Course Syllabus: Teaching Science in Elementary School

College of Education
EDUC-4053-101
Fall 2023

Contact Information

Instructor: **Dr. Timothy Hinchman**
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Preferred Form of Communication**:** Email

Instructor Response Policy

Communication Response Time: Within 24 hours Monday- Friday, Within 48 hours on the weekend.

Textbook & Instructional Materials

One of the following textbook is **recommended** for this course:

- Contant, T. L., Tweed, A. L., Bass, J. E., & Carin, A. A. (2018). *Teaching science through inquiry based instruction*. New York: Pearson.
- Peters, J. M., & Stout, D. L. (2011). *Science in elementary education: Methods, concepts, and inquiries*. Boston: Pearson Education.

Course Description

This field-based course focuses on elementary school science pedagogy with emphasis on instructional strategies and models, the use of technology in the learning/teaching process, effective practices, professionalism, curriculum, and lesson design. Different teaching strategies include: appropriate use of creative approaches to the learning/teaching process, cooperative learning, direct instruction, inquiry, concept attainment, etc. An important component of this field-based block of classes is the course time spent in active participation in field (classroom) experiences.

Course Objectives/Learning Outcomes/Course Competencies

1. TEXES EC-6 Core Subjects Standard Competencies:

- **The science teacher manages classroom, field and laboratory activities to ensure the safety of all students and the ethical care and treatment of organisms and specimens.**
- **The science teacher understands the correct use of tools, materials, equipment and technologies.**

- **The science teacher understands the process of scientific inquiry and its role in science instruction.**
- **The science teacher has theoretical and practical knowledge about teaching science and about how students learn science.**
- **The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.**
- **The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in physical science.**
- **The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science.**
- **The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in Earth and Space science.**

See Appendix A for a complete list of standards/competencies (if applicable) and Appendix B for assignment/standards alignment matrix

Study Hours and Tutoring Assistance

Located in Moffett Library, The Office of Tutoring and Academic Support Programs (TASP) offers a variety of resources designed to help students meet the demands of the college classroom. Their mission is to provide the necessary support to help students achieve academic success. This can be completing in-person and through distance learning. MSU-Texas-Tutoring

Student Handbook

Refer to: Student Handbook-2023-24

Academic Misconduct Policy & Procedures

Academic Dishonesty: Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individual's to whom credit is given). Additional guidelines on procedures in these matters may be found in the Office of Student Conduct.

Office of Student Conduct

Grading/Assessment

Course Grade- List all graded assignments (for all certification courses at least one assessed performance-based assignment is required) with their point value and or percentage of total grade. Letter Grade Scale indicate the overall points or % to letter grade scale for example 1270 to 1137=A.

Table 1: Points allocated to each assignment – You can change table information but will need to use table tool if you add more columns or rows. Do not leave any blanks in table. Follow instructions listed under Course Schedule.

Assignments	Points
Writing Assignments	525
Classroom Observation, Lesson Plan, and Reflection	250

Assignments	Points
Performance Assessments	225
Total Points	1000

Table 2: Total points for final grade.

Grade	Points
A	890-1000
B	790 to 889
C	690 to 789
D	590 to 689
F	Less than 590

Homework

Each module will have a written assignment that will assess your ability to synthesize and apply the module's learning goal. Unless noted, each written assignment will use a constructed response formatting. Almost all constructed responses can follow the same basic structure with variations based on the number of paragraphs or specific requirement. An outline is provided in Module 1 to provide the student with a starting point and to assist in organizing thoughts for a better flowing paper.

Key Assessments

The performance assessment for this course is a portfolio consisting of the foundations in inquiry-based instruction. Students will research, identify, and model instructional practices that are promote inquiry-based instruction in a mainstream science classroom setting. This is a requirement for course credit.

All grade levels are examined within the TEKs to determine what knowledge, skills, and abilities are addressed at the different grade levels. Students are to determine how the standards are connected.

Students will identify the basic ideas behind constructivism. They will explore several resources on constructivism and methods to scaffold learning in a science classroom.

Students will then dive deeper into inquiry-based instructional practices. They will explore research-based strategies and practices that acknowledge and respect diversity in the science classroom. They will examine teachers using strategies for teaching culturally diverse students, culturally responsive pedagogy, and read research regarding this practice.

Students will explore the content areas necessary to teach science. They will first explore the techniques and strategies of teaching history. They will next explore the techniques and strategies of teaching physical science, life science, and earth/space science.

Students will write an original inquiry-based lesson plan. They will plan an instructional unit which demonstrates their knowledge and skills in the following areas: Learner Development, Learner Differences, Learning Environment, Content Knowledge, Application of Content, Assessment, Planning for Instruction, Instructional Strategies, and Professional Learning and Ethical Practice (West College of Education Handbook of Policies and Clinical Experiences; InTASC Standards). ***The student must achieve a Developing or Above on all criteria- failure to achieve a Developing or above will result in teaching a mini-lesson that specifically addresses the deficit(s)***.

Late Work

Because all assignments are available and submitted online, “make up” work should not be an issue. Late work will not be accepted unless a written medical or equally extenuating circumstance is provided. The D2L Dropbox will close at 11:59pm on the due date.

Instructor Class Policies

Plagiarism is a serious academic offense and goes against the principles of integrity and originality that are essential in an educational setting. In this course, we uphold a zero-tolerance policy towards plagiarism and the use of AI-generated content without proper attribution. It is crucial that all students understand and adhere to this policy to maintain the academic integrity of the course.

Plagiarism is the act of presenting someone else's work, ideas, or intellectual property as one's own without appropriate acknowledgment. This includes, but is not limited to, copying and pasting from online sources, using another student's work, paraphrasing without proper citation, and using AI-generated content without proper attribution.

The use of AI-generated content is not permitted in this course, unless explicitly specified by the instructor. If the use of AI-generated content is allowed for specific assignments, students must disclose this fact and provide appropriate attribution to the AI tool used.

Self-plagiarism refers to submitting work for credit that is the same or substantially similar to work prepared or submitted for another course, without appropriate citation. This includes reusing previous assignments, papers, presentations, or other submissions without instructor approval. Self-plagiarism gives the impression of original work, when in fact the content has already been submitted for assessment elsewhere.

Students should be aware that turning in the same or similar papers for multiple classes violates academic integrity, unless expressly authorized by the instructor. To avoid self-plagiarism, communicate openly with your instructor about building on existing work or repurposing prior submissions. Provide proper citations for any previous work referenced. Unless the instructor indicates otherwise, all assignments submitted for this course must be newly prepared by you and you alone for this specific class.

Any instance of plagiarism, AI generated content, and/or self-plagiarism will be subject to disciplinary action in accordance with the Academic Integrity Policy outlined in the Student Handbook-2023-24.

By enrolling in this course, you acknowledge and agree to comply with this plagiarism and AI-generated content policy, understanding the importance of academic integrity in our learning community.

Important Dates

Refer to: Drops, Withdrawals & Void

Desire-to-Learn (D2L)

Extensive use of the MSU D2L program is a part of this course. Each student is expected to be familiar with this program as it provides a primary source of communication regarding assignments, examination materials, and general course information. You can log into D2L through the MSU Homepage. If you experience difficulties, please contact the technicians listed for the program or contact your instructor.

Attendance

WCOE Face to Face Policy: Professionals are dependable, reliable, and responsible. Therefore, candidates are expected to be on time and in attendance at every class, and to stay for the entire class. Tardiness, leaving early, and excessive absences (3) are considered evidence of lack of dependability, and are taken seriously. Candidates will receive a grade of F on the third offense. If a candidate is taking 'blocked' courses that are taught at a Professional Development School, requiring field experience, the candidate will be dropped with an F from those classes as well. Attendance and class activity participation grades will be recorded in the Dispositions category.

Computer Requirements

Taking an online or hybrid class requires you to have access to a computer (with Internet access) to complete and upload your assignments. It is your responsibility to have (or have access to) a working computer in this class. ***Assignments and tests are due by the due date, and personal computer technical difficulties will not be considered reason for the instructor to allow students extra time to submit assignments, tests, or discussion postings.*** Computers are available on campus in various areas of the buildings as well as the Academic Success Center. **Your computer being down is not an excuse for missing a deadline.** There are many places to access your class. D2L can be accessed from any computer in the world that is connected to the internet. Contact your instructor immediately upon having computer trouble. If you have technical difficulties in the course, there is also a student helpdesk available to you. The college cannot work directly on student computers due to both liability and resource limitations however they are able to help you get connected to our online services. For help, log into D2L**.**

Change of Schedule

A student dropping a course (but not withdrawing from the University) within the first 12 class days of a regular semester or the first four class days of a summer semester is eligible for a 100% refund of applicable tuition and fees. Dates are published in the Schedule of Classes each semester.

Refund and Repayment Policy

A student who withdraws or is administratively withdrawn from Midwestern State University (MSU) may be eligible to receive a refund for all or a portion of the tuition, fees and room/board charges that were paid to MSU for the semester. HOWEVER, if the student received financial aid (federal/state/institutional grants, loans and/or scholarships), all or a portion of the refund may be returned to the financial aid programs. As described below, two formulas (federal and state) exists in determining the amount of the refund. (Examples of each refund calculation will be made available upon request).

