Select appropriate instruments to measure the size, weight, shape and temperature of living and non-living objects. • Apply knowledge of	B. Apply appropriate instruments and apparatus to examine a variety of objects and processes. • Describe and use appropriate instruments to gather and analyze data. • Compare and contrast different scientific measurement systems; select the best measurement system for a specific situation. • Explain the need to estimate measurements within error of various instruments. • Apply accurate measurement knowledge to solve	B. Evaluate appropriate instruments and apparatus to accurately measure materials and processes. • Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment. • Evaluate the appropriate use of different measurement

instrument selection for specific tasks.	different measurement systems to measure and record objects' properties.	everyday problems. • Describe and demonstrate the operation and use of advanced instrumentation in evaluating material and chemical properties (e.g., scanning electron microscope, nuclear magnetic resonance machines).	scales (macro and micro). • Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.
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3.7. Technological Devices

3.7.4. GRADE 4

3.7.7. GRADE 7

3.7.10. GRADE 10

3.7.12. GRADE 12

Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.

Computer literacy, including the use of hardware and software in standard statements C, D, and E, should be integrated across all content areas.

<p>Identify basic computer operations and concepts.</p> <ul style="list-style-type: none"> • Identify the major parts necessary for a computer to input and output data. • Explain and demonstrate the basic use of input and output devices (e.g., keyboard, monitor, printer, mouse). • Explain and demonstrate the use of external and internal 	<p>Explain and demonstrate basic computer operations and concepts.</p> <ul style="list-style-type: none"> • Know specialized computer applications used in the community. • Describe the function of advanced input and output devices (e.g., scanners, video images, plotters, projectors) and demonstrate their use. • Demonstrate age appropriate keyboarding skills 	<p>Apply basic computer operations and concepts.</p> <ul style="list-style-type: none"> • Identify solutions to basic hardware and software problems. • Apply knowledge of advanced input devices. • Apply knowledge of hardware setup. • Describe the process for basic software installation and demonstrate it. • Analyze and solve basic operating systems problems. • Apply touch keyboarding 	<p>Evaluate computer operations and concepts as to their effectiveness to solve specific problems.</p> <ul style="list-style-type: none"> • Describe and demonstrate atypical software installation. • Analyze and solve hardware and advanced software problems. • Assess and apply multiple input and output devices to solve
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storage devices (e.g., disk drive, CD drive).	and techniques.	skills and techniques at expectable speed and accuracy. • Demonstrate the ability to perform basic software installation.	specific problems.
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3.7. Technological Devices							
3.7.4. GRADE 4		3.7.7. GRADE 7		3.7.10. GRADE 10		3.7.12. GRADE 12	
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.</i>							
..							
D. Use basic computer software. • Apply operating system skills to perform basic computer tasks. • Apply basic word processing skills. • Identify and use simple graphic and presentation graphic materials generated by the computer. • Apply specific instructional software.		D. Apply computer software to solve specific problems. • Identify software designed to meet specific needs (e.g., Computer Aided Drafting, design software, tutorial, financial, presentation software). • Identify and solve basic software problems relevant to specific software applications. • Identify basic multimedia applications. • Demonstrate a basic knowledge of desktop publishing applications. • Apply intermediate skills in utilizing word processing, database and spreadsheet software. • Apply basic graphic		D. Utilize computer software to solve specific problems. • Identify legal restrictions in the use of software and the output of data. • Apply advanced graphic manipulation and desktop publishing techniques. • Apply basic multi-media applications. • Apply advanced word processing, database and spreadsheet skills. • Describe and demonstrate how two or more software applications can be used to produce an output. • Select and		D. Evaluate the effectiveness of computer software to solve specific problems. • Evaluate the effectiveness of software to produce an output and demonstrate the process. • Design and apply advanced multimedia techniques. • Analyze, select and apply the appropriate software to solve complex problems. • Evaluate the effectiveness of the computer as a presentation tool. • Analyze the legal responsibilities of computer users.	

