Vertical Alignment Document

Science

Grade 6 – Grade 8

2011 – 2012

CSCOPE®

Texas Education Service Center Curriculum Collaborative

GRADE 6	GRADE 7	GRADE 8
§112.17. Implementation of Texas Essential Knowledge and Skills for Science, Middle School, Beginning with School Year 2010-2011. *Source: The provisions of this §112.17 adopted to be effective August 4, 2009, 34 TexReg 5063; amended to be effective August 24, 2010, 35 TexReg 7230.*		
§112.18. - §112.20. Science, Grade 6 – Grade 8, Beginning with School Year 2010-2011.		
(a) Introduction.		
(1) Science, as defined by the National Academy of Science, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.		
(2) Scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions become theories. Scientific theories are based on natural and physical phenomena and are capable of being tested by multiple, independent researchers. Students should know that scientific theories, unlike hypotheses, are well-established and highly reliable, but they may still be subject to change as new information and technologies are developed. Students should be able to distinguish between scientific decision-making methods and ethical/social decisions that involve the application of scientific information.		
(3) Grade 6 science is interdisciplinary in nature; however, much of the content focus is on physical science. National standards in science are organized as multi-grade blocks such as Grades 5-8 rather than individual grade levels. In order to follow the grade level format used in Texas, the various national standards are found among Grades 6, 7, and 8. Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include change and constancy, patterns, cycles, systems, models, and scale.	(3) Grade 7 science is interdisciplinary in nature; however, much of the content focus is on organisms and the environment. National standards in science are organized as a multi-grade block, such as Grade 5-8 rather than individual grade levels. In order to follow the grade level format used in Texas, the various national standards are found among grades 6, 7, and 8. Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include change and constancy, patterns, cycles, systems, models, and scale.	(3) Grade 8 science is interdisciplinary in nature; however, much of the content focus is on earth and space science. National standards in science are organized as multi-grade blocks such as grades 5-8 rather than individual grade levels. In order to follow the grade level format used in Texas, the various national standards are found among Grade 6, 7, and 8. Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include change and constancy, patterns, cycles, systems, models, and scale.
(4) The strands for Grades 6 – 8 include: (A) Scientific investigations and Reasoning (i) To develop a rich knowledge of science and the natural world, students must become familiar with different modes of scientific inquiry, rules of evidence, ways of formulating questions, ways of proposing explanations, and the diverse ways scientists study the natural world and propose explanations based on evidence derived from their work.		

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GRADE 6	GRADE 7	GRADE 8
(ii) Scientific investigations are conducted for different reasons. All investigations require a research question, careful observations, data gathering, and analysis of the data to identify the patterns that will explain the findings. Descriptive investigations are used to explore new phenomena such as conducting surveys of organisms or measuring the abiotic components in a given habitat. Descriptive statistics include frequency, range, mean, median, and mode. A hypothesis is not required in a descriptive investigation. On the other hand, when conditions can be controlled in order to focus on a single variable, experimental research design is used to determine causation. Students should experience both types of investigations and understand that different scientific research questions require different research designs. (iii) Scientific investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and the methods, models, and conclusions built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. Models have limitations, and based on new discoveries are constantly being modified to more closely reflect the natural world.		
(B) Matter and energy (i) Matter can be classified as elements, compounds, or mixtures. Students have already had experience with mixtures in fifth grade, so sixth grade will concentrate on developing an understanding of elements and compounds. It is important that students learn the differences between elements and compounds based on observations, description of physical properties, and chemical reactions. Elements are represented by chemical symbols, while compounds are represented by chemical formulas. Subsequent grades will learn about the differences at the molecular and atomic level. (ii) Elements are classified as metals, nonmetals, or metalloids based on their physical properties. The elements are divided into three groups on the periodic table. Each	(B) Matter and energy. Matter and energy are conserved throughout living systems. Radiant energy from the sun drives much of the flow of energy throughout living systems due to the process of photosynthesis in organisms described as producers. Most consumers then depend on producers to meet their energy needs. Decomposers play an important role in recycling matter. Organic compounds are composed of carbon and other elements that are recycled due to chemical changes that rearrange the elements for the particular needs of that living system. Large molecules, such as carbohydrates, are composed of chains of smaller units such as sugars, similar to a train being composed of multiple box cars. Subsequent grade levels will learn about the differences at the molecular and atomic level.	(B) Matter and energy. Students recognize that matter is composed of atoms. Students examine information on the periodic table to recognize that elements are grouped into families. In addition, students understand the basic concept of conservation of mass. Lab activities will allow students to demonstrate evidence of chemical reactions. They will use chemical formulas and balanced equations to show chemical reactions and the formation of new substances.