Services for Students with Disabilities

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Midwestern State University endeavors to make reasonable accommodations to ensure equal opportunity for qualified persons with disabilities to participate in all educational, social, and recreational programs and activities. After notification of acceptance, students requiring accommodations should make application for such assistance through Disability Support Services, located in the Clark Student Center, Room 168, (940) 397-4140. Current documentation of a disability will be required in order to provide appropriate services, and each request will be individually reviewed. For more details, please go to Disability Support Services.

College Policies

Campus Carry Rules/Policies

Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes has prohibited. The new Constitutional Carry law does not change this process. Concealed carry still requires a License to Carry permit, and openly carrying handguns is not allowed on college campuses. For more information, visit Campus Carry.

Active Shooter

The safety and security of our campus is the responsibility of everyone in our community. Each of us has an obligation to be prepared to appropriately respond to threats to our campus, such as an active aggressor. Please review the information provided by MSU Police Department regarding the options and strategies we can all use to stay safe during difficult situations. For more information, visit Safety / Emergency Procedures. Students are encouraged to watch the video entitled "*Run. Hide. Fight.*" which may be electronically accessed via the University police department's webpage: *"Run. Hide. Fight."*

Smoking/Tobacco Policy

College policy strictly prohibits the use of tobacco products in any building owned or operated by MSU TEXAS Adult students may smoke only in the outside designated-smoking areas at each location.

Alcohol and Drug Policy

To comply with the Drug Free Schools and Communities Act of 1989 and subsequent amendments, students and employees of Midwestern State are informed that strictly enforced policies are in place which prohibits the unlawful possession, use or distribution of any illicit drugs, including alcohol, on university property or as part of any university-sponsored activity. Students and employees are also subject to all applicable legal sanctions under local, state and federal law for any offenses involving illicit drugs on University property or at University-sponsored activities.

Grade Appeal Process

Update as needed. Students who wish to appeal a grade should consult the Midwestern State University MSU Catalog

Notice

Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor.

Course Schedule:

Course outline with assigned course topics, assigned readings, and assignments are required for certification courses.

Use this area to tell the students what is scheduled for the duration of the class. Please note the disclaimer above and include that with your schedule. There can be no blanks in your table. You must put some kind of text in all the blanks such as: N/A or No content. (Use the same color text as background if you want to keep it uncluttered for your sighted learners). Tables must not extend to another page (cannot be wider than the page). If it is going to extend to next page, you will need to create another table with heading. You can use a dash (-) or "to" between dates, avoid using the @ sign unless in web address.

Course Schedule

Week or Module	Activities/Assignments/Exams	Due Date All Assignments are due 11:30pm on due date
Module 1	Module 1: Nature of Science and Science Education Writing Assignment #1	10/27/2023
Module 2	Module 2: Constructivism and Science Teaching Writing Assignment #1	11/32023
Module 3	Module 3 Assignment #1: Science TEKS Introduction Statement Graphic Organizer Module 3 Assignment #2: TEKs T-Chart	11/10/2023 11/10/2023
Module 4	Module 5 -Teaching Physical Science for Understanding Assignment Performance Assessment- Physical Science	11/17/2023 11/21/2023
Module 5	Module 6 -Teaching Life Science for Understanding Assignment Performance Assessment- Life Science	12/1/2023 12/3/2023
Module 6	Module 7: Teaching Earth Space Science for Understanding Assignment Performance Assessment- Earth-Space	12/8/2023 12/10/2023
Module 7	5E Lesson Plan Classroom Observation Grade Observation Reflection	Dates will vary based on Observation Schedule

Note: Tables cannot continue to the next page. If the table continues to the next page, you will need to make a new table using the table tools for every page. Remember to add Alt Text.

References/Scientifically-Based Research/Additional Readings:

Required scientifically-based references/evidence for certification courses and applicable standards and professional associations.

- Atzori, P. (1996). Discovering CyberAntarctic: A Conversation with Knowbotics Research. *CTHEORY*. Available at: http://www.ctheory.com/

- **Barzilai, S., Zohar, A. R., & Mor-Hagani, S. (2018). Promoting integration of multiple texts: A review of instructional approaches and practices. *Educational psychology review*, *30*(3), 973-999.**
- Brown, J.S., Collins, A. & Duguid, S. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.
- Derry, S. (1992). Beyond symbolic processing: Expanding horizons in educational psychology. *Journal of Educational Psychology*, 413-418.
- Derry, S. (1996). Cognitive Schema Theory in the Constructivist Debate. In *Educational Psychologist*, 31(3/4), 163-174.
- Driver, R., Aasoko, H., Leach, J., Mortimer, E., Scott, P. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher* , 23 (7), 5-12.
- **Dusenbury, L., & Weissberg, R. P. (2017). Social emotional learning in elementary school: Preparation for success. *The Education Digest*, *83*(1), 36.**
- Ernest, P. (1995). The one and the many. In L. Steffe & J. Gale (Eds.). *Constructivism in education* (pp.459-486). New Jersey: Lawrence Erlbaum Associates,Inc.
- Fosnot, C. (1996). Constructivism: A Psychological theory of learning. In C. Fosnot (Ed.) *Constructivism: Theory, perspectives, and practice*, (pp.8-33). New York: Teachers College Press.
- **Graham, S., Kiuhara, S. A., & MacKay, M. (2020). The effects of writing on learning in science, social studies, and mathematics: A meta-analysis. *Review of Educational Research*, *90*(2), 179-226.**
- **Grant, S. G., Swan, K., & Lee, J. (2017). *Inquiry-based practice in social studies education: Understanding the inquiry design model*. Taylor & Francis.**
- **Grant, S. G., & VanSledright, B. A. (2020). *Elementary social studies: Constructing a powerful approach to teaching and learning*. Routledge.**
- Gergen, K. (1995). Social construction and the educational process. In L. Steffe & J. Gale (Eds.). *Constructivism in education*, (pp.17-39). New Jersey: Lawrence Erlbaum Associates,Inc.
- Hanley, Susan (1994). On Constructivism. Available at: http://www.inform.umd.edu/UMS+State/UMD-Projects/MCTP/Essays/Constructivism.txt
- **Levstik, L. S., & Barton, K. C. (2018). *Researching history education: Theory, method, and context*. Routledge.**
- **Mohammed, S. H., & Kinyo, L. (2020). The role of constructivism in the enhancement of social studies education. *Journal of Critical Reviews*, *7*(7), 249-256.**
- von Glasersfeld, E. (1996).Introduction: Aspects of constructivism. In C. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice*, (pp.3-7). New York: Teachers College Press.
- Vygotsky, L. (1978). *Mind in Society: The Development of Higher Psychological Processes* MA: Harvard University Press.
- Wilson, B. & Cole, P. (1991) A review of cognitive teaching models. *Educational Technology Research and Development*, 39(4), 47-64.
- Wilson, B. (1997). The postmodern paradigm. In C. R. Dills and A. Romiszowski (Eds.), *Instructional development paradigms*. Englewood Cliffs NJ: Educational Technology Publications. Also available at: http://www.cudenver.edu/~bwilson/postmodern.html

Appendix A: Standards/Competencies

Course Objectives or Student Learning Outcomes	Standard or Competency
Module 1 Learning Goal 1: The student understands that science involves observing, analyzing, and investigating the natural world. **Module 1 Learning Goal 2:** The student can explain how science educational initiatives emphasize student-centered inquiry and conceptual understanding.	• *The teacher understands how science impacts the daily lives of students and interacts with and influences personal and societal decisions.* o Understands that decisions about the use of science are based on factors such as ethical standards, economics and personal and societal needs. o Applies scientific principles to analyze the advantages of, disadvantages of or alternatives to a given decision or course of action. o Applies scientific principles and processes to analyze factors that influence personal choices concerning fitness and health, including physiological and psychological effects and risks associated with the use of substances and substance abuse. o Understands concepts, characteristics and issues related to changes in populations and human population growth. o Identifies and understands the types and uses of natural resources and the effects of human consumption on the renewal and depletion of resources. o Understands the role science and scientists can play in helping resolve personal, societal and global challenges.
Module 2 Learning Goal 1: The student understands that the TEKs are vertically aligned to increase conceptual understanding from Pre-K to 6th grade. **Module 2 Learning Goal 2:** The student can describe their strengths and weaknesses in each content strand of the Pre-K to 6th grade TEKs.	• The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in physical science. • The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science. • The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in Earth and Space science.
Module 3 Learning Goal 1: The student can identify the basic structure of constructivism **Module 3 Learning Goal 2:** The student will be able	• *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.* o Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. o Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet

Course Objectives or Student Learning Outcomes	Standard or Competency
to select the science concepts, procedures, and skills that they will use during inquiry-based instruction.	the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners. o Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. o Understands common misconceptions in science and has effective ways to address those misconceptions. o Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes. o Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding. o Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. o Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science.
Module 4 Learning Goal 1: The student will learn the foundations of inquiry-based instruction **Module 4 Learning Goal 2:** The student will create a positive classroom environment where learning is rigorous, yet engaging, trust is evident and everyone believes that they can learn. **Module 4 Learning Goal 3:** The student will understand that a positive classroom environment is essential in promoting active inquiry-based learning.	• *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.* o Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. o Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners. o Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. o Understands common misconceptions in science and has effective ways to address those misconceptions. o Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes.