		manipulation techniques.	apply software designed to meet specific needs.	
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3.7. Technological Devices				
3.7.4. GRADE 4	3.7.7. GRADE 7	3.7.10. GRADE 10	3.7.12. GRADE 12	
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.</i>				
E.	E.	E.	E.	
Identify basic computer communications systems. • Apply a web browser. • Apply basic electronic mail functions. • Use on-line searches to answer age appropriate questions.	Explain basic computer communications systems. • Describe the organization and functions of the basic parts that make up the World Wide Web. • Apply advanced electronic mail functions. • Apply basic on-line research techniques to solve a specific problem.	Apply basic computer communications systems. • Identify and explain various types of on-line services. • Identify and explain the function of the parts of a basic network. • Describe and apply the components of a web page and their function. • Explain and demonstrate file transfer within and out side of a computer network. • Identify, describe and complete advanced on-line research.	Assess the effectiveness of computer communications systems. • Assess the effectiveness of a computer based communications system. • Transfer files among different computer platforms. • Analyze the effectiveness of on-line information resources to meet the needs for collaboration, research, publications, communications and productivity. • Apply knowledge of protocol standards to solve connectivity problems.	

3.8. Science, Technology and Human Endeavors				
3.8.4. GRADE 4	3.8.7. GRADE 7	3.8.10. GRADE 10	3.8.12. GRADE 12	
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.</i>				
			Analyze the	

<p>Know that people select, create and use science and technology and that they are limited by social and physical restraints.</p> <ul style="list-style-type: none"> • Identify and describe positive and negative impacts that influence or result from new tools and techniques. • Identify how physical technology (e.g., construction, manufacturing, transportation), informational technology and biotechnology are used to meet human needs. • Describe how scientific discoveries and technological advancements are related. • Identify interrelationships among technology, people and their world. • Apply the technological design process to solve a simple problem. 	<p>Explain how sciences and technologies are limited in their effects and influences on society.</p> <ul style="list-style-type: none"> • Identify and describe the unavoidable constraints of technological design. • Identify changes in society as a result of a technological development. • Identify and explain improvements in transportation, health, sanitation and communications as a result of advancements in science and technology and how they effect our lives. 	<p>relationship between societal demands and scientific and technological enterprises.</p> <ul style="list-style-type: none"> • Identify past and current tradeoffs between increased production, environmental harm and social values (e.g., increased energy needs, power plants, automobiles). • Compare technologies that are applied and accepted differently in various cultures (e.g., factory farming, nuclear power). • Describe and evaluate social change as a result of technological developments. • Assess the social impacts of a specific international environmental problem by designing a solution that applies the appropriate technologies and resources. 	<p>Synthesize and evaluate the interactions and constraints of science and technology on society.</p> <ul style="list-style-type: none"> • Compare and contrast how scientific and technological knowledge is both shared and protected. • Evaluate technological developments that have changed the way humans do work and discuss their impacts (e.g., genetically engineered crops). • Evaluate socially proposed limitations of scientific research and technological application.
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3.8. Science, Technology and Human Endeavors

