2021 Introduction	*2017 Introduction*
(1) In Grades 6 through 8 Science, content is organized into recurring strands. The concepts within each grade level build on prior knowledge, prepare students for the next grade level, and establish a foundation for high school courses. In Grade 6, the following concepts will be addressed in each strand.	*(1) 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.*
(A) Scientific and engineering practices. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, correlative, comparative, or experimental. The method chosen should be appropriate to the grade level and question being asked. Student learning for different types of investigations includes descriptive investigations, which have no hypothesis that tentatively answers the research question and involve collecting data and recording observations without making comparisons; correlative and comparative investigations, which have a hypothesis that predicts a relationship and involve collecting data, measuring variables relevant to the hypothesis that are manipulated, and comparing results; and experimental investigations, which involve processes similar to comparative investigations but in which a hypothesis can be tested by comparing a treatment with a control.	*The strands for Grade 6 include the following.* *(A) Scientific investigations and reasoning.*
(i) Scientific practices. Students ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.	*(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.*
(ii) Engineering practices. Students identify problems and design solutions using appropriate tools and models .	*(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.*
(B) Matter and energy. Students build upon their knowledge of properties of solids, liquids, and gases and further explore their molecular energies. In Grade 6, students learn how elements are classified as metals, nonmetals, or metalloids based on their properties on the Periodic Table. Students have previous experience with mixtures in Grade 5. Grade 6 furthers their understanding by investigating the different types of mixtures. Subsequent grades will learn about compounds. In Grade 6, students compare the density of substances relative to fluids and identify evidence of chemical changes.	*(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.*
(C) Force, motion, and energy. Students investigate the relationship between force and motion using a variety of means, including calculations and measurements through the study of Newton's Third Law of Motion. Subsequent grades will study force and motion through Newton's First and Second Laws of Motion. Energy occurs as either potential or kinetic energy. Potential energy can take several forms, including gravitational, elastic, and chemical energy. Energy is conserved throughout systems by changing from one form to another and transfers through waves.	*(B) Matter and energy.*
	(i) Matter can be classified as elements, compounds, or mixtures. Students have already had experience with mixtures in Grade 5, so Grade 6 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, formulas. Subsequent grades will learn about the differences at the molecular and atomic level.
(D) Earth and space. Cycles within Sun, Earth, and Moon systems are studied as students learn about seasons and tides. Students identify that the Earth is divided into spheres and examine the processes within and organization of the geosphere. Researching the advantages and disadvantages of short- and long-term uses of resources enables informed decision making about resource management.	*(ii) Elements are classified as metals, nonmetals, and metalloids based on their physical properties. The elements are divided into three groups on the Periodic Table. Each different substance usually has a different density, so density can be used as an identifying property. Therefore, calculating density aids classification of substances.*
(E) Organisms and environments. All living organisms are made up of smaller units called cells. Ecosystems are organized into communities, populations, and organisms. Students compare and contrast variations within organisms and how they impact survival. Students examine relationships and interactions between organisms, biotic factors, and abiotic factors in an ecosystem.	

2021 Introduction *(continued)*	***2017 Introduction***
(2) Nature of science. Science, as defined by the National Academy of Sciences, 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 currently scientifically testable. (3) Scientific observations, inferences, hypotheses, and theories. Students are expected to know that: (A) observations are active acquisition of either qualitative or quantitative information from a primary source through the senses; (B) inferences are conclusions reached on the basis of observations or reasoning supported by relevant evidence; (C) 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 are incorporated into theories; and (D) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed. (4) Science and social ethics. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students distinguish between scientific decision-making practices and ethical and social decisions that involve science. (5) Recurring themes and concepts. Science consists of recurring themes and making connections between overarching concepts. Recurring themes include structure and function, systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Models have limitations but provide a tool for understanding the ideas presented. Students analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment. (6) Statements containing the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.	*(iii) Energy resources are available on a renewable or nonrenewable 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.* *(D) Earth and space. The focus of this strand is on introducing Earth's processes. Students should develop an understanding of Earth as part of our solar system. The topics include organization of our solar system, the role of gravity, and space exploration.* *(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.* *(2) 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.* *(3) 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.* *(4) Statements containing the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.*