Course Objectives or Student Learning Outcomes	Standard or Competency
	○ Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding. ○ Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. ○ Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science.
Module 5 Learning Goal 1: The student will lead their class to a deeper understanding of physical science concepts using various approaches. **Module 5 Learning Goal 2:** The student will be able to change their classroom alternative conceptions and misconceptions of science concepts through various instructional practices.	• *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.* ○ Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. ○ Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners. ○ Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. ○ Understands common misconceptions in science and has effective ways to address those misconceptions. ○ Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes. ○ Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding. ○ Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. ○ Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science. • The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.

Course Objectives or Student Learning Outcomes	Standard or Competency
	○ Understands the relationships between a science curriculum, assessment and instruction and bases instruction on information gathered through assessment of students' strengths and needs. ○ Understands the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis, including how to use formal and informal assessments of student performance and how to use products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate students' understanding of and participation in the inquiry process. ○ Selects — or designs — and administers a variety of appropriate assessments (e.g., performance assessment, self-assessment, formal/informal assessment, formative/summative assessment) to monitor students' understanding and progress and to plan for instruction. ○ Understands the importance of communicating evaluation criteria and assessment results to students. • *The teacher understands forces and motion and their relationships.* ○ Demonstrates an understanding of the properties of universal forces (e.g., gravitational, electrical, magnetic). ○ Understands how to measure, graph and describe changes in motion by using concepts of position, direction of motion and speed. ○ Analyzes the ways unbalanced forces acting on an object cause changes in the position or motion of the object. ○ Analyzes the relationship between force and motion in a variety of situations (e.g., simple machines, geologic processes). • *The teacher understands the physical and chemical properties of and changes in matter.* ○ Describes and measures the physical and chemical properties of substances (e.g., size, shape, temperature, magnetism, hardness, mass, conduction, density). ○ Describes the physical properties of solids, liquids and gases. ○ Distinguishes between physical and chemical changes in matter. ○ Applies knowledge of physical and chemical properties (including atomic structure) of and changes in matter to processes and situations that occur in life and in earth and space science.

Course Objectives or Student Learning Outcomes	Standard or Competency
	○ Distinguishes between elements, compounds, mixtures and solutions and describes their properties. ○ Describes and explains the occurrence and importance of a variety of chemical reactions that occur in daily life (e.g., rusting, burning of fossil fuels, photosynthesis, cell respiration, chemical batteries, digestion of food). • *The teacher understands energy and interactions between matter and energy.* ○ Understands conservation of energy and energy transformations and analyzes how energy is transformed from one form to another (e.g., potential, kinetic, mechanical, sound, heat, light, chemical, electrical) in a variety of everyday situations and how increasing or decreasing amounts affect objects. ○ Understands the basic concepts of heat energy and related processes (e.g., melting, evaporation, boiling, condensation, conduction, convection, and radiation). ○ Understands the principles of electricity and magnetism and their applications (e.g., electric circuits, electromagnetic fields, motors, audio speakers, lightning). ○ Applies knowledge of properties of light (e.g., reflection, refraction) to describe the functioning of optical systems and phenomena (e.g., camera, microscope, rainbow, eye). ○ Demonstrates an understanding of the properties, production, and transmission of sound. • *The teacher understands energy transformations and the conservation of matter and energy.* ○ Describes sources of electrical energy and processes of energy transformation for human uses (e.g., fossil fuels, solar panels, hydroelectric plants). ○ Applies knowledge of transfer of energy in a variety of situations (e.g., the production of heat, light, sound and magnetic effects by electrical energy; the process of photosynthesis; weather processes; food webs; food and energy pyramids). ○ Understands applications of energy transformations and the conservation of matter and energy in life and in earth and space science.
Module 6 Learning Goal 1: The student will lead their class to a deeper understanding of life	• The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science.

Course Objectives or Student Learning Outcomes	Standard or Competency

science concepts using various approaches.
 	
Module 6 Learning Goal 2: The student will be able to change their classroom alternative conceptions and misconceptions of science concepts through various instructional practices.
	• *The teacher understands the structure and function of living things.*
	  ○ Understands that living systems have different structures that perform different functions.
	  ○ Understands and describes stages in the life cycles of common plants and animals (including animals that experience complete and incomplete metamorphosis).
	  ○ Understands that organisms have basic needs.
	  ○ Analyzes how structure complements function in cells, tissues, organs, organ systems and organisms.
	  ○ Identifies human body systems and describes their functions.
	  ○ Understands the relationship between characteristics, structures, and functions and corresponding taxonomic classifications.
	• *The teacher understands reproduction and the mechanisms of heredity.*
	  ○ Describes the processes by which plants and animals reproduce and explains how hereditary information is passed from one generation to the next.
	  ○ Compares and contrasts inherited traits and learned characteristics.
	  ○ Understands the organization of hereditary material and how an inherited trait can be determined by one or many genes and how more than one trait can be influenced by a single gene.
	  ○ Distinguishes between dominant and recessive traits and predicts the probable outcomes of genetic combinations.
	  ○ Evaluates the influence of environmental and genetic factors on the traits of an organism.
	• *The teacher understands adaptations of organisms and the theory of evolution.*
	  ○ Demonstrates knowledge of adaptive characteristics and explains how adaptations influence the survival of populations or species.
	  ○ Describes how populations and species change through time.
	  ○ Describes processes that enable traits to change through time, including selective breeding, mutation and other natural occurrences.
	• *The teacher understands the relationships between organisms and the environment.*
	  ○ Understands that organisms respond to internal or external stimuli and analyzes the role of internal and external stimuli in the behavior of organisms.

Course Objectives or Student Learning Outcomes	Standard or Competency
	○ Understands relationships between organisms and the environment and describes ways that living organisms depend on each other and on the environment to meet their basic needs. ○ Identifies organisms, populations or species with similar needs and analyzes how they compete with one another for resources. ○ Analyzes the interrelationships and interdependence among producers, consumers and decomposers in an ecosystem (e.g., food webs, food chains, competition, predation). ○ Identifies factors that influence the size and growth of populations in an ecosystem ○ Analyzes adaptive characteristics that result in a population's or species' unique niche in an ecosystem. ○ Knows how populations and species modify and affect ecosystems.
Module 7 Learning Goal 1: The student will lead their class to a deeper understanding of earth/space science concepts using various approaches. **Module 7 Learning Goal 2:** The student will be able to change their classroom alternative conceptions and misconceptions of science concepts through various instructional practices.	• The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in Earth and Space science. • *The teacher understands the structure and function of Earth systems.* ○ Understands the structure of Earth and analyzes constructive and destructive processes (including plate tectonics, weathering and erosion) that produce geologic change, including how these processes have affected Earth history. ○ Understands the form and function of surface water and groundwater. ○ Applies knowledge of the composition and structure of the atmosphere and its properties. ○ Applies knowledge of how human activity and natural processes, both gradual and catastrophic, can alter Earth systems. • *The teacher understands cycles in Earth systems.* ○ Understands the rock cycle and how rocks, minerals and soils are formed, and their respective properties. ○ Understands the water cycle and its relationship to weather processes. ○ Understands the nutrient (e.g., carbon, nitrogen) cycle and its relationship to Earth systems. ○ Applies knowledge of how human and natural processes affect Earth systems. ○ Understands and describes the properties and uses of Earth materials (e.g., rocks, soils, water, atmospheric gases). • *The teacher understands the role of energy in weather and climate.*

Course Objectives or Student Learning Outcomes	Standard or Competency
	○ Understands the elements of weather (e.g., humidity, wind speed and direction, air pressure, temperature) and the tools used for measurement. ○ Compares and contrasts weather and climate. ○ Analyzes weather charts and data to make weather predictions. ○ Applies knowledge of how transfers of energy between Earth systems affect weather and climate. ○ Analyzes how Earth's position, orientation, and surface features affect weather and climate. • *The teacher understands the characteristics of the solar system and the universe.* ○ The teacher understands the characteristics of the solar system and the universe. ○ Applies knowledge of the Earth–Moon–Sun system and the interactions among them (e.g., day and night, seasons, lunar phases, eclipses). ○ Identifies properties of the components of the solar system.
Module 8 Learning Goal 1: The student will apply key concepts of physical, earth/space, and life sciences to develop lessons using strategies and methods that increase understanding through authentic learning experiences. **Module 8 Learning Goal 2:** The student will utilize digital tools, resources, and strategies to enhance their teaching effectiveness. **Module 8 Learning Goal 3:** The student will create a learning experience that facilitates creative and critical thinking skills across the curriculum.	• *(Lab Processes and Safety): The teacher understands how to manage learning activities, tools, materials, equipment and technologies to ensure the safety of all students.* ○ Understands safety regulations and guidelines for science facilities and science instruction. ○ Knows procedures for and sources of information regarding the appropriate handling, use, disposal, care and maintenance of chemicals, materials, specimens and equipment. ○ Knows procedures for the safe handling and ethical care and treatment of organisms and specimens. ○ Selects and safely uses appropriate tools, technologies, materials and equipment needed for instructional activities. ○ Understands concepts of precision, accuracy and error with regard to reading and recording numerical data from a scientific instrument. ○ Understands how to gather, organize, display and communicate data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations). ○ Understands the international system of measurement (i.e., metric system) and performs unit conversions within measurement systems, including the use of nonstandard units.