GRADE 6	GRADE 7	GRADE 8
different substance usually has a different density, so density can be used as an identifying property. Therefore, calculating density aids classification of substances. (iii) Energy resources are available on a renewable, nonrenewable, or indefinite basis. Understanding the origins and uses of these resources enables informed decision-making. Students should consider the ethical/social issues surrounding Earth's natural energy resources, while looking at the advantages and disadvantages of their long-term uses.		
(C) Force, motion, and energy. Energy occurs in two types, potential and kinetic, and can take several forms. Thermal energy can be transferred by conduction, convection, or radiation. It can also be changed from one form to another. Students will investigate the relationship between force and motion using a variety of means including calculations and measurements.	(C) Force, motion, and energy. Force, motion, and energy are observed in living systems and the environment in several ways. Interactions between muscular and skeletal system allow the body to apply forces and transform energy both internally and externally. Force and motion can also describe the direction and growth of seedlings, turgor pressure, and geotropism. Catastrophic events of weather systems such as hurricanes, floods, and tornadoes can shape and restructure the environment through the force and motion evident in them. Weathering, erosion and deposition occur in environments due to the forces of gravity, wind, ice, and water.	(C) Force, motion, and energy. Students experiment with the relationship between forces and motion through the study of Newton's three laws. Students learn how these forces relate to geologic processes and astronomical phenomena. In addition, students recognize that these laws are evident in everyday objects and activities. Math is used to calculate speed using distance and time measurements.
(D) Earth and space. The focus of this strand is on introducing Earth's processes. Students should develop an understanding	(D) Earth and space. Earth and space phenomena can be observed in a variety of settings. Both natural events and	(D) Earth and space. Students identify the role of natural events in altering Earth systems. Cycles within Earth,

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GRADE 6	GRADE 7	GRADE 8
of Earth as part of our solar system. The topics include organization of our solar system, the role of gravity, and space exploration.	human activities can impact Earth systems. There are characteristics of Earth and relationships to objects in our solar system that allow life to exist.	Sun, and Moon systems are studied as students learn about seasons, tides, and lunar phases. Students learn that stars and galaxies are part of the universe and that distances in space are measured by using light waves. In addition, students use data to research about scientific theories of the origin of the universe. Students will illustrate how Earth features change over time by plate tectonics. They will interpret land and erosional features on topographic maps. Students learn how interactions in solar, weather, and ocean systems create changes in weather patterns and climate.
(E) Organisms and environments. Students will gain an understanding of the broadest taxonomic classifications of organisms and how characteristics determine their classification. The other major topics developed in this strand include the interdependence between organisms and their environments and the levels of organization within an ecosystem.	(E) Organisms and environments (i) Students will understand the relationship between living organisms and their environment. Different environments support different living organisms that are adapted to that region of Earth. Organisms are living systems that maintain a steady state with that environment and whose balance may be disrupted by internal and external stimuli. External stimuli include human activity or the environment. Successful organisms can reestablish a balance through different processes such as a feedback mechanism. Ecological succession can be seen on a broad or small scale. (ii) Students learn that all	(E) Organisms and environments. In studies of living systems, students explore the interdependence between these systems. Interactions between organisms in ecosystems, including producer/consumer, predator/prey, and parasite/host relationships are investigated in aquatic and terrestrial systems. Students describe how biotic and abiotic factors affect the number of organisms and populations present in an ecosystem. In addition, students explore how organisms and their populations respond to short- and long-term environmental changes including those caused by human activities.

GRADE 6	GRADE 7	GRADE 8
	organisms obtain energy, get rid of wastes, grow, and reproduce. During both sexual and asexual reproduction, traits are passed onto the next generation. These traits are contained in genetic material that is found on genes within a chromosome from the parent. Changes in traits sometimes occur in a population over many generations. One of the ways a change can occur is through the process of natural selection. Students extend their understanding of structures in living systems from a previous focus on external structures to an understanding of internal structures and functions within living things. (iii) All living organisms are made up of smaller units called cells. All cells use energy, get rid of wastes and contain genetic material. Students will compare plant and animal cells and understand the internal structures within them that allow them to obtain energy, get rid of wastes, grow and reproduce in different ways. Cells can organize into tissues, tissues into organs, and organs into organ systems. Students will learn the major functions of human body systems, such as the ability of the integumentary system to protect against infection, injury, and UV radiation, regulate body	

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	temperature, and remove waste.	

