Course Syllabus: Teaching Science in Elementary School

College of Education
EDUC-4503X10; EDUC-4503DX1
Fall 2024

Contact Information

Instructor: Dr. Kristen A. Brown
Physical Office Location: Fort Worth
Virtual Office Hours: Available through Zoom as needed M-Th, between 8:30am – 5:30pm, schedule a time by visiting the link below (https://calendly.com/kapplingbrown/introduction-meeting)
University Email Address: kristen.brown@msutexas.edu
Personal Cell Phone: 940-781-7018
Preferred Form of Communication**:** Email (kristen.brown@msutexas.edu)

Instructor Response Policy

We will be communicating with each other constantly throughout the semester. I usually answer all emails and texts within 24 hours, however you will definitely get a response within 48 hours (2 days). Any emails or texts received during weekends will not receive a response till the following Monday. No emails or texts will be answered over the weekend.

Textbook & Instructional Materials

Open Education resource materials will be used in the class. There is no required textbook for the class.

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 and Competencies

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 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. Visit the website MSU-Texas-Tutoring for more information.

Online Course Navigation

How to Navigate Course:

1. Modules are arranged in correspondence with the Student Learning Outcomes.
2. Begin each module with "READ ME FIRST!". Each Module is designed in accordance with Blooms Taxonomy to ensure students build the higher order thinking skills to reach competency.
3. This CBE course requires that you earn an 80% or above on the module assignments prior to moving on to the next module.
4. After you complete Module 3, you can schedule your pre-conference for the Science Classroom Teaching Experience. For more information on this assignment, please refer to Module 4 in D2L.

Notice

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

Course Schedule

Notice: *Changes in the course syllabus, procedure, assignments, and schedule may be made at any time at the discretion of the instructor.* Any changes will be clearly communicated with students via email and D2L, and any changes will be designed to benefit students (i.e. deadlines will be extended, assignments will be shortened, etc.).

Module	Activities/Assignments/Exams	Due Date
Most assignments due on Sunday nights by 11:59pm on due date.		
Introduction Zoom with Dr. Brown https://calendly.com/kapplingbrown/introduction-zoom-call-w-dr-brown		**8/30/2024 @5:30pm**
Module 1	**Module 1: Nature of Science** Nature of Science Synthesis Assignment	9/2/2024* *(Due Monday night)*
Module 2	**Module 2: Constructivism** Constructivism Synthesis Assignment	9/15/2024
Module 3	**Module 3: Science Curriculum** Curriculum Synthesis Assignment Part 1: Science TEKS Introduction Statement Graphic Organizer Curriculum Synthesis Assignment Part #2: TEKS T-Chart	9/22/2024 9/29/2024
Module #4: Teaching & Lesson Plan Module	**Module 4: Planning and teaching a science lesson** Performance Assessment Components: • 5E Lesson Plan • Pre-Conference Zoom Meeting • Classroom Observation Video • Post-Teaching Reflection • Post-Conference Zoom Meeting	Dates will vary* Science Classroom Teaching Experience (and assignment components) must be completed between Oct. 1 – Oct. 31st.
Module 5	**Module 5: Teaching Physical Science for Understanding** Physical Science Synthesis Assignment	11/3/2024 .
Module 6	**Module 6: Teaching Life Science for Understanding** Life Science Synthesis Assignment	11/17/2024
Module 7	**Module 7: Teaching Earth Space Science for Understanding** Earth Science Synthesis Assignment	12/8/2024

Grading and Assessment

Course Grade – Scheduling and completing an introductory Zoom meeting with Dr. Brown is a required assignment. There are 6 module synthesis assignments, 2 required Zoom conferences before and after the Science Classroon Teaching Experience, 1 formal science lesson plan to use during the Science Classroom Teaching Experience, and a grade for timeliness and professionalism. There is 1 performance-based assignment, the Science Classroom Teaching Experience, worth 500 total points, or 1/2 of the final grade.

Table 1: Points allocated to each assignment.