Course Objectives or Student Learning Outcomes	Standard or Competency

	• *The teacher understands the history and nature of science, the process and role of scientific inquiry and the role of inquiry in science instruction.*
	  ○ Understands, plans, designs and implements instruction that provides opportunities for all students to engage in nonexperimental- and experimental-inquiry investigations.
	  ○ Focuses inquiry-based instruction on questions and issues relevant to students and uses strategies to assist students with generating, refining and focusing scientific questions and hypotheses.
	  ○ Understands and instructs students in the safe and proper use of a variety of grade-appropriate tools, equipment, resources, technology and techniques to access, gather, store, retrieve, organize and analyze data.
	  ○ Knows how to guide students in making systematic observations and measurements and posing questions to guide investigations.
	  ○ Knows how to promote the use of critical-thinking skills, logical reasoning and scientific problem solving to reach conclusions based on evidence.
	  ○ Knows how to teach students to develop, analyze and evaluate different explanations for a given scientific result, including that repeated investigations may increase reliability.
	  ○ Knows how to teach students to demonstrate an understanding of potential sources of error in inquiry-based investigation.
	  ○ Knows how to teach students to demonstrate an understanding of how to communicate and defend the results of an inquiry-based investigation.
	  ○ Understands principles of scientific ethics
	  ○ Understands the roles that logical reasoning, verifiable evidence, prediction and peer review play in the process of generating and evaluating scientific knowledge.
	  ○ Understands the historical development of science (e.g., cell theory, plate tectonics, laws of motion, universal gravity) and technology and the contributions that diverse cultures and individuals of both genders have made to scientific and technological knowledge.
	• *The teacher knows and understands the unifying concepts and processes that are common to all sciences.*
	• *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.*

Course Objectives or Student Learning Outcomes	Standard or Competency
	○ Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. ○ Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners. ○ Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. ○ Understands common misconceptions in science and has effective ways to address those misconceptions. ○ Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes. ○ Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding. ○ Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. ○ Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science. • *The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.* ○ *Understands the relationships between a science curriculum, assessment and instruction and bases instruction on information gathered through assessment of students' strengths and needs.* ○ *Understands the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis, including how to use formal and informal assessments of student performance and how to use products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate students' understanding of and participation in the inquiry process.* ○ *Selects — or designs — and administers a variety of appropriate assessments (e.g., performance assessment, self-assessment, formal/informal assessment,*

Course Objectives or Student Learning Outcomes	Standard or Competency
	formative/summative assessment) to monitor students' understanding and progress and to plan for instruction. o *Understands the importance of communicating evaluation criteria and assessment results to students.*

Appendix B:

Required assignment/standard alignment matrix

Assignment/Module/ Course Activities	Standard or Competency
Module 1 Constructed	• *The teacher understands how science impacts the daily lives of students and interacts with and influences personal and societal decisions.* o Understands that decisions about the use of science are based on factors such as ethical standards, economics and personal and societal needs. o Applies scientific principles to analyze the advantages of, disadvantages of or alternatives to a given decision or course of action. o Applies scientific principles and processes to analyze factors that influence personal choices concerning fitness and health, including physiological and psychological effects and risks associated with the use of substances and substance abuse. o Understands concepts, characteristics and issues related to changes in populations and human population growth. o Identifies and understands the types and uses of natural resources and the effects of human consumption on the renewal and depletion of resources. Understands the role science and scientists can play in helping resolve personal, societal and global challenges.
Module 2 TEKS Assignment	• The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in physical science. • The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science.

Assignment/Module/ Course Activities	Standard or Competency
	• The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in Earth and Space science.
Module 3 Constructed Response Assignment	• *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.* o Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. o Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners. o Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. o Understands common misconceptions in science and has effective ways to address those misconceptions. o Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes. o Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding. o Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. o Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science.
Module 4 Constructed Response Assignment	• *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.* o Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. o Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners.

Assignment/Module/ Course Activities	Standard or Competency
	○ Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. ○ Understands common misconceptions in science and has effective ways to address those misconceptions. ○ Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes. ○ Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding. ○ Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. ○ Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science.
Module 5 Constructed Response Assignment AND Module 5 Performance Assessment	• *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.* ○ Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. ○ Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners. ○ Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. ○ Understands common misconceptions in science and has effective ways to address those misconceptions. ○ Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes. ○ Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding.

Assignment/Module/ Course Activities	Standard or Competency
	○ Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. ○ Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science. • The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning. ○ Understands the relationships between a science curriculum, assessment and instruction and bases instruction on information gathered through assessment of students' strengths and needs. ○ Understands the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis, including how to use formal and informal assessments of student performance and how to use products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate students' understanding of and participation in the inquiry process. ○ Selects — or designs — and administers a variety of appropriate assessments (e.g., performance assessment, self-assessment, formal/informal assessment, formative/summative assessment) to monitor students' understanding and progress and to plan for instruction. ○ Understands the importance of communicating evaluation criteria and assessment results to students. • *The teacher understands forces and motion and their relationships.* ○ Demonstrates an understanding of the properties of universal forces (e.g., gravitational, electrical, magnetic). ○ Understands how to measure, graph and describe changes in motion by using concepts of position, direction of motion and speed. ○ Analyzes the ways unbalanced forces acting on an object cause changes in the position or motion of the object. ○ Analyzes the relationship between force and motion in a variety of situations (e.g., simple machines, geologic processes). • *The teacher understands the physical and chemical properties of and changes in matter.* ○ Describes and measures the physical and chemical properties of substances (e.g., size, shape, temperature, magnetism, hardness, mass, conduction, density).

Assignment/Module/ Course Activities	Standard or Competency
	○ Describes the physical properties of solids, liquids and gases. ○ Distinguishes between physical and chemical changes in matter. ○ Applies knowledge of physical and chemical properties (including atomic structure) of and changes in matter to processes and situations that occur in life and in earth and space science. ○ Distinguishes between elements, compounds, mixtures and solutions and describes their properties. ○ Describes and explains the occurrence and importance of a variety of chemical reactions that occur in daily life (e.g., rusting, burning of fossil fuels, photosynthesis, cell respiration, chemical batteries, digestion of food). • *The teacher understands energy and interactions between matter and energy.* ○ Understands conservation of energy and energy transformations and analyzes how energy is transformed from one form to another (e.g., potential, kinetic, mechanical, sound, heat, light, chemical, electrical) in a variety of everyday situations and how increasing or decreasing amounts affect objects. ○ Understands the basic concepts of heat energy and related processes (e.g., melting, evaporation, boiling, condensation, conduction, convection, and radiation). ○ Understands the principles of electricity and magnetism and their applications (e.g., electric circuits, electromagnetic fields, motors, audio speakers, lightning). ○ Applies knowledge of properties of light (e.g., reflection, refraction) to describe the functioning of optical systems and phenomena (e.g., camera, microscope, rainbow, eye). ○ Demonstrates an understanding of the properties, production, and transmission of sound. • *The teacher understands energy transformations and the conservation of matter and energy.* ○ Describes sources of electrical energy and processes of energy transformation for human uses (e.g., fossil fuels, solar panels, hydroelectric plants). ○ Applies knowledge of transfer of energy in a variety of situations (e.g., the production of heat, light, sound and magnetic effects by electrical energy; the process of photosynthesis; weather processes; food webs; food and energy pyramids). Understands applications of energy transformations and the conservation of matter and energy in life and in earth and space science.