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GRADE 6		GRADE 7		GRADE 8	
SCIENTIFIC INVESTIGATION AND REASONING					
6.4	***Scientific investigation and reasoning. The student knows how to use a variety of tools and safety equipment to conduct science inquiry. The student is expected to:***	***7.4***	***Scientific investigation and reasoning. The student knows how to use a variety of tools and safety equipment to conduct science inquiry. The student is expected to:***	***8.4***	***Scientific investigation and reasoning. The student knows how to use a variety of tools and safety equipment to conduct science inquiry. The student is expected to:***
6.4A	**Use appropriate tools to collect, record, and analyze information, including journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and other equipment as needed to teach the curriculum.** Use APPROPRIATE TOOLS TO COLLECT, RECORD, AND ANALYZE INFORMATION Including, but not limited to: • Journals/notebooks • Beakers • Petri dishes • Meter sticks • Graduated cylinders • Hot plates • Test tubes • Triple beam balances • Microscopes • Thermometers • Calculators	**7.4A**	**Use appropriate tools to collect, record, and analyze information, including life science models, hand lens, stereoscopes, microscopes, beakers, Petri dishes, microscope slides, graduated cylinders, test tubes, meter sticks, metric rulers, metric tape measures, timing devices, hot plates, balances, thermometers, calculators, water test kits, computers, temperature and pH probes, collecting nets, insect traps, globes, digital cameras, journals/notebooks and other equipment as needed to teach the curriculum.** Use APPROPRIATE TOOLS TO COLLECT, RECORD, AND ANALYZE INFORMATION Including, but not limited to: • Life science models • Hand lens • Stereoscopes • Microscopes • Microscope slides • Beakers • Petri dishes	**8.4A**	**Use appropriate tools to collect, record, and analyze information, including lab journals/notebooks, beakers, meter sticks, graduated cylinders, anemometers, psychrometers, hot plates, test tubes, spring scales, balances, microscopes, thermometers, calculators, computers, spectroscopes, timing devices, and other equipment as needed to teach the curriculum.** Use APPROPRIATE TOOLS TO COLLECT, RECORD, AND ANALYZE INFORMATION Including, but not limited to: • Lab journals/notebooks • Beakers • Meter sticks • Graduated cylinders • Anemometers • Psychrometers • Hot plates • Test tubes • Spring scales

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GRADE 6		GRADE 7		GRADE 8	
	• Computers • Timing devices		• Graduated cylinders • Test tubes • Meter sticks • Metric rulers • Metric tape measure • Timing devices • Hot plates • Balances • Thermometers • Calculators • Water test kits • Computers • Probes • Temperature • pH • Collecting nets • Insect traps • Globes • Digital cameras • Notebooks/journals		• Balances • Microscopes • Thermometers • Calculators • Computers • Spectroscopes • Timing devices STAAR Note: • The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.
6.4B	**Use preventative safety equipment, including chemical splash goggles, aprons, and gloves, and be prepared to use emergency safety equipment, including an eye/face wash, a fire blanket, and a fire extinguisher.** Use SAFETY EQUIPMENT	**7.4B**	**Use preventative safety equipment, including chemical splash goggles, aprons, and gloves and be prepared to use emergency safety equipment, including an eye/face wash, a fire blanket, and a fire extinguisher.** Use SAFETY EQUIPMENT	**8.4B**	**Use preventative safety equipment, including chemical splash goggles, aprons, and gloves, and be prepared to use emergency safety equipment, including an eye/face wash, a fire blanket, and a fire extinguisher.** Use SAFETY EQUIPMENT

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GRADE 6		GRADE 7		GRADE 8	

	Including, but not limited to:
	• Preventative safety equipment
	  • Chemical splash goggles
	  • Aprons
	  • Gloves
	• Emergency safety equipment
	  • Eye/face wash
	  • Fire blanket
	  • Fire extinguisher
			Including, but not limited to:
			• Preventative safety equipment
			  • Chemical splash goggles
			  • Aprons
			  • Gloves
			• Emergency safety equipment
			  • Eye/face wash
			  • Fire blanket
			  • Fire extinguisher
					Including, but not limited to:
					• Preventative safety equipment
					  • Chemical splash goggles
					  • Aprons
					  • Gloves
					• Emergency safety equipment
					  • Eye/face wash
					  • Fire blanket
					  • Fire extinguisher
					
					STAAR Note:
					• The process skills will be incorporated into at least 40% of the test questions and will be identified along with content standards.