Assignments	Points
Introduction Zoom Meeting	25
Module Synthesis Assignments (6 x 75 each)	450
1 Zoom Pre-Teaching Conference and 1 Zoom Post-Teaching Conferences (2 x 50 points)	100
1 Formal Science Lesson Plan	100
1 Post-Teaching Reflection	75
1 Performance Assessment – Science Classroom Teaching Experience (submit video to D2L)	225
Timeliness & professionalism (Turning in items when due, scheduling Zooms and teaching experience, communicating with Dr. Brown via email/phone as needed, etc.)	25
Total Points	**1000**

***Grading points may change as per the needs of the class, school, and students.**

Table 2: Total points for final grade.

Grade	Points
A	900 to 1000
B	800 to 899
C	700 to 799
D	600 to 699
F	Less than 600

Homework

Each module will have a synthesis assignment that will assess your ability to synthesize and apply the module's learning goal. To receive full credit for a synthesis assignment, you must review all of the documents, videos, activities, etc. for the Module in D2L and submit the assignment on the due date. Assignments are due by 11:59pm on Sunday night (except Module 1 is due on Monday, September 2nd).

There are some written assignments in this course that build your understanding of thinking about the nature of science and and also prepare you to become

aware of research-based practices in teaching science. Details for assignments will be on D2L. Any questions can be asked via email or during a Zoom appointment.

Expectations for written work:
Correct grammar, punctuation, and spelling are expected on all written assignments (although web discussions are not held to the high standard of a research project or other written assignment).

Written assignments should be:

- Done in Microsoft Word and turned in as an attachment in dropbox on D2L (do not submit assignments as PDF because it limits my ability to give constructive feedback).
- Discussions (if applicable) should be completed within the D2L discussion space and NOT uploaded as an attachment.

Performance Assessment

The performance assessment for this course is a Science Classroom Teaching Experience using inquiry-based instruction. Students will research, identify, design, and implement an inquiry-based science lesson 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 nature of science, how science is a unique academic discipline, and basic ideas for teaching and learning in science. 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 experience 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)***.

Extra Credit

There are no plans for extra credit on assignments, however, students may be provided an opportunity to revise an assignment in order to improve their grade if Dr. Brown determines instructions were unclear or all students fail to meet the course expectations for an assignment.

Late Work

Because all assignments are available and submitted online, "make up" work should not be an issue. The D2L Dropbox will close at 11:59pm on the due date. If there are any issues or you are confused about an assignment, contact Dr. Brown *BEFORE* the assignment is due (at least 24 to 48 hours before the assignment is due). Time shown on D2L, or email will be used. Late work will not be accepted unless a written medical or equally extenuating circumstance is provided. Late work will not be accepted more than one week after the due date UNLESS you communicate with Dr. Brown via email and document why an assignment is missing.

If you have a life event that impacts your ability to submit an assignment on time, it is up to the student to communicate with Dr. Brown as soon as possible. When in doubt, send an email and explain your situation – do not avoid tough conversations to the detriment of your grade.

Important Dates

Last day for term schedule changes: August 26-29, 2024. Check date on Academic Calendar.
Deadline to file for graduation: October 7, 2024. Check date on Academic Calendar.
Last Day to drop with a grade of "W:" October 9, 2024. Check date on Academic Calendar.
Refer to: Drops, Withdrawals & Void

Online Computer Requirements

Taking an online 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! Our online classes 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**.**

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. DO NOT WAIT till the last minute to submit the assignment. Delays or sending through email will be counted late!

Attendance

Professional teachers are dependable, reliable, and responsible. Failure to schedule and attend a conference after an absence from class will result in the loss of classroom participation and disposition points and also in the overall grade being lowered by one letter. It is the candidate's responsibility to make up for any missed work. It is also expected that you will complete all course field experience hours in a professional manner. Professional conduct is expected when observing or participating in school settings (e.g., dressing appropriately, arriving on time, remaining for the entire pre-arranged time, not canceling, and demonstrating respect in all interactions with young people, parents, teachers, and staff). If you must miss your field experience for any reason, you are expected to call the school and the teacher you are working with *before* school begins for the day. You must also contact the course instructor by e-mail or phone to let me know you will not be present and arrange a time with me when we can discuss the most appropriate way to make up that absence.