Assignment/Module/ Course Activities	Standard or Competency

Module 6 Constructed Response Assignment
 	
AND
 	
Module 6 Performance Assessment
	• The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science.
	• *The teacher understands the structure and function of living things.*
	  ○ Understands that living systems have different structures that perform different functions.
	  ○ Understands and describes stages in the life cycles of common plants and animals (including animals that experience complete and incomplete metamorphosis).
	  ○ Understands that organisms have basic needs.
	  ○ Analyzes how structure complements function in cells, tissues, organs, organ systems and organisms.
	  ○ Identifies human body systems and describes their functions.
	  ○ Understands the relationship between characteristics, structures, and functions and corresponding taxonomic classifications.
	• *The teacher understands reproduction and the mechanisms of heredity.*
	  ○ Describes the processes by which plants and animals reproduce and explains how hereditary information is passed from one generation to the next.
	  ○ Compares and contrasts inherited traits and learned characteristics.
	  ○ Understands the organization of hereditary material and how an inherited trait can be determined by one or many genes and how more than one trait can be influenced by a single gene.
	  ○ Distinguishes between dominant and recessive traits and predicts the probable outcomes of genetic combinations.
	  ○ Evaluates the influence of environmental and genetic factors on the traits of an organism.
	• *The teacher understands adaptations of organisms and the theory of evolution.*
	  ○ Demonstrates knowledge of adaptive characteristics and explains how adaptations influence the survival of populations or species.
	  ○ Describes how populations and species change through time.
	  ○ Describes processes that enable traits to change through time, including selective breeding, mutation and other natural occurrences.
	• *The teacher understands the relationships between organisms and the environment.*

Assignment/Module/ Course Activities	Standard or Competency
	○ Understands that organisms respond to internal or external stimuli and analyzes the role of internal and external stimuli in the behavior of organisms. ○ Understands relationships between organisms and the environment and describes ways that living organisms depend on each other and on the environment to meet their basic needs. ○ Identifies organisms, populations or species with similar needs and analyzes how they compete with one another for resources. ○ Analyzes the interrelationships and interdependence among producers, consumers and decomposers in an ecosystem (e.g., food webs, food chains, competition, predation). ○ Identifies factors that influence the size and growth of populations in an ecosystem ○ Analyzes adaptive characteristics that result in a population's or species' unique niche in an ecosystem. Knows how populations and species modify and affect ecosystems.
Module 7 Constructed Response Assignment AND Module 7 Performance Assessment	• The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in Earth and Space science. • *The teacher understands the structure and function of Earth systems.* ○ Understands the structure of Earth and analyzes constructive and destructive processes (including plate tectonics, weathering and erosion) that produce geologic change, including how these processes have affected Earth history. ○ Understands the form and function of surface water and groundwater. ○ Applies knowledge of the composition and structure of the atmosphere and its properties. ○ Applies knowledge of how human activity and natural processes, both gradual and catastrophic, can alter Earth systems. • *The teacher understands cycles in Earth systems.* ○ Understands the rock cycle and how rocks, minerals and soils are formed, and their respective properties. ○ Understands the water cycle and its relationship to weather processes. ○ Understands the nutrient (e.g., carbon, nitrogen) cycle and its relationship to Earth systems. ○ Applies knowledge of how human and natural processes affect Earth systems. ○ Understands and describes the properties and uses of Earth materials (e.g., rocks, soils, water, atmospheric gases).

Assignment/Module/ Course Activities	Standard or Competency

	• *The teacher understands the role of energy in weather and climate.*
	  ○ Understands the elements of weather (e.g., humidity, wind speed and direction, air pressure, temperature) and the tools used for measurement.
	  ○ Compares and contrasts weather and climate.
	  ○ Analyzes weather charts and data to make weather predictions.
	  ○ Applies knowledge of how transfers of energy between Earth systems affect weather and climate.
	  ○ Analyzes how Earth's position, orientation, and surface features affect weather and climate.
	• *The teacher understands the characteristics of the solar system and the universe.*
	  ○ The teacher understands the characteristics of the solar system and the universe.
	  ○ Applies knowledge of the Earth–Moon–Sun system and the interactions among them (e.g., day and night, seasons, lunar phases, eclipses).
	• Identifies properties of the components of the solar system.

Module 8
Classroom Observation
	• *(Lab Processes and Safety): The teacher understands how to manage learning activities, tools, materials, equipment and technologies to ensure the safety of all students.*
	  ○ Understands safety regulations and guidelines for science facilities and science instruction.
	  ○ Knows procedures for and sources of information regarding the appropriate handling, use, disposal, care and maintenance of chemicals, materials, specimens and equipment.
	  ○ Knows procedures for the safe handling and ethical care and treatment of organisms and specimens.
	  ○ Selects and safely uses appropriate tools, technologies, materials and equipment needed for instructional activities.
	  ○ Understands concepts of precision, accuracy and error with regard to reading and recording numerical data from a scientific instrument.
	  ○ Understands how to gather, organize, display and communicate data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
	  ○ Understands the international system of measurement (i.e., metric system) and performs unit conversions within measurement systems, including the use of nonstandard units.
	• *The teacher understands the history and nature of science, the process and role of scientific inquiry and the role of inquiry in science instruction.*

Assignment/Module/ Course Activities	Standard or Competency
	○ Understands, plans, designs and implements instruction that provides opportunities for all students to engage in nonexperimental- and experimental-inquiry investigations. ○ Focuses inquiry-based instruction on questions and issues relevant to students and uses strategies to assist students with generating, refining and focusing scientific questions and hypotheses. ○ Understands and instructs students in the safe and proper use of a variety of grade-appropriate tools, equipment, resources, technology and techniques to access, gather, store, retrieve, organize and analyze data. ○ Knows how to guide students in making systematic observations and measurements and posing questions to guide investigations. ○ Knows how to promote the use of critical-thinking skills, logical reasoning and scientific problem solving to reach conclusions based on evidence. ○ Knows how to teach students to develop, analyze and evaluate different explanations for a given scientific result, including that repeated investigations may increase reliability. ○ Knows how to teach students to demonstrate an understanding of potential sources of error in inquiry-based investigation. ○ Knows how to teach students to demonstrate an understanding of how to communicate and defend the results of an inquiry-based investigation. ○ Understands principles of scientific ethics ○ Understands the roles that logical reasoning, verifiable evidence, prediction and peer review play in the process of generating and evaluating scientific knowledge. ○ Understands the historical development of science (e.g., cell theory, plate tectonics, laws of motion, universal gravity) and technology and the contributions that diverse cultures and individuals of both genders have made to scientific and technological knowledge. • *The teacher knows and understands the unifying concepts and processes that are common to all sciences.* • *The teacher has theoretical and practical knowledge about teaching science and about how students learn science.* ○ Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning. ○ Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the

Assignment/Module/ Course Activities	Standard or Competency
	abilities, experiences and needs of all students, including English-language learners. o Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions. o Understands common misconceptions in science and has effective ways to address those misconceptions. o Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes. o Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding. o Understands the importance of planning activities that are inclusive and that accommodate the needs of all students. o Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science. • *The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.* o *Understands the relationships between a science curriculum, assessment and instruction and bases instruction on information gathered through assessment of students' strengths and needs.* o *Understands the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis, including how to use formal and informal assessments of student performance and how to use products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate students' understanding of and participation in the inquiry process.* o *Selects — or designs — and administers a variety of appropriate assessments (e.g., performance assessment, self-assessment, formal/informal assessment, formative/summative assessment) to monitor students' understanding and progress and to plan for instruction.* o *Understands the importance of communicating evaluation criteria and assessment results to students.*

Grade Level	Standards
Pre-K	VII.A.1. Child observes, investigates describes, and discusses properties and characteristics of common objects. VII.A.2. Child observes, investigates describes and discusses position and motion of objects. VII.A.3. Child uses simple measuring devices to learn about objects. VI.A.4. Child observes investigates describes and discusses sources of energy including light, heat, and electricity. VII.B.1. Child observes, investigates, describes and discusses the characteristics of organisms. VII.B. 2. Child describes life cycles of organisms. VII.B.3. Child observes, investigates, describes and discusses the relationship of organisms to their environments. Vll.C.1. Child observes, investigates, describes and discusses earth materials, and their properties and uses. VII.C.2. Child identifies, observes, and discusses objects in the sky. VII.C.3. Child observes and describes what happens during changes in the earth and sky VII.C.4. Child demonstrates the importance of caring for our environment and our planet.
K	(a) Introduction. (1) In Kindergarten, students observe and describe the natural world using their senses. Students do science as inquiry in order to develop and enrich their abilities to understand scientific concepts and processes. Students develop vocabulary through their experiences investigating properties of common objects, earth materials, and organisms. (A) A central theme throughout the study of scientific investigation and reasoning; matter and energy; force, motion, and energy; Earth and space; and organisms and environment is active engagement in asking questions, creating a method to answer those questions, answering those questions, communicating ideas, and exploring with scientific tools. Scientific investigation and reasoning involves practicing safe procedures, asking questions about the natural world, and seeking answers to those questions through simple observations used in descriptive investigations.