MATTER AND ENERGY					
6.5	***Matter and energy. The student knows the differences between elements and compounds. The student is expected to:***	***7.6***	***Matter and energy. The student knows that matter has physical and chemical properties and can undergo physical and chemical changes. The student is expected to:***	***8.5***	***Matter and energy. The student knows that matter is composed of atoms and has chemical and physical properties. The student is expected to:***
6.5A	**Know that an element is a pure substance represented by chemical symbols.** Know THAT AN ELEMENT IS A PURE SUBSTANCE REPRESENTED BY CHEMICAL SYMBOLS Including, but not limited to:			**8.5A**	**Describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud.** ***Readiness Standard*** Describe STRUCTURE OF ATOMS

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GRADE 6	GRADE 7	GRADE 8

• H: hydrogen
• He: helium
• N: nitrogen
• O: oxygen
• C: carbon
• Cl: chlorine
• Na: sodium
• Ca: calcium
 	
STAAR Note:
• This is the first time that students have been directly introduced to elements and their symbols. Although not marked as a supporting standard, this SE builds content for Readiness Standard 8.5A.
 	
2061 Note: By the end of the 8th grade, students should know that:
• Chemical elements are those substances that do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. All substances from living and nonliving things can be broken down to a set of about 100 elements, but since most elements tend to combine with others, few elements are found in their pure form. 4D/M5*
		Including, but not limited to:
		• Properties of an atom
		  • Mass number (protons plus neutrons)
		  • Atomic number (protons)
		• Mass/size comparison
		  • Protons and neutrons have a similar mass.
		  • Electrons are significantly smaller in mass than protons and neutrons.
		• Electrical charges
		  • Electrons: negatively charged
		  • Protons: positively charged
		  • Neutrons: neutral (no charge)
		• Location
		  • Nucleus: protons and neutrons
		  • Electrons cloud: electrons
		  • Outer shell: valence electrons
		
		STAAR Note:
		• This is the first time students have been introduced to protons or electrons.
		
		TxCCRS Note:
		V. Cross-Disciplinary Themes – A1 – Know modern theories of atomic structure VII. Chemistry – B1 – Summarize the development of atomic theory. Understand that models of the atom are used to help us understand the properties of elements and compounds.

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					2061 Note: By the end of the 8th grade, students should know that: • All matter is made up of atoms, which are far too small to see directly through a microscope. 4D/M1a • The atoms of any element are like other atoms of the same element, but are different from the atoms of other elements. 4D/M1b*

6.5B	**Recognize that a limited number of the many known elements comprise the largest portion of solid Earth, living matter, oceans, and the atmosphere.**
	
	Recognize
	
	THAT A LIMITED NUMBER OF ELEMENTS COMPRISE THE LARGEST PORTION OF SOLID EARTH, LIVING MATTER, OCEANS, AND THE ATMOSPHERE
	
	Including, but not limited to:
	• Solid Earth
	  • Si: silicon
	  • O: oxygen
	• Living matter
	  • C: carbon
	  • H: hydrogen
	  • N: nitrogen
	  • O: oxygen
	  • P: phosphorous
	  • S: sulfur
		7.6A	**Identify that organic compounds contain carbon and other elements such as hydrogen, oxygen, phosphorus, nitrogen, or sulfur.**
			
			Supporting Standard
			
			Identify
			
			THAT ORGANIC COMPOUNDS CONTAIN CARBON AND OTHER ELEMENTS
			
			Including, but not limited to:
			• C: carbon (required to be organic)
			• H: hydrogen
			• O: oxygen
			• P: phosphorus
			• N: nitrogen
			• S: sulfur
			
			TxCCRS Note:
			V. Cross-Disciplinary Themes – A1 – Know modern theories of atomic structure.		

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GRADE 6		GRADE 7		GRADE 8	

	• Oceans
	  • O: oxygen
	  • H: hydrogen
	  • Cl: chlorine
	  • Na: sodium
	• Atmosphere
	  • N: nitrogen
	  • O: oxygen
	
	STAAR Note:
	• This is an introduction to the elements which builds content for the Supporting TEKS 7.6A.
	
	TxCCRS Note:
	VII. Chemistry – A2 – Recognize and classify pure substances (elements, compounds) and mixtures.
	
	2061 Note: By the end of the 8th grade, students should know that:
	• The atmosphere is a mixture of nitrogen, oxygen, and trace amounts of water vapor, carbon dioxide, and other gases. 4B/M15** (NSES)
			2061 Note: By the end of the 8th grade, students should know that:
			• Carbon and hydrogen are common elements of living matter. 4D/M6c*		

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