3.8.4. GRADE 4	3.8.7. GRADE 7	3.8.10. GRADE 10	3.8.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.</i>			
• •			
<p>Know how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.</p> <p>• Identify and distinguish between human needs and improving the quality of life.</p> <p>• Identify and distinguish between natural and human-made resources.</p> <p>• Describe a technological invention and the resources that were used to develop it.</p>	<p>Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.</p> <p>• Identify interrelationships between systems and resources.</p> <p>• Identify and describe the resources necessary to solve a selected problem in a community and improve the quality of life.</p> <p>• Identify and explain specific examples of how agricultural science has met human needs and has improved the quality of life.</p>	<p>Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.</p> <p>• Identify several problems and opportunities that exist in your community, apply various problem-solving methods to design and evaluate possible solutions.</p> <p>• Analyze a recently invented item, describing the human need that prompted its invention and the current and potential social impacts of the specific invention.</p> <p>• Apply knowledge of oceanography, meteorology, geology and human anatomy to explain important considerations that need to be made for construction of homes, buildings and businesses in the United States.</p>	<p>Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.</p> <p>• Apply appropriate tools, materials and processes to solve complex problems.</p> <p>• Use knowledge of human abilities to design or modify technologies that extend and enhance human abilities.</p> <p>• Apply appropriate tools, materials and processes to physical, informational or biotechnological systems to identify and recommend solutions to international problems.</p> <p>• Apply knowledge of agricultural science to develop a solution that will improve on a human need or want.</p>

3.8. Science, Technology and Human Endeavors

3.8.4. GRADE 4	3.8.7. GRADE 7	3.8.10. GRADE 10	3.8.12. GRADE 12
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Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.

- Assess the impacts that agricultural science has had on meeting human needs and improving the quality of life.

3.8. Science, Technology and Human Endeavors

3.8.4. GRADE 4

3.8.7. GRADE 7

3.8.10. GRADE 10

3.8.12. GRADE 12

Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to.

<p>Know the pros and cons of possible solutions to scientific and technological problems in society.</p> <p>• Compare the positive and negative expected and unexpected impacts of technological change.</p> <p>• Identify and discuss examples of technological change in the community that have both positive and negative impacts.</p>	<p>Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.</p> <p>• Describe the positive and negative expected and unexpected effects of specific technological developments.</p> <p>• Describe ways technology extends and enhances human abilities.</p>	<p>Evaluate possibilities, consequences and impacts of scientific and technological solutions.</p> <p>• Relate scientific and technological advancements in terms of cause and effect.</p> <p>• Describe and evaluate the impacts that financial considerations have had on specific scientific and technological applications.</p> <p>• Compare and contrast potential solutions to technological, social, economic and environmental problems.</p> <p>• Analyze the impacts on society of accepting or rejecting</p>	<p>Evaluate the consequences and impacts of scientific and technological solutions.</p> <p>• Propose solutions to specific scientific and technological applications, identifying possible financial considerations.</p> <p>• Analyze scientific and technological solutions through the use of risk/benefit analysis.</p> <p>• Analyze and communicate the positive or negative impacts that a recent technological invention had on society.</p> <p>• Evaluate and describe potential impacts from emerging technologies and the consequences of not keeping abreast of technological advancements (e.g., assessment</p>
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			scientific and technological advances.	alternatives, risks, benefits, costs, economic impacts, constraints).
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IX. GLOSSARY

Allele:	Any of a set of possible forms of a gene.
Biochemical conversion:	The changing of organic matter into other chemical forms.
Biomass conversion:	The changing of organic matter that has been produced by photosynthesis into useful liquid, gas or fuel.
Biomedical technology:	The application of health care theories to develop methods, products and tools to maintain or improve homeostasis.
Biomes:	A community of living organisms of a single major ecological region.
Biotechnology:	The ways that humans apply biological concepts to produce products and provide services.
Carbon chemistry:	The science of the composition, structure, properties and reactions of carbon based matter, especially of atomic and molecular systems; sometimes referred to as organic chemistry.
Construction technology:	The ways that humans build structures on sites.
Desalinization:	To remove salts and other chemicals from sea or saline water.
Dichotomous:	Divided or dividing into two parts or classifications.
Electronic communication:	System for the transmission of information using electronic technology (e.g., digital cameras, cellular telephones, Internet, television, fiber optics).
Embryology:	The branch of biology dealing with the development of living things from fertilized egg to its developed state.
Engineering:	The application of scientific, physical, mechanical and mathematical principles to design processes, products and structures that improve the quality of life.
Enzyme:	A protein that increases the rate of a chemical reaction without being changed by the reaction; an organic catalyst.
Ergonomical:	Of or relating to the design of equipment or devices to fit the human body's control, position, movement and environment.
Evolution:	A process of change that explains why what we see today is different from what existed in the past; it includes changes in the galaxies, stars, solar system, earth and life on earth. Biological evolution is a change in hereditary characteristics of groups of organisms over the course of generations.
Fact:	Information that has been objectively verified.
Geologic hazard:	A naturally occurring or man-made condition or phenomenon that presents a risk or is a potential danger to life and property (e.g., landslides, floods, earthquakes, ground subsidence, coastal and beach erosion, faulting, dam leakage and failure, mining disasters, pollution