Grade Level	Standards
	(B) Matter is described in terms of its physical properties, including relative size, weight, shape, color, and texture. The importance of light, thermal, and sound energy is identified as it relates to the students' everyday life. The location and motion of objects are explored. (C) Weather is recorded and discussed on a daily basis so students may begin to recognize patterns in the weather. Other patterns are observed in the appearance of objects in the sky. (D) In life science, students recognize the interdependence of organisms in the natural world. They understand that all organisms have basic needs that can be satisfied through interactions with living and nonliving things. Students will investigate the life cycle of plants and identify likenesses between parents and offspring. (2) 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." (3) Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy. (4) The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 80% of instructional time. (5) 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 investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and uses environmentally appropriate and responsible practices. The student is expected to: (A) identify, discuss, and demonstrate safe and healthy practices as outlined in Texas Education Agency-approved safety standards during classroom and outdoor investigations, including wearing safety goggles or chemical splash goggles, as appropriate, washing hands, and using materials appropriately; and (B) demonstrate how to use, conserve, and dispose of natural resources and materials such as conserving water and reusing or recycling paper, plastic, and metal. (2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to: (A) ask questions about organisms, objects, and events observed in the natural world; (B) plan and conduct simple descriptive investigations;

Grade Level	Standards
	(C) collect data and make observations using simple tools; (D) record and organize data and observations using pictures, numbers, and words; and (E) communicate observations about simple descriptive investigations. (3) Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving. The student is expected to: (A) identify and explain a problem such as the impact of littering and propose a solution; (B) make predictions based on observable patterns in nature; and (C) explore that scientists investigate different things in the natural world and use tools to help in their investigations. (4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to: (A) collect information using tools, including computing devices, hand lenses, primary balances, cups, bowls, magnets, collecting nets, and notebooks; timing devices; non-standard measuring items; weather instruments such as demonstration thermometers; and materials to support observations of habitats of organisms such as terrariums and aquariums; and (B) use the senses as a tool of observation to identify properties and patterns of organisms, objects, and events in the environment. (5) Matter and energy. The student knows that objects have properties and patterns. The student is expected to: (A) observe and record properties of objects, including bigger or smaller, heavier or lighter, shape, color, and texture; and (B) observe, record, and discuss how materials can be changed by heating or cooling. (6) Force, motion, and energy. The student knows that energy, force, and motion are related and are a part of their everyday life. The student is expected to: (A) use the senses to explore different forms of energy such as light, thermal, and sound; (B) explore interactions between magnets and various materials; (C) observe and describe the location of an object in relation to another such as above, below, behind, in front of, and beside; and (D) observe and describe the ways that objects can move such as in a straight line, zigzag, up and down, back and forth, round and round, and fast and slow. (7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to: (A) observe, describe, and sort rocks by size, shape, color, and texture; (B) observe and describe physical properties of natural sources of water, including color and clarity; and (C) give examples of ways rocks, soil, and water are useful. (8) Earth and space. The student knows that there are recognizable patterns in the natural world and among objects in the sky. The student is expected to:

Grade Level	Standards
	(A) observe and describe weather changes from day to day and over seasons; (B) identify events that have repeating patterns, including seasons of the year and day and night; and (C) observe, describe, and illustrate objects in the sky such as the clouds, Moon, and stars, including the Sun. (9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to: (A) differentiate between living and nonliving things based upon whether they have basic needs and produce offspring; and (B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants. (10) Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments. The student is expected to: (A) sort plants and animals into groups based on physical characteristics such as color, size, body covering, or leaf shape; (B) identify basic parts of plants and animals; (C) identify ways that young plants resemble the parent plant; and (D) observe changes that are part of a simple life cycle of a plant: seed, seedling, plant, flower, and fruit.
1st	(a) Introduction. (1) In Grade 1, students observe and describe the natural world using their senses. Students do science as inquiry in order to develop and enrich their abilities to understand the world around them in the context of scientific concepts and processes. Students develop vocabulary through their experiences investigating properties of common objects, earth materials, and organisms. (A) A central theme in first grade science is active engagement in asking questions, creating a method to answer those questions, answering those questions, communicating ideas, and exploring with scientific tools in order to explain scientific concepts and processes like scientific investigation and reasoning; matter and energy; force, motion, and energy; Earth and space; and organisms and environment. Scientific investigation and reasoning involves practicing safe procedures, asking questions about the natural world, and seeking answers to those questions through simple observations used in descriptive investigations. (B) Matter is described in terms of its physical properties, including relative size, weight, shape, color, and texture. The importance of light, thermal, and sound energy is identified as it relates to the students' everyday life. The location and motion of objects are explored. (C) Weather is recorded and discussed on a daily basis so students may begin to recognize patterns in the weather. In addition, patterns are observed in the appearance of objects in the sky.

Grade Level	Standards
	(D) In life science, students recognize the interdependence of organisms in the natural world. They understand that all organisms have basic needs that can be satisfied through interactions with living and nonliving things. Students will investigate life cycles of animals and identify likenesses between parents and offspring. (2) 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." (3) Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy. (4) The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 80% of instructional time. (5) 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 investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and uses environmentally appropriate and responsible practices. The student is expected to: (A) identify, discuss, and demonstrate safe and healthy practices as outlined in Texas Education agency-approved safety standards during classroom and outdoor investigations, including wearing safety goggles or chemical splash goggles, as appropriate, washing hands, and using materials appropriately; and (B) identify and learn how to use natural resources and materials, including conservation and reuse or recycling of paper, plastic, and metals. (2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to: (A) ask questions about organisms, objects, and events observed in the natural world; (B) plan and conduct simple descriptive investigations; (C) collect data and make observations using simple tools; (D) record and organize data using pictures, numbers, and words; and (E) communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations. (3) Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving. The student is expected to: (A) identify and explain a problem and propose a solution;

Grade Level	Standards
	(B) make predictions based on observable patterns; and (C) describe what scientists do. (4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to: (A) collect, record, and compare information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, notebooks, and safety goggles or chemical splash goggles, as appropriate; timing devices; non-standard measuring items; weather instruments such as demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as aquariums and terrariums; and (B) measure and compare organisms and objects using non-standard units. (5) Matter and energy. The student knows that objects have properties and patterns. The student is expected to: (A) classify objects by observable properties such as larger and smaller, heavier and lighter, shape, color, and texture; (B) predict and identify changes in materials caused by heating and cooling; and (C) classify objects by the materials from which they are made. (6) Force, motion, and energy. The student knows that force, motion, and energy are related and are a part of everyday life. The student is expected to: (A) identify and discuss how different forms of energy such as light, thermal, and sound are important to everyday life; (B) predict and describe how a magnet can be used to push or pull an object; and (C) demonstrate and record the ways that objects can move such as in a straight line, zig zag, up and down, back and forth, round and round, and fast and slow. (7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to: (A) observe, compare, describe, and sort components of soil by size, texture, and color; (B) identify and describe a variety of natural sources of water, including streams, lakes, and oceans; and (C) identify how rocks, soil, and water are used to make products. (8) Earth and space. The student knows that the natural world includes the air around us and objects in the sky. The student is expected to: (A) record weather information, including relative temperature such as hot or cold, clear or cloudy, calm or windy, and rainy or icy; (B) observe and record changes in the appearance of objects in the sky such as the Moon and stars, including the Sun; (C) identify characteristics of the seasons of the year and day and night; and (D) demonstrate that air is all around us and observe that wind is moving air.

Grade Level	Standards
	(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to: (A) sort and classify living and nonliving things based upon whether they have basic needs and produce offspring; (B) analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver; and (C) gather evidence of interdependence among living organisms such as energy transfer through food chains or animals using plants for shelter. (10) Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments. The student is expected to: (A) investigate how the external characteristics of an animal are related to where it lives, how it moves, and what it eats; (B) identify and compare the parts of plants; (C) compare ways that young animals resemble their parents; and (D) observe and record life cycles of animals such as a chicken, frog, or fish.
2nd	(a) Introduction. (1) In Grade 2, careful observation and investigation are used to learn about the natural world and reveal patterns, changes, and cycles. Students should understand that certain types of questions can be answered by using observation and investigations and that the information gathered in these investigations may change as new observations are made. As students participate in investigation, they develop the skills necessary to do science as well as develop new science concepts. (A) A central theme throughout the study of scientific investigation and reasoning; matter and energy; force, motion, and energy; Earth and space; and organisms and environment is active engagement in asking questions, creating a method to answer those questions, answering those questions, communicating ideas, and exploring with scientific tools. Scientific investigation and reasoning involves practicing safe procedures, asking questions about the natural world, and seeking answers to those questions through simple observations used in descriptive investigations. (B) Within the physical environment, students expand their understanding of the properties of objects such as temperature, shape, and flexibility then use those properties to compare, classify, and then combine the objects to do something that they could not do before. Students manipulate objects to demonstrate a change in motion and position. (C) Within the natural environment, students will observe the properties of earth materials as well as predictable patterns that occur on Earth and in the sky. The students understand that those patterns are used to make choices in clothing, activities, and transportation. (D) Within the living environment, students explore patterns, systems, and cycles by investigating characteristics of organisms, life cycles, and

Grade Level	Standards
	interactions among all the components within their habitat. Students examine how living organisms depend on each other and on their environment. (2) 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." (3) Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy. (4) The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 60% of instructional time. (5) 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 investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures. The student is expected to: (A) identify, describe, and demonstrate safe practices as outlined in Texas Education Agency-approved safety standards during classroom and outdoor investigations, including wearing safety goggles or chemical splash goggles, as appropriate, washing hands, and using materials appropriately; and (B) identify and demonstrate how to use, conserve, and dispose of natural resources and materials such as conserving water and reuse or recycling of paper, plastic, and metal. (2) Scientific investigation and reasoning. The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations. The student is expected to: (A) ask questions about organisms, objects, and events during observations and investigations; (B) plan and conduct descriptive investigations; (C) collect data from observations using scientific tools; (D) record and organize data using pictures, numbers, and words; (E) communicate observations and justify explanations using student-generated data from simple descriptive investigations; and (F) compare results of investigations with what students and scientists know about the world. (3) Scientific investigation and reasoning. The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to: (A) identify and explain a problem and propose a task and solution for the problem;