Tentative assignment due dates are listed on the course schedule. While the actual due dates may vary due to the flow of the class, all assignment due dates will be finalized and announced in D2L well in advance of the specific date. *Late work, unless arrangements are made by the student and approved in advance by the instructor, will not be accepted for full credit.

During your field observations, you are required to submit time logs in TK20 to your cooperating teacher for attendance and participation verification. You must accumulate a minimum of 50 hours total prior to clinical teaching, which need to be approved by the cooperating teacher. This should be done weekly, and you should periodically check TK20 to ensure that your time logs have been approved. For this course, a minimum of 20 hours in the classroom should be dedicated to engaging with students in instructional or educational activities, although you will likely spend more than 20 hours doing so. Prior to your clinical teaching experience, you should have at a minimum of 50 hours of field-based experiences, 30 of which show active engagement in instructional or educational activities. All time log entries must have a detailed description/reflection

explaining the instructional or educational activities. At the end of the course, on the date indicated on the calendar, you must upload a screenshot of every approved time log to the appropriate Dropbox in D2L.

Instructor Class Policies

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 individuals to whom credit is given) will not be considered. Turnitin will be used for the written assignments and D2L directly syncs with it (you do not have to do anything). You will be able to see the plagiarism percentage and are welcome to make changes and resubmit *__BEFORE__* the due date. ***Any plagiarism of 30% and above is too much! Your plagiarized assignment will not be graded, receive a zero, and no make-up allowed.**

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. 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 self-plagiarism of 30% and above is too much! Your plagiarized assignment will not be graded, receive a zero, and no make-up allowed.**

Advances in Artificial Intelligence (AI) have now provided generative and creative applications such as Chat GPT, Google Bard, Guru, Microsoft Copilot, and others. Certainly, these tools can be quite useful in the learning process; however, the content they generate does not represent the effort and learning of the student. Since writing, analytical, and critical thinking skills are part of the learning outcomes of this course, all writing assignments should be prepared by the student. Developing strong competencies in this area will prepare you for a competitive workplace. Submitting AI generated work in place of the original and genuine work of the student will be considered a form of academic misconduct. Therefore, **AI-generated submissions are not permitted and will be treated as plagiarism. Any AI generated work of 30% and above is too much! Your assignment will not be graded, receive a zero, and no make-up allowed**.

You may type a question into ChatGPT, you may not exactly copy and paste its response, and turn it in as your own. If you use ChatGPT or any AI, please use it in ways that are ethical, accurate, and useful.

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. It's important to remember that the consequences of violating this policy are serious and can have a lasting impact on your academic record. By enrolling in this course, you acknowledge and agree to comply with this plagiarism and AI-generated content policy. Your understanding and commitment to academic integrity are crucial to our learning community.

Student Handbook

Refer to this website Student Handbook for more information.

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. Visit the website for the Office of Student Conduct for more infotmation.

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. 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.

Final written products submitted for grading on D2L will have the *Turnitin* software used to check for similarity of the written content to online sources. You will be notified in D2L on the assignment submission that *Turnitin* is being used.

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.

Students with Disabilities:
Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements. Students must present appropriate verification from the University's Disability Support Services (DSS) Office during

the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation(s) to a student until appropriate verification from DSS has been provided.

Inclement Weather

In the case of campus closure due to inclement weather, assignment due dates may be extended as needed. Any changes in assignment due dates will be communicated via email and in D2L.

Instructor Drop

As per the College policies, an instructor may drop a student any time during the semester for excessive absences, for consistently failing to meet class assignments, for an indifferent attitude, or for disruptive conduct. Instructor will give the student a verbal or written warning prior to dropping the student from the class. The instructor-drop takes precedence over the student-initiated course drop of a later date. The instructor will assign a grade of either WF or F through the first 8 weeks of this semester. After this period, the grade will be an F. The date the instructor drop form is received in the Office of the Registrar is the official drop date.