2021	2017
Scientific and Engineering Practices	***Scientific investigation and reasoning***
(1) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:	***(1) Scientific investigation and reasoning. The student, for at least 40% of instructional time, conducts laboratory and field investigations following safety procedures and environmentally appropriate and ethical practices. The student is expected to:***
(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	*(2)(A) plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology;*
(B) use scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	*(2)(B) design and implement experimental investigations by making observations, asking well defined questions, formulating testable hypotheses, and using appropriate equipment and technology;*
(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;	*(1)(A) demonstrate safe practices during laboratory and field investigations as outlined in Texas Education Agency-approved safety standards; and* *(4)(B) 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.*
(D) use appropriate tools such as graduated cylinders, metric rulers, periodic tables, balances, scales, thermometers, temperature probes, laboratory ware, timing devices, pH indicators, hot plates, models, microscopes, slides, life science models, petri dishes, dissecting kits, magnets, spring scales or force sensors, tools that model wave behavior, satellite images, hand lenses, and lab notebooks or journals;	*(4)(A) use appropriate tools, including journals/notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, balances, microscopes, thermometers, calculators, computers, timing devices, and other necessary equipment to collect, record, and analyze information; and*
(E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;	*(2)(C) collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers;*
(F) construct appropriate tables, graphs, maps, and charts using repeated trials and means to organize data;	*(2)(D) construct tables and graphs, using repeated trials and means, to organize data and identify patterns; and*
(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	*(3)(B) use models to represent aspects of the natural world such as a model of Earth's layers;*
(H) distinguish between scientific hypotheses, theories, and laws.	**NEW**
(2) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:	***(2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and field investigations. The student is expected to:***
(A) identify advantages and limitations of models such as their size, properties, and materials;	*(3)(C) identify advantages and limitations of models such as size, scale, properties, and materials; and*
(B) analyze data by identifying any significant descriptive statistical features, patterns, sources of error, or limitations;	*(2)(E)* ***analyze data*** *to formulate reasonable explanations, communicate valid conclusions supported by the data, and* ***predict trends****.*
(C) use mathematical calculations to assess quantitative relationships in data; and	
(D) evaluate experimental and engineering designs.	**NEW**

2021	*2017*
(3) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:	***(3) Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to:***
(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;	*(2)(E) analyze data **to formulate reasonable explanations**, communicate valid conclusions supported by the data, and predict trends.*
(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	*(2)(E) analyze data to formulate reasonable explanations, **communicate valid conclusions supported by the data**, and predict trends.*
(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.	*(3)(A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;*
(4) The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:	***(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:***
(A) relate the impact of past and current research on scientific thought and society, including the process of science, cost-benefit analysis, and contributions of diverse scientists as related to the content;	*(3)(D) relate the impact of research on scientific thought and society, including the history of science and contributions of scientists as related to the content.*
(B) make informed decisions by evaluating evidence from multiple appropriate sources to assess the credibility, accuracy, cost-effectiveness, and methods used; and	*(3)(A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;*
(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field to investigate STEM careers.	**NEW**

Recurring Themes and Concepts	
(5) The student understands that recurring themes and concepts provide a framework for making connections across disciplines. The student is expected to:	**NEW**
(A) identify and apply patterns to understand and connect scientific phenomena or to design solutions;	**NEW**
(B) identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems;	
(C) analyze how differences in scale, proportion, or quantity affect a system's structure or performance;	
(D) examine and model the parts of a system and their interdependence in the function of the system;	
(E) analyze and explain how energy flows and matter cycles through systems and how energy and matter are conserved through a variety of systems;	
(F) analyze and explain the complementary relationship between the structure and function of objects, organisms, and systems; and	
(G) analyze and explain how factors or conditions impact stability and change in objects, organisms, and systems.	

