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 8, the following concepts will be addressed in each strand. (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. (i) Scientific practices. Students ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models. (ii) Engineering practices. Students identify problems and design solutions using appropriate tools and models . (B) Matter and energy. Students make connections between elements, compounds, and mixtures that were introduced in prior grade levels. Students examine the properties of water, acids, and bases. In addition, students understand the basic concept of conservation of mass using chemical equations. (C) Force, motion, and energy. Students are introduced to Newton's Second Law of Motion and investigate how all three laws of motion act simultaneously within systems. Students understand that waves transfer energy and further explore the characteristics and applications of waves. (D) Earth and space. Students learn that stars and galaxies are part of the universe. In addition, students use data to research scientific theories of the origin of the universe. Students learn how interactions in solar, weather, and ocean systems create changes in weather patterns and climate. In addition, students understand that climate can be impacted by natural events and human activities. (E) Organisms and environments. Students identify the function of organelles. Traits are contained in genetic material that is found on genes within a chromosome from the parent. These traits influence the success of a species over time. Students explore how organisms and their populations respond to environmental changes, including those caused by human activities. (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.	*(1) 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 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.* *The strands for Grade 8 include the following.* *(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.* *(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. 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 to identify substances.* *(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. Mathematics is used to calculate speed using distance and time measurements.*

2021 Introduction *(continued)*	2017 Introduction
(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.	*(D) Earth and space. Students identify the role of natural events in altering Earth systems. Cycles within Sun, Earth, 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. In addition, students use data to research 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 and satellite views. Students learn how interactions in solar, weather, and ocean systems create changes in weather patterns and climate.* *(E) Organisms and environments. In studies of living systems, students explore the interdependence between these 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.* *(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, **weather maps**, 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;	
(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;	**NEW**
(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 understands that matter can be classified according to its properties and matter is conserved in chemical changes that occur within closed systems. The student is expected to:	***(5) The student knows that matter is composed of atoms and has chemical and physical properties. The student is expected to:***
(A) explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures	**NEW**
(B) use the periodic table to identify the atoms involved in chemical reactions;	**NEW**
(C) describe the properties of cohesion, adhesion, and surface tension in water and relate to observable phenomena such as the formation of droplets, transport in plants, and insects walking on water;	**NEW**
(D) compare and contrast the properties of acids and bases, including pH relative to water; and	**NEW**
(E) investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis.	*(8)(5)(E) investigate how evidence of chemical reactions indicates that new substances with different properties are formed and how that relates to the law of conservation of mass.*
	MOVED TO GRADE 7 *(8)(5)(D) recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts; and*
	REMOVED *(8)(5)(A) 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;* *(8)(5)(B) identify that protons determine an element's identity and valence electrons determine its chemical properties, including reactivity;* *(8)(5)(C) interpret the arrangement of the Periodic Table, including groups and periods, to explain how properties are used to classify elements;*

2021	2017
Force, motion, and energy.	***Force, motion, and energy.***
(7) The student understands the relationship between force and motion within systems. The student is expected to:	***(6) The student knows that there is a relationship between force, motion, and energy. The student is expected to:***
(A) calculate and analyze how the acceleration of an object is dependent upon the net force acting on the object and the mass of the object using Newton's Second Law of Motion; and	*(8)(6)(A) demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion;*
(B) investigate and describe how Newton's three laws of motion act simultaneously within systems such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.	*(8)(6)(C) investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.*
	MOVED TO GRADE 7 *(8)(6)(B) differentiate between speed, velocity, and acceleration; and*
Force, motion, and energy. **(8) The student knows how energy is transferred through waves. The student is expected to:**	**NEW**
(A) compare the characteristics of amplitude, frequency, and wavelength in transverse waves, including the electromagnetic spectrum; and	**NEW**
(B) explain the use of electromagnetic waves in applications such as radiation therapy, wireless technologies, fiber optics, microwaves, ultraviolet sterilization, astronomical observations, and X-rays.	*(8)(8)(C) identify how different wavelengths of the electromagnetic spectrum such as visible light and radio waves are used to gain information about components in the universe; and*

