Approved for second reading and final adoption by the State Board of Education on November 19, 2021.

Not yet filed as adopted with the Texas Register; subject to technical edits by Texas Register editors.

Text of Adopted New 19 TAC

Chapter 112. Texas Essential Knowledge and Skills for Science

Subchapter B. Middle School

§112.25. Implementation of Texas Essential Knowledge and Skills for Science, Middle School, Adopted 2021.

(a) The provisions of §§112.26-112.28 of this chapter shall be implemented by school districts beginning with the 2021-2022 school year.

(b) Students identify problems and design solutions using engineering practices.

appropriate tools and models.

(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

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.

(b) Knowledge and skills.

(1) Scientific and engineering practices. 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:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) use scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(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, [~~and~~] hand lenses , and lab notebooks or journals ;

(E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;

(F) construct appropriate tables, graphs, maps, and charts using repeated trials and means to organize data;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(2) Scientific and engineering practices. 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:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying any significant descriptive statistical features, patterns, sources of error, or limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(3) Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(4) Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. 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;

(B) make informed decisions by evaluating evidence from multiple appropriate sources to assess the credibility, accuracy, cost-effectiveness, and methods used; and

(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.

(5) Recurring themes and concepts. The student understands that recurring themes and concepts provide a framework for making connections across disciplines. The student is expected to:

(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;

(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.

(6) Matter and energy. 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:

(A) compare solids, liquids, and gases in terms of their structure, shape, volume, and kinetic energy of atoms and molecules;

(B) investigate the physical properties of matter to distinguish between pure substances, homogeneous mixtures (solutions), and heterogeneous mixtures;

(C) identify [~~classify~~] elements on the periodic table as metals, nonmetals, [~~and~~] metalloids , and rare Earth elements based on [~~using~~] their physical properties and importance to modern life ;

(D) compare the density of substances relative to various fluids; 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.

(A) identify and explain how forces act on objects, including gravity, friction, magnetism, applied forces, and normal forces, using real-world applications;

(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

(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.

(8) Force, motion, and energy. The student knows that the total energy in systems is conserved through energy transfers and transformations. The student is expected to:

(A) compare and contrast gravitational, elastic, and chemical potential energies with 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

(C) explain how energy is transferred through transverse and longitudinal waves.

(9) Earth and space. The student models the cyclical movements of the Sun, Earth, and Moon and describes their effects. The student is expected to:

(A) model and illustrate how the tilted Earth revolves around the Sun, causing changes in seasons; and

(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.

(10) Earth and space. The student understands the rock cycle and the structure of Earth. The student is expected to:

(A) differentiate between the biosphere, hydrosphere, atmosphere, and geosphere and identify components of each system;

(B) model and describe the layers of Earth, including the inner core, outer core, mantle, and crust; and

(C) describe how metamorphic, igneous, and sedimentary rocks form and change through geologic processes in the rock cycle.

(11) Earth and space. The student understands how resources are managed. The student is expected to : [~~research and describe why resource management is important and how conservation, increased efficiency, and technology can help manage air, water, soil, and energy resources.~~]

(A) research and describe why resource management is important in reducing global energy, poverty, malnutrition, and air and water pollution, and

(B) explain how conservation, increased efficiency, and technology can help manage air, water, soil, and energy resources.

(12) Organisms and environments. The student knows that interdependence occurs between living systems and the environment. The student is expected to:

(A) investigate how organisms and populationso74.1 (en)-4 (er)9.7 1J0 Tc 096 144 190.32ieti Tyeirst, how ors.g

Approved for second reading and final adoption by the State Board of Education on November 19, 2021.

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) use scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(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, [~~and~~] hand lenses , and lab notebooks or journals ;

(E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;

(F)

(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.

(5) Recurring themes and concepts. The student understands that recurring themes and concepts provide a framework for making connections across disciplines. The student is expected to:

(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 quarefEMC 7luMCID 2 dquarefEMC 7luMCID 2 dquaref

(B) investigate how thermal energy moves in a predictable pattern from warmer to cooler until all substances within the system reach thermal equilibrium; and

(C) explain the relationship between temperature and the kinetic energy of the particles within a substance.

(9) Earth and space. The student understands the patterns of movement, organization, and characteristics of components of our solar system. The student is expected to:

(A) describe the physical properties, locations, and movements of the Sun, planets, moons, meteors, asteroids, comets, Kuiper belt, and Oort cloud;

(B) describe how gravity governs motion within Earth's solar system; and

(C) analyze the characteristics of Earth that allow life to exist such as the proximity of the Sun, presence of water, and composition of the atmosphere.

(10) Earth and space. The student understands the causes and effects of plate tectonics. The student is expected to:

(A) describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition; and

(B) describe how plate tectonics causes ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including supervolcanoes and hot spots.

(11) Earth and space. The student understands how human activity can impact the hydrosphere. The student is expected to:

(A) analyze the beneficial and harmful influences of human activity on groundwater and surface water in a watershed; and

(B) describe human dependence and influence on ocean systems and explain how human activities impact these systems.

(12) Organisms and environments. The student understands that ecosystems are dependent upon the cycling of matter and the flow of energy. The student is expected to:

(A) diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids; and

(B) describe how ecosystems are sustained by the continuous flow of energy and the recycling of matter and nutrients within the biosphere.

(13) Organisms and environments. The student knows how systems are organized and function to support the health of an organism and how traits are inherited. The student is expected to:

(A) identify and model the main functions of the systems of the human organism, including

(B) describe the characteristics of the recognized kingdoms and their importance in ecosystems such as bacteria aiding digestion or fungi decomposing organic matter.

§112.28. Grade 8, Adopted 2021.

(a) 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 [include] descriptive investigations,

(3) Scientific observations, inferences, hypotheses , and theories. Students are expected to know that:

Approved for second reading and final adoption by the State Board of Education on November 19, 2021.

Not yet filed as adopted with the26.1297 .48 ref66.12 738.15.4 veconleo3 11t E; p16[28 11t t.

Approved for second reading and final adoption by the State Board of Education on November 19, 2021.