2021	*2017*
Matter and energy.	***Matter and energy.***
(6) The student knows that matter is made of atoms, can be classified according to its properties, and can undergo changes. The student is expected to:	***(5) The student knows the differences between elements and compounds. The student is expected to:*** ***(6) The student knows matter has physical properties that can be used for classification. The student is expected to:***
(A) compare solids, liquids, and gases in terms of their structure, shape, volume, and kinetic energy of atoms and molecules;	**NEW**
(B) investigate the physical properties of matter to distinguish between pure substances, homogeneous mixtures (solutions), and heterogeneous mixtures;	**NEW**
(C) identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life;	*(6)(6)(A) compare metals, nonmetals, and metalloids using physical properties such as luster, conductivity, or malleability;*
(D) compare the density of substances relative to various fluids; and	*(6)(6)(B) calculate density to identify an unknown substance; and*
(E) identify the formation of a new substance by using the evidence of a possible chemical change, including production of a gas, change in thermal energy, production of a precipitate, and color change.	*(6)(5)(C) identify the formation of a new substance by using the evidence of a possible chemical change such as production of a gas, change in temperature, production of a precipitate, or color change.*
	REMOVED *(6)(5)(A) know that an element is a pure substance represented by a chemical symbol and that a compound is a pure substance represented by a chemical formula;* *(6)(5)(B) recognize that a limited number of the many known elements comprise the largest portion of solid Earth, living matter, oceans, and the atmosphere; and* *(6)(6)(C) test the physical properties of minerals, including hardness, color, luster, and streak.*
	REMOVED ***(6)(7) Matter and energy. The student knows that some of Earth's energy resources are available on a nearly perpetual basis, while others can be renewed over a relatively short period of time. Some energy resources, once depleted, are essentially nonrenewable. The student is expected to research and discuss the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources.***

2021	*2017*
Force, motion, and energy.	***Force, motion, and energy.***
(7) The student knows the nature of forces and their role in systems that experience stability or change. The student is expected to:	***(8) The student knows force and motion are related to potential and kinetic energy. The student is expected to:***
(A) identify and explain how forces act on objects, including gravity, friction, magnetism, applied forces, and normal forces, using real-world applications;	**NEW**
(B) calculate the net force on an object in a horizontal or vertical direction using diagrams and determine if the forces are balanced or unbalanced; and.	**NEW**
(C) identify simultaneous force pairs that are equal in magnitude and opposite in direction that result from the interactions between objects using Newton's Third Law of Motion.	**NEW**
	MOVED TO GRADE 7 *(C) calculate average speed using distance and time measurements;* *(D) measure and graph changes in motion; and*
	REMOVED *(B) identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces; [acceleration is introduced in new (8)(7)(A)]* *(E) investigate how inclined planes can be used to change the amount of force to move an object.*
(8) The student knows that the total energy in systems is conserved through energy transfers and transformations. The student is expected to:	***(9) The student knows that the Law of Conservation of Energy states that energy can neither be created nor destroyed, it just changes form. The student is expected to:***
(A) compare and contrast gravitational, elastic, and chemical potential energies with kinetic energy;	*(6)(8)(A) compare and contrast potential and kinetic energy;*
(B) describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, or photosynthesis; and	*(6)(9)(C) demonstrate energy transformations such as energy in a flashlight battery changes from chemical energy to electrical energy to light energy.*
(C) explain how energy is transferred through transverse and longitudinal waves.	**NEW**
	MOVED TO GRADE 7 *(6)(9)(A) investigate methods of thermal energy transfer, including conduction, convection, and radiation;* *(6)(9)(B) verify through investigations that thermal energy moves in a predictable pattern from warmer to cooler until all the substances attain the same temperature such as an ice cube melting; and*