Earth and space	***Earth and space***
(9) The student describes the characteristics of the universe and the relative scale of its components. The student is expected to:	***(8) The student knows characteristics of the universe. The student is expected to:***
(A) describe the life cycle of stars and compare and classify stars using the Hertzsprung-Russell diagram;	*(8)(8)(A) describe components of the universe, including stars, nebulae, and galaxies, and use models such as the Hertzsprung-Russell diagram for classification;*
(B) categorize galaxies as spiral, elliptical, and irregular and locate Earth's solar system within the Milky Way galaxy; and	*(8)(8)(B) recognize that the Sun is a medium-sized star located in a spiral arm of the Milky Way galaxy and that the Sun is many thousands of times closer to Earth than any other star;*
(C) research and analyze scientific data used as evidence to develop scientific theories that describe the origin of the universe.	*(8)(8)(D) research how scientific data are used as evidence to develop scientific theories to describe the origin of the universe.*
	MOVED TO ANOTHER STRAND *(8)(8)(C) identify how different wavelengths of the electromagnetic spectrum such as visible light and radio waves are used to gain information about components in the universe; and*
	Earth and space
	(7) The student knows the effects resulting from cyclical movements of the Sun, Earth, and Moon. The student is expected to:
	MOVED TO GRADE 6 *(8)(7)(A) model and illustrate how the tilted Earth rotates on its axis, causing day and night, and revolves around the Sun, causing changes in seasons;* *(8)(7)(C) relate the positions of the Moon and Sun to their effect on ocean tides.*
	REMOVED *(8)(7)(B) demonstrate and predict the sequence of events in the lunar cycle; and*

2021	2017
Earth and space	***Earth and space***
(10) The student knows that interactions between Earth, ocean, and weather systems impact climate. The student is expected to:	***(10) The student knows that climatic interactions exist among Earth, ocean, and weather systems. The student is expected to:***
(A) describe how energy from the Sun, hydrosphere, and atmosphere interact and influence weather and climate;	*(8)(10)(A) recognize that the Sun provides the energy that drives convection within the atmosphere and oceans, producing winds;*
(B) identify global patterns of atmospheric movement and how they influence local weather; and	*(8)(10)(B) identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts; and*
(C) describe the interactions between ocean currents and air masses that produce tropical cyclones, including typhoons and hurricanes.	*(8)(10)(C) identify the role of the oceans in the formation of weather systems such as hurricanes.*
Earth and space	
(11) The student knows that natural events and human activity can impact global climate. The student is expected to:	**NEW**
(A) use scientific evidence to describe how natural events, including volcanic eruptions, meteor impacts, abrupt changes in ocean currents, and the release and absorption of greenhouse gases influence climate;	**NEW**
(B) use scientific evidence to describe how human activities, including the release of greenhouse gases, deforestation, and urbanization, can influence climate; and	**NEW**
(C) describe the carbon cycle.	**NEW**
	(8)(9) The student knows that natural events can impact Earth systems. The student is expected to:
	MOVED TO GRADE 7 *(8)(9)(A) describe the historical development of evidence that supports plate tectonic theory;* ***REMOVED; ADDRESSED IN GRADE 7*** *(8)(9)(B) relate plate tectonics to the formation of crustal features; and* ***REMOVED*** *(8)(9)(C) interpret topographic maps and satellite views to identify land and erosional features and predict how these features may be reshaped by weathering.*

2021	2017
Organisms and environments	***Organisms and environments***
(12) The student understands stability and change in populations and ecosystems. The student is expected to:	***(8)(11) The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:***
(A) explain how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems;	**NEW**
(B) describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity; and	***MOVED FROM GRADE 7*** *(7)(10)(C) observe, record, and describe the role of ecological succession such as in a microhabitat of a garden with weeds.*
(C) describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem.	***MOVED FROM GRADE 7*** *(7)(10)(B) describe how biodiversity contributes to the sustainability of an ecosystem; and*
	MOVED TO GRADE 6 *(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;* ***TOPIC ADDRESSED IN ANOTHER TEKS*** *(8)(11)(B) explore how short- and long-term environmental changes affect organisms and traits in subsequent populations; and* ***MOVED TO GRADE 7*** *(8)(11)(C) recognize human dependence on ocean systems and explain how human activities such as runoff, artificial reefs, or use of resources have modified these systems.*
Organisms and environments	***NEW TO GRADE 8***
(13) The student knows how cell functions support the health of an organism and how adaptation and variation relate to survival. The student is expected to:	
(A) identify the function of the cell membrane, cell wall, nucleus, ribosomes, cytoplasm, mitochondria, chloroplasts, and vacuoles in plant or animal cells;	***MOVED FROM GRADE 7*** *(7)(12)(D) differentiate between structure and function in plant and animal cell organelles, including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole;*
(B) describe the function of genes within chromosomes in determining inherited traits of offspring; and	***MOVED FROM GRADE 7*** *(7)(14)(C) recognize that inherited traits of individuals are governed in the genetic material found in the genes within chromosomes in the nucleus.*
(C) describe how variations of traits within a population lead to structural, behavioral, and physiological adaptations that influence the likelihood of survival and reproductive success of a species over generations.	***MOVED FROM GRADE 7*** *(7)(11)(B) explain variation within a population or species by comparing external features, behaviors, or physiology of organisms that enhance their survival such as migration, hibernation, or storage of food in a bulb; and*