Grade Level	Standards
	(B) make predictions based on observable patterns; and (C) identify what a scientist is and explore what different scientists do. (4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to: (A) collect, record, and compare information using tools, including computers, hand lenses, rulers, plastic beakers, magnets, collecting nets, notebooks, and safety goggles or chemical splash goggles, as appropriate; timing devices; weather instruments such as thermometers, wind vanes, and rain gauges; and materials to support observations of habitats of organisms such as terrariums and aquariums; and (B) measure and compare organisms and objects. (5) Matter and energy. The student knows that matter has physical properties and those properties determine how it is described, classified, changed, and used. The student is expected to: (A) classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid; (B) compare changes in materials caused by heating and cooling; (C) demonstrate that things can be done to materials such as cutting, folding, sanding, and melting to change their physical properties; and (D) combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties. (6) Force, motion, and energy. The student knows that forces cause change and energy exists in many forms. The student is expected to: (A) investigate the effects on objects by increasing or decreasing amounts of light, heat, and sound energy such as how the color of an object appears different in dimmer light or how heat melts butter; (B) observe and identify how magnets are used in everyday life; and (C) trace and compare patterns of movement of objects such as sliding, rolling, and spinning over time. (7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to: (A) observe, describe, and compare rocks by size, texture, and color; (B) identify and compare the properties of natural sources of freshwater and saltwater; and (C) distinguish between natural and manmade resources. (8) Earth and space. The student knows that there are recognizable patterns in the natural world and among objects in the sky. The student is expected to: (A) measure, record, and graph weather information, including temperature, wind conditions, precipitation, and cloud coverage, in order to identify patterns in the data; (B) identify the importance of weather and seasonal information to make choices in clothing, activities, and transportation; and (C) observe, describe, and record patterns of objects in the sky, including the appearance of the Moon.

Grade Level	Standards
	(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to: (A) identify the basic needs of plants and animals; (B) identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things; and (C) compare the ways living organisms depend on each other and on their environments such as through food chains. (10) Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments. The student is expected to: (A) observe, record, and compare how the physical characteristics and behaviors of animals help them meet their basic needs; (B) observe, record, and compare how the physical characteristics of plants help them meet their basic needs such as stems carry water throughout the plant; and (C) investigate and record some of the unique stages that insects such as grasshoppers and butterflies undergo during their life cycle.
3rd	(a) Introduction. (1) In Grade 3, students learn that the study of science uses appropriate tools and safe practices in planning and implementing investigations, asking and answering questions, collecting data by observing and measuring, and using models to support scientific inquiry about the natural world. (A) Within the physical environment, students recognize that patterns, relationships, and cycles exist in matter. Students will investigate the physical properties of matter and will learn that changes occur. They explore mixtures and investigate light, sound, and thermal energy in everyday life. Students manipulate objects by pushing and pulling to demonstrate changes in motion and position. (B) Within the natural environment, students investigate how the surface of Earth changes and provides resources that humans use. As students explore objects in the sky, they describe how relationships affect patterns and cycles on Earth. Students will construct models to demonstrate Sun, Earth, and Moon system relationships. (C) Within the living environment, students explore patterns, systems, and cycles within environments by investigating characteristics of organisms, life cycles, and interactions among all components of the natural environment. Students examine how the environment plays a key role in survival. Students know that when changes in the environment occur organisms may thrive, become ill, or perish. (2) 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."

Grade Level	Standards
	(3) Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy. (4) The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific practices, analyzing information, making informed decisions, and using tools to collect and record information while addressing the content and vocabulary in physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 60% of instructional time. (5) 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 investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and environmentally appropriate practices. The student is expected to: (A) demonstrate safe practices as described in Texas Education Agency-approved safety standards during classroom and outdoor investigations using safety equipment as appropriate, including safety goggles or chemical splash goggles, as appropriate, and gloves; and (B) make informed choices in the use and conservation of natural resources by recycling or reusing materials such as paper, aluminum cans, and plastics. (2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and outdoor investigations. The student is expected to: (A) plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world; (B) collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data; (C) construct maps, graphic organizers, simple tables, charts, and bar graphs using tools and current technology to organize, examine, and evaluate measured data; (D) analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations; (E) demonstrate that repeated investigations may increase the reliability of results; and (F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion. (3) Scientific investigation and reasoning. The student knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to: (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing;

Grade Level	Standards
	(B) represent the natural world using models such as volcanoes or the Sun, Earth, and Moon system and identify their limitations, including size, properties, and materials; and (C) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists. (4) Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to collect, record, and analyze information using tools, including cameras, computers, hand lenses, metric rulers, Celsius thermometers, wind vanes, rain gauges, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, magnets, collecting nets, notebooks, and Sun, Earth, and Moon system models; timing devices; and materials to support observation of habitats of organisms such as terrariums and aquariums. (5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to: (A) measure, test, and record physical properties of matter, including temperature, mass, magnetism, and the ability to sink or float; (B) describe and classify samples of matter as solids, liquids, and gases and demonstrate that solids have a definite shape and that liquids and gases take the shape of their container; (C) predict, observe, and record changes in the state of matter caused by heating or cooling such as ice becoming liquid water, condensation forming on the outside of a glass of ice water, or liquid water being heated to the point of becoming water vapor; and (D) explore and recognize that a mixture is created when two materials are combined such as gravel and sand or metal and plastic paper clips. (6) Force, motion, and energy. The student knows that forces cause change and that energy exists in many forms. The student is expected to: (A) explore different forms of energy, including mechanical, light, sound, and thermal in everyday life; (B) demonstrate and observe how position and motion can be changed by pushing and pulling objects such as swings, balls, and wagons; and (C) observe forces such as magnetism and gravity acting on objects. (7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to: (A) explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains; (B) investigate rapid changes in Earth's surface such as volcanic eruptions, earthquakes, and landslides; and (C) explore the characteristics of natural resources that make them useful in products and materials such as clothing and furniture and how resources may be conserved. (8) Earth and space. The student knows there are recognizable patterns in the natural world and among objects in the sky. The student is expected to:

Grade Level	Standards
	(A) observe, measure, record, and compare day-to-day weather changes in different locations at the same time that include air temperature, wind direction, and precipitation; (B) describe and illustrate the Sun as a star composed of gases that provides light and thermal energy; (C) construct models that demonstrate the relationship of the Sun, Earth, and Moon, including orbits and positions; and (D) identify the planets in Earth's solar system and their position in relation to the Sun. (9) Organisms and environments. The student knows and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to: (A) observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem; (B) identify and describe the flow of energy in a food chain and predict how changes in a food chain affect the ecosystem such as removal of frogs from a pond or bees from a field; and (C) describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations. (10) Organisms and environments. The student knows that organisms undergo similar life processes and have structures that help them survive within their environments. The student is expected to: (A) explore how structures and functions of plants and animals allow them to survive in a particular environment; and (B) investigate and compare how animals and plants undergo a series of orderly changes in their diverse life cycles such as tomato plants, frogs, and lady beetles.
4th	(a) Introduction. (1) In Grade 4, investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations and that 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. They have limitations and, based on new discoveries, are constantly being modified to more closely reflect the natural world. (A) Within the physical environment, students know about the physical properties of matter including mass, volume, states of matter, temperature, magnetism, and the ability to sink or float. Students will differentiate among forms of energy including mechanical, light, sound, and thermal energy. Students will explore electrical circuits and design descriptive investigations to explore the effect of force on objects. (B) Within the natural environment, students know that earth materials have properties that are constantly changing due to Earth's forces. The students learn that the natural world consists of resources, including renewable and nonrenewable, and their responsibility to conserve our natural

Grade Level	Standards
	resources for future generations. They will also explore Sun, Earth, and Moon relationships. The students will recognize that our major source of energy is the Sun. (C) Within the living environment, students know and understand that living organisms within an ecosystem interact with one another and with their environment. The students will recognize that plants and animals have basic needs, and they are met through a flow of energy known as food webs. Students will explore how all living organisms go through a life cycle and have structures that enable organisms to survive in their ecosystem. (2) 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." (3) Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy. (4) The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 50% of instructional time. (5) 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 investigation and reasoning. The student conducts classroom and outdoor investigations, following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to: (A) demonstrate safe practices and the use of safety equipment as described in Texas Education Agency-approved safety standards during classroom and outdoor investigations using safety equipment, including safety goggles or chemical splash goggles, as appropriate, and gloves, as appropriate; and (B) make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans, and plastic. (2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and outdoor investigations. The student is expected to: (A) plan and implement descriptive investigations, including asking well defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions; (B) collect and record data by observing and measuring, using the metric system, and using descriptive words and numerals such as labeled drawings, writing, and concept maps; (C) construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data;