	and waste disposal, sinkholes).
Geologic map:	A representation of a region on which is recorded earth information (e.g., the distribution, nature and age relationships of rock units and the occurrences of structural features, mineral deposits and fossil localities).
Hydrology:	The scientific study of the properties, distribution and effects of water on the earth's surface, in the soil and underlying rocks and in the atmosphere.
Hypothesis:	An assertion subject to verification or proof as a premise from which a conclusion is drawn.
Information technology:	The technical means that humans create to store and transmit information.
Inquiry:	A systematic process for using knowledge and skills to acquire and apply new knowledge.
Instructional technology:	Any mechanical aid (including computer technology) used to assist in or enhance the process of teaching and learning.
Law:	Summarizing statement of observed experimental facts that has been tested many times and is generally accepted as true.
Manufacturing technology:	The ways that humans produce goods and products.
Mitosis:	The sequential differentiation and segregation of replicated chromosomes in a cell's nucleus that precedes complete cell division.
Model:	A description, analogy or a representation of something that helps us understand it better (e.g., a physical model, a conceptual model, a mathematical model).
Nova:	A variable star that suddenly increases in brightness to several times its normal magnitude and returns to its original appearance in a few weeks to several months or years.
Patterns:	Repeated processes that are exhibited in a wide variety of ways; identifiable recurrences of the element and/or the form.
Physical technology:	The ways that humans construct, manufacture and transport products.
Radioactive isotope:	An atom that gives off nuclear radiation and has the same number of protons (atomic number) as another atom but a different number of neutrons.
Relationship between science and technology:	Science builds principles or theories while technology is the practical application of those principles or theories.
Scale:	Relates concepts and ideas to one another by some measurement (e.g., quantitative, numeral, abstract, ideological); provides a measure of size and/or incremental change.
Science:	Search for understanding the natural world using inquiry and experimentation.
System:	A group of related objects that work together to achieve a desired result.

Open Loop system:	A group of related objects that do not have feedback and cannot modify themselves.
Closed Loop system:	A group of related objects that have feedback and can modify themselves.
Subsystem:	A group of related objects that make up a larger system (e.g., automobiles have electrical systems, fuel systems).
Technology education:	The application of tools, materials, processes and systems to solve problems and extend human capabilities.
Technological design process:	Recognizing the problem, proposing a solution, implementing the solution, evaluating the solution and communicating the problem, design and solution.
Theory:	Systematically organized knowledge applicable in a relatively wide variety of circumstances; especially, a system of assumptions, accepted principles and rules of procedure devised to analyze, predict or otherwise explain the nature or behavior of a specified set of phenomena.
Theory of evolution:	A theory that the various types of animals and plants have their origin in other preexisting types and that the distinguishable differences are due to modification in successive generations.
Topographic map:	A representation of a region on a sufficient scale to show detail, selected man-made and natural features of a portion of the land surface including its relief and certain physical and cultural features; the portrayal of the position, relation, size, shape and elevation of the area.
Transportation systems:	A group of related parts that function together to perform a major task in any form of transportation.
Transportation technology:	The physical ways humans move materials, goods and people.
Tool:	Any device used to extend human capability including computer-based tools.

Academic Standards for Environment and Ecology

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