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).

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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
Refer to: Campus Carry Rules and Policies

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.

Campus Carry

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."*

Obligation to Report Sex Discrimination under State and Federal Law
Midwestern State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. State and federal law require University employees to report sex discrimination and sexual misconduct to the University's Office of Title IX. As a faculty member, I am required to report to the Title IX Coordinator any allegations, personally observed behavior, or other direct or indirect knowledge of conduct that reasonably may constitute sex

discrimination or sexual misconduct, which includes sexual assault, sexual harassment, dating violence, or stalking, involving a student or employee. After a report is made, the office of Title IX will reach out to the affected student or employee in an effort to connect such person(s) with resources and options in addressing the allegations made in the report. You are also encouraged to report any incidents to the office of Title IX. You may do so by contacting:

Laura Hetrick
Title IX Coordinator
Sunwatcher Village Clubhouse
940-397-4213
laura.hetrick@msutexas.edu
You may also file an online report 24/7 at Online Reporting Form

Should you wish to visit with someone about your experience in confidence, you may contact the MSU Counseling Center at 940-397-4618. For more information on the University's policy on Title IX or sexual misconduct, please visit Title IX Website

Grade Appeal Process

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

References/Scientifically-Based Research/Additional Readings:

Abell, S. (2013). *Writing in Science*. In D. Hanuscin and M. P. Rogers. (Eds.). *Perspectives: Research & tips to support science education, K-6*. National Science Teachers Association. https://archive.org/details/perspectivesrese0000unse/page/132/mode/2up

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, *18*(1), 32–42. https://doi.org/10.2307/1176008

Chiappetta, E. L., & Adams, A. D. (2004). Inquiry-based instruction: Understanding how content and process go hand-in-hand with school science. *The Science Teacher (National Science Teachers Association)*, *71*(2), 46–50.

Derry, S. J. (1992). Beyond symbolic processing: Expanding horizons for educational psychology. *Journal of Educational Psychology*, *84*(4), 413–418. https://doi.org/10.1037/0022-0663.84.4.413

Derry, S. J. (1996). Cognitive schema theory in the constructivist debate. *Educational Psychologist*, *31*(3–4), 163–174. https://doi.org/10.1080/00461520.1996.9653264

Driver, R., Asoko, H., Leach, J., Scott, P., & Mortimer, E. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher*, *23*(7), 5–12. https://doi.org/10.3102/0013189X023007005

Egbert, J., & Roe, M. F. (2014). The Power of Why: Connecting Curriculum to Students' Lives. *Childhood Education*, *90*(4), 251–258. https://doi.org/10.1080/00094056.2014.933665

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Larimore, R. A. (2020). Preschool Science Education: A Vision for the Future. *Early Childhood Education Journal*, *48*(6), 703–714. https://doi.org/10.1007/s10643-020-01033-9

Mina Herrera, S. P. (2020). *Situated learning theory.* In J. Egbert & M. F. Roe (Eds.). *Theoretical models for teaching and research*. Open Text WSU. https://opentext.wsu.edu/theoreticalmodelsforteachingandresearch/chapter/situated-learning-theory/

Narayan, R., Rodriguez, Araujo, J., Shaqlaih, A., & Moss, G. (2013). *Constructivism: Constructivist learning theory.* In B. J. Irby, G. Brown, R. Lara-Alecio, & S. Jackson (Eds.). (pp. 169 - 183). *The Handbook of Educational Theories*. Information Age Publishers.

Rimm-Kaufman, S., & Merritt, E. (2019). Let's power our future: Integrating science and social and emotional learning improves collaborative discourse and science understanding. *Science and Children*, *57*(1), 52–60. https://doi.org/10.1080/19434812.2019.12292384

Snow, C. E., & Dibner, K. A. (Eds.). (2016). *Science literacy: concepts, contexts, and consequences*. (pp. 1-9). National Academies Press.

von Glasersfeld, E. (1996). Introduction: Aspects of constructivism. In C. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice*, (pp.3-7). Teachers College Press.