Grade Level	Standards
	(D) analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured; (E) perform repeated investigations to increase the reliability of results; and (F) communicate valid oral and written results supported by data. (3) Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to: (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing; (B) represent the natural world using models such as the water cycle and stream tables and identify their limitations, including accuracy and size; and (C) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists. (4) Scientific investigation and reasoning. The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry. The student is expected to collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, mirrors, spring scales, balances, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices; and materials to support observation of habitats of organisms such as terrariums and aquariums. (5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to: (A) measure, compare, and contrast physical properties of matter, including mass, volume, states (solid, liquid, gas), temperature, magnetism, and the ability to sink or float; and (B) compare and contrast a variety of mixtures, including solutions. (6) Force, motion, and energy. The student knows that energy exists in many forms and can be observed in cycles, patterns, and systems. The student is expected to: (A) differentiate among forms of energy, including mechanical, sound, electrical, light, and thermal; (B) differentiate between conductors and insulators of thermal and electrical energy; (C) demonstrate that electricity travels in a closed path, creating an electrical circuit; and (D) design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism. (7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to: (A) examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants; (B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice; and

Grade Level	Standards
	(C) identify and classify Earth's renewable resources, including air, plants, water, and animals, and nonrenewable resources, including coal, oil, and natural gas, and the importance of conservation. (8) Earth and space. The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system. The student is expected to: (A) measure, record, and predict changes in weather; (B) describe and illustrate the continuous movement of water above and on the surface of Earth through the water cycle and explain the role of the Sun as a major source of energy in this process; and (C) collect and analyze data to identify sequences and predict patterns of change in shadows, seasons, and the observable appearance of the Moon over time. (9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to: (A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food; and (B) describe the flow of energy through food webs, beginning with the Sun, and predict how changes in the ecosystem affect the food web. (10) Organisms and environments. The student knows that organisms undergo similar life processes and have structures and behaviors that help them survive within their environment. The student is expected to: (A) explore how structures and functions enable organisms to survive in their environment; (B) explore and describe examples of traits that are inherited from parents to offspring such as eye color and shapes of leaves and behaviors that are learned such as reading a book and a wolf pack teaching their pups to hunt effectively; and (C) explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans.
5th	(a) Introduction. (1) In Grade 5, scientific investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations and that 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. They have limitations and based on new discoveries are constantly being modified to more closely reflect the natural world. (A) Within the physical environment, students learn about the physical properties of matter, including magnetism, mass, physical states of matter, relative density, solubility in water, and the ability to conduct or insulate electrical and thermal energy. Students explore the uses of light, thermal, electrical, mechanical, and sound energies.

Grade Level	Standards
	(B) Within the natural environment, students learn how changes occur on Earth's surface and that predictable patterns occur in the sky. Students learn that the natural world consists of resources, including nonrenewable and renewable. (C) Within the living environment, students learn that structure and function of organisms can improve the survival of members of a species. Students learn to differentiate between inherited traits and learned behaviors. (2) 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." (3) Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy. (4) The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 50% of instructional time. (5) 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 investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to: (A) demonstrate safe practices and the use of safety equipment as outlined in Texas Education Agency-approved safety standards during classroom and outdoor investigations using safety equipment, including safety goggles or chemical splash goggles, as appropriate, and gloves, as appropriate; and (B) make informed choices in the conservation, disposal, and recycling of materials. (2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and outdoor investigations. The student is expected to: (A) describe, plan, and implement simple experimental investigations testing one variable; (B) ask well defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology; (C) collect and record information using detailed observations and accurate measuring; (D) analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence; (E) demonstrate that repeated investigations may increase the reliability of results;

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	(F) communicate valid conclusions in both written and verbal forms; and (G) construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information. (3) Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to: (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing; (B) draw or develop a model that represents how something that cannot be seen such as the Sun, Earth, and Moon system and formation of sedimentary rock works or looks; and (C) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists. (4) Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, prisms, mirrors, balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices; and materials to support observations of habitats or organisms such as terrariums and aquariums. (5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to: (A) classify matter based on measurable, testable, and observable physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating using water as a reference point), solubility in water, and the ability to conduct or insulate thermal energy or electric energy; (B) demonstrate that some mixtures maintain physical properties of their ingredients such as iron filings and sand and sand and water; and (C) identify changes that can occur in the physical properties of the ingredients of solutions such as dissolving salt in water or adding lemon juice to water. (6) Force, motion, and energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to: (A) explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy; (B) demonstrate that the flow of electricity in closed circuits can produce light, heat, or sound; (C) demonstrate that light travels in a straight line until it strikes an object and is reflected or travels through one medium to another and is refracted; and (D) design a simple experimental investigation that tests the effect of force on an object.

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	(7) Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to: (A) explore the processes that led to the formation of sedimentary rocks and fossil fuels; and (B) recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to Earth's surface by wind, water, or ice. (8) Earth and space. The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system. The student is expected to: (A) differentiate between weather and climate; (B) explain how the Sun and the ocean interact in the water cycle; (C) demonstrate that Earth rotates on its axis once approximately every 24 hours causing the day/night cycle and the apparent movement of the Sun across the sky; and (D) identify and compare the physical characteristics of the Sun, Earth, and Moon. (9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to: (A) observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components; (B) describe the flow of energy within a food web, including the roles of the Sun, producers, consumers, and decomposers; (C) predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways; and (D) identify fossils as evidence of past living organisms and the nature of the environments at the time using models. (10) Organisms and environments. The student knows that organisms have structures and behaviors that help them survive within their environments. The student is expected to: (A) compare the structures and functions of different species that help them live and survive in a specific environment such as hooves on prairie animals or webbed feet in aquatic animals; and (B) differentiate between inherited traits of plants and animals such as spines on a cactus or shape of a beak and learned behaviors such as an animal learning tricks or a child riding a bicycle.
6th	a) Introduction. (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. The strands for Grade 6 include the following.

Grade Level	Standards
	(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. (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, 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, 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. (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

Grade Level	Standards
	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. (b) Knowledge and skills. (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) demonstrate safe practices during laboratory and field investigations as outlined in Texas Education Agency-approved safety standards; and (B) practice appropriate use and conservation of resources, including disposal, reuse, or recycling of materials. (2) Scientific investigation and reasoning. The student uses scientific practices during laboratory and field investigations. The student is expected to: (A) plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology;

Grade Level	Standards
	(B) design and implement experimental investigations by making observations, asking well defined questions, formulating testable hypotheses, and using appropriate equipment and technology; (C) collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers; (D) construct tables and graphs, using repeated trials and means, to organize data and identify patterns; and (E) analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends. (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) 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; (B) use models to represent aspects of the natural world such as a model of Earth's layers; (C) identify advantages and limitations of models such as size, scale, properties, and materials; and (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. (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) 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 (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. (5) Matter and energy. The student knows the differences between elements and compounds. The student is expected to: (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; (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 (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. (6) Matter and energy. The student knows matter has physical properties that can be used for classification. The student is expected to: (A) compare metals, nonmetals, and metalloids using physical properties such as luster, conductivity, or malleability;

Grade Level	Standards
	(B) calculate density to identify an unknown substance; and (C) test the physical properties of minerals, including hardness, color, luster, and streak. (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. (8) Force, motion, and energy. The student knows force and motion are related to potential and kinetic energy. The student is expected to: (A) compare and contrast potential and kinetic energy; (B) identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces; (C) calculate average speed using distance and time measurements; (D) measure and graph changes in motion; and (E) investigate how inclined planes can be used to change the amount of force to move an object. (9) Force, motion, and energy. 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) investigate methods of thermal energy transfer, including conduction, convection, and radiation; (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 (C) demonstrate energy transformations such as energy in a flashlight battery changes from chemical energy to electrical energy to light energy. (10) Earth and space. The student understands the structure of Earth, the rock cycle, and plate tectonics. The student is expected to: (A) build a model to illustrate the compositional and mechanical layers of Earth, including the inner core, outer core, mantle, crust, asthenosphere, and lithosphere; (B) classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation; (C) identify the major tectonic plates, including Eurasian, African, Indo-Australian, Pacific, North American, and South American; and (D) describe how plate tectonics causes major geological events such as ocean basin formation, earthquakes, volcanic eruptions, and mountain building. (11) Earth and space. 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) describe the physical properties, locations, and movements of the Sun, planets, moons, meteors, asteroids, and comets; (B) understand that gravity is the force that governs the motion of our solar system; and

Grade Level	Standards
	(C) describe the history and future of space exploration, including the types of equipment and transportation needed for space travel. (12) Organisms and environments. 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) understand that all organisms are composed of one or more cells; (B) recognize that the presence of a nucleus is a key factor used to determine whether a cell is prokaryotic or eukaryotic; (C) recognize that the broadest taxonomic classification of living organisms is divided into currently recognized domains; (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; (E) describe biotic and abiotic parts of an ecosystem in which organisms interact; and (F) diagram the levels of organization within an ecosystem, including organism, population, community, and ecosystem.