2021	2017
Earth and space.	***Earth and Space.***
(9) The student models the cyclical movements of the Sun, Earth, and Moon and describes their effects. The student is expected to:	***(11) The student understands the organization of our solar system and the relationships among the various bodies that comprise it. The student is expected to:***
(A) model and illustrate how the tilted Earth revolves around the Sun, causing changes in seasons; and	***MOVED FROM GRADE 8***
(B) describe and predict how the positions of the Earth, Sun, and Moon cause daily, spring, and neap cycles of ocean tides due to gravitational forces.	***MOVED FROM GRADE 8***
	MOVED TO GRADE 7 *(6)(11)(A) describe the physical properties, locations, and movements of the Sun, planets, moons, meteors, asteroids, and comets;* *(6)(11)(B) understand that gravity is the force that governs the motion of our solar system; and*
	REMOVED *(6)(11)(C) describe the history and future of space exploration, including the types of equipment and transportation needed for space travel.*
(10) The student understands the rock cycle and the structure of Earth. The student is expected to:	***(10) The student understands the structure of Earth, the rock cycle, and plate tectonics. The student is expected to***
(A) differentiate between the biosphere, hydrosphere, atmosphere, and geosphere and identify components of each system;	**NEW**
(B) model and describe the layers of Earth, including the inner core, outer core, mantle, and crust; and	*(6)(10)(A) build a model to illustrate the compositional and mechanical layers of Earth, including the inner core, outer core, mantle, crust, asthenosphere, and lithosphere;*
(C) describe how metamorphic, igneous, and sedimentary rocks form and change through geologic processes in the rock cycle.	*(6)(10)(B) classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation;*
	MOVED TO GRADE 7 *(6)(10)(D) describe how plate tectonics causes major geological events such as ocean basin formation, earthquakes, volcanic eruptions, and mountain building.*
	REMOVED *(6)(10)(C) identify the major tectonic plates, including Eurasian, African, Indo-Australian, Pacific, North American, and South American; and*
(11) Earth and space. The student understands how resources are managed. The student is expected to:	***(7)** Matter and energy. The student knows that some of Earth's energy resources are available on a nearly perpetual basis, while others can be renewed over a relatively short period of time. Some energy resources, once depleted, are essentially nonrenewable. The student is expected to*
(A) research and describe why resource management is important in reducing global energy poverty, malnutrition, and air and water pollution; and	**NEW**
(B) explain how conservation, increased efficiency, and technology can help manage air, water, soil, and energy resources.	***EXPANDED*** *(6)(7) research and discuss the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources.*

2021	*2017*
Organisms and environments.	***Organisms and environments.***
(12) The student knows that interdependence occurs between living systems and the environment. The student is expected to:	***(12) The student knows all organisms are classified into domains and kingdoms. Organisms within these taxonomic groups share similar characteristics that allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:***
(A) investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition;	***MOVED FROM GRADE 8*** *(8)(11)(A) investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as quantity of light, water, range of temperatures, or soil composition;*
(B) describe and give examples of predatory, competitive, and symbiotic relationships between organisms, including mutualism, parasitism, and commensalism; and	**NEW**
(C) describe the hierarchical organization of organism, population, and community within an ecosystem.	*(6)(12)(F) diagram the levels of organization within an ecosystem, including organism, population, community, and ecosystem.*
(13) The student knows that organisms have an organizational structure and variations can influence survival of populations. The student is expected to:	
(A) describe the historical development of cell theory and explain how organisms are composed of one or more cells, which come from pre-existing cells and are the basic unit of structure and function	*(6)(12)(A) understand that all organisms are composed of one or more cells;*
(B) identify and compare the basic characteristics of organisms, including prokaryotic and eukaryotic, unicellular and multicellular, and autotrophic and heterotrophic; and	*(6)(12)(B) recognize that the presence of a nucleus is a key factor used to determine whether a cell is prokaryotic or eukaryotic;* *(6)(12)(D) identify the basic characteristics of organisms, including prokaryotic or eukaryotic, unicellular or multicellular, autotrophic or heterotrophic, and mode of reproduction, that further classify them in the currently recognized kingdoms;*
(C) describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change.	***MOVED FROM GRADE 8*** *(8)(11)(B) explore how short- and long-term environmental changes affect organisms and traits in subsequent populations; and*
	REMOVED *(6)(12)(C) recognize that the broadest taxonomic classification of living organisms is divided into currently recognized domains;* *(6)(12)(E) describe biotic and abiotic parts of an ecosystem in which organisms interact; and* *[Integrated within other topics]*