Vygotsky, L. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Wolfe, Z. M. (2019). "You explore, I guide, we learn!": Developing an inquiry-based teaching curriculum. *Childhood Education*, *95*(4), 30–35. https://doi.org/10.1080/00094056.2019.1638710

** This is a selected set of references and do not include all sources used in the course.*

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.	• Demonstrate knowledge of the Science domain of the Texas Prekindergarten Guidelines and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation).
Module 2 Learning Goal 1: The student can identify the basic structure of constructivism **Module 2 Learning Goal 2:** The student will be able to select the science concepts, procedures, and skills that they will use during inquiry-based instruction.	• Demonstrate knowledge of the Science domain of the Texas Prekindergarten Guidelines and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to

Course Objectives or Student Learning Outcomes	Standard or Competency
Module 2 Learning Goal 3: The student will learn the foundations of inquiry-based instruction. **Module 2 Learning Goal 4:** 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 2 Learning Goal 5:** The student will understand that a positive classroom environment is essential in promoting active inquiry-based learning.	explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding, and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.
Module 3 Learning Goal 1: The student understands that the TEKs are vertically aligned to increase conceptual understanding from Pre-K to 6th grade. **Module 3 Learning Goal 2:** The student	• Demonstrate knowledge of the Science domain of the Texas Prekindergarten Guidelines and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment,

Course Objectives or Student Learning Outcomes	Standard or Competency
can describe their strengths and weaknesses in each content strand of the Pre-K to 6th grade TEKs.	incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of physical science, Earth and space science, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications.
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	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions

Course Objectives or Student Learning Outcomes	Standard or Competency
instructional practices.	and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of **physical science**, Earth and space science, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.
Module 6 Learning Goal 1: The student will lead their class to a deeper understanding of l**ife science** concepts using various approaches.	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children.

Course Objectives or Student Learning Outcomes	Standard or Competency
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.	• Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of physical science, Earth and space science, and **life science** to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations.

Course Objectives or Student Learning Outcomes	Standard or Competency
	• Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.
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.	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools, and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of physical science, **earth and space science**, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written

Course Objectives or Student Learning Outcomes	Standard or Competency
	expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.
Module 4 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 4 Learning Goal 2:** The student will utilize digital tools, resources, and strategies to enhance their teaching effectiveness. **Module 4 Learning Goal 3:** The student will create a learning experience that facilitates creative and	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities.

Course Objectives or Student Learning Outcomes	Standard or Competency
critical thinking skills across the curriculum.	• Apply knowledge of key concepts of physical science, Earth and space science, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas. • Demonstrate knowledge of developmentally appropriate digital tools and resources and strategies to help children explore real-world issues, solve authentic problems, develop global awareness, participate in local and global learning communities, and develop the ability to pursue and manage their own learning, while understanding safety and privacy risks.

Appendix B:

Assignment/Module/ Course Activities	Standard or Competency
Module 1: Nature of Science Synthesis Assignment	• Demonstrate knowledge of the Science domain of the Texas Prekindergarten Guidelines and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation).
Module 2: Constructivism Snythesis Assignment	• Demonstrate knowledge of the Science domain of the Texas Prekindergarten Guidelines and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation).

Assignment/Module/ Course Activities	Standard or Competency
	• Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.
Module 3: Curriuclum Synthesis Assignment Part 1 (TEKS Assignment)	• Demonstrate knowledge of the Science domain of the Texas Prekindergarten Guidelines and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation).

Assignment/Module/ Course Activities	Standard or Competency
	• Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of physical science, Earth and space science, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications.
Module 5: Physical Science Synthesis Assignment	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of **physical science**, Earth and space science, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate,

Assignment/Module/ Course Activities	Standard or Competency
	meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.
Module 6: Life Science Synthesis Assignment	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation).

Assignment/Module/ Course Activities	Standard or Competency
	• Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of physical science, Earth and space science, and **life science** to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.
Module 7: Earth/Space Science Synthesis Assignment	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's

Assignment/Module/ Course Activities	Standard or Competency
	development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of physical science, **Earth and space science**, and life science to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas.

Assignment/Module/ Course Activities	Standard or Competency
	• Demonstrate knowledge of developmentally appropriate digital tools and resources and strategies to help children explore real-world issues, solve authentic problems, develop global awareness, participate in local and global learning communities, and develop the ability to pursue and manage their own learning, while understanding safety and privacy risks.
Module 4: Performance Assessment (includes pre-conference, inquiry based science lesson plan, science teaching experience, post-teaching reflection, and post-conference)	• Demonstrate knowledge of the Science domain of the *Texas Prekindergarten Guidelines* and of the Texas Essential Knowledge and Skills (TEKS) for Science (Kindergarten through Grade 5), as well as ways to scaffold and sequence skills and concepts to teach science to young children. • Apply knowledge of how to plan and implement inquiry-based science lessons that are responsive to children's diverse interests, knowledge, skills, and experiences and that promotes children's development of scientific knowledge, inquiry, and skills. • Demonstrate knowledge of developmentally appropriate strategies for encouraging children to explore and make discoveries about their world (e.g., exploratory play, using senses, using simple tools or technology to gain information about environment, incorporating children's literature, making predictions and/or drawing conclusions on the basis of observation). • Demonstrate knowledge of instructional resources, tools and materials, including technology, for teaching science and procedures for ensuring the proper use of safety equipment and safe practices during classroom science activities. • Apply knowledge of key concepts of **physical science, earth and space science, OR life science** to select strategies and methods for developing children's knowledge and skills in these areas through a variety of developmentally appropriate, meaningful, authentic learning experiences and real-world applications. • Apply knowledge of developmentally appropriate strategies for encouraging students to view themselves as competent scientific explorers and activities for promoting students' ability to think and

Assignment/Module/ Course Activities	Standard or Competency
	communicate scientific knowledge through written expression (e.g., providing opportunities to observe and describe objects and phenomena; engaging in simple investigation; applying skills such as collecting, classifying, and interpreting data; recognizing patterns and drawing conclusions). • Demonstrate knowledge of developmentally appropriate strategies and procedures for implementing scientific inquiry methods in classroom laboratory and outdoor investigations, including understanding and applying terminology common to scientific investigations. • Demonstrate knowledge of types of digital tools and resources and strategies for using them to enhance teaching effectiveness, create learning experiences that facilitate creativity, and promote student achievement across the content areas. • Demonstrate knowledge of developmentally appropriate digital tools and resources and strategies to help children explore real-world issues, solve authentic problems, develop global awareness, participate in local and global learning communities, and develop the ability to pursue and manage their own learning, while understanding safety and privacy risks.

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.

Grade Level	Standards
	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	(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. (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."

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 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; (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.

Grade Level	Standards
	(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:

Grade Level	Standards
	(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: (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

Grade Level	Standards
	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. (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

Grade Level	Standards
	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; (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,

Grade Level	Standards
	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;

Grade Level	Standards
	(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. (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

Grade Level	Standards
	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 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.

Grade Level	Standards
	(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; (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

Grade Level	Standards
	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;

Grade Level	Standards
	(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. (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

Grade Level	Standards
	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." (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.

Grade Level	Standards
	(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; (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.

Grade Level	Standards
	(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: (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;

Grade Level	Standards
	(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

Grade Level	Standards
	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 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:

Grade Level	Standards
	(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; (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,

Grade Level	Standards
	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 (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.

Grade Level	Standards
	(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

Grade Level	Standards
	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. (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:

Grade Level	Standards
	(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; (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,

Grade Level	Standards
	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. (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:

Grade Level	Standards
	(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.