Pacing Guide

Level 5 Module 1

EARTH PROCESSES
with Spotlight Lessons on Physical Properties of Matter

Each *PhD Science® Texas* Level 5 lesson requires 45 minutes of instructional time. This guide is intended for teachers who are providing in-person instruction. This guide presents lesson objectives and activities by concept and multiple pacing options to allow teachers to maximize instructional time while remaining responsive to student needs. Choose one or more options for each lesson. Note that pacing options do not omit parts of lessons. Teacher choice days are also included in this pacing guide to allow for review, reteaching, assessment, and extension activities.

Pacing Option Key

Lesson Split: This symbol identifies single lessons teachers may split across 2 days.

Cross-Curricular Activity: This symbol identifies parts of lessons teachers may incorporate during instructional time for other content areas, such as English, math, social and emotional learning, and center time. Teachers may implement these parts before or after science instruction; for example, if the class reads a *PhD Science* core text during English instruction, students can discuss the core text during science instruction rather than reading the full text during that time.

Investigation Preparation: This symbol identifies preparation the teacher may do in advance of an investigation. This advance preparation does not interfere with student learning.

Teacher Think Aloud: This symbol identifies activities that are appropriate for a teacher Think Aloud. Suggested primarily for use during station activities, this option allows completion of these activities as a class. During a teacher Think Aloud, the teacher assumes the role of a student and verbalizes the thought process of a student completing the activity to engage students with intentional questioning techniques. The teacher may also ask students to model appropriate procedures and participate in collaborative conversations.

Shared Media Experience: This symbol identifies media (e.g., videos, images) that the teacher may share with the whole class rather than having students view the media individually or in groups. After students observe the media as a class, they complete an activity.

Focal Point: This symbol identifies parts of lessons teachers should emphasize. For example, in an activity with multiple resources (e.g., videos, texts, charts), a focal point identifies the most important resources, thus ensuring the coherence of the lessons.

Instructional Note: This symbol identifies parts of lessons that have instructional notes that describe time-saving strategies. Examples of such instructional notes are Differentiation supports that provide sentence frames for writing assignments and Teacher Notes that suggest alternative activities.

Instructional Routine: This symbol identifies opportunities to use alternative instructional routines. See the Implementation Guide for information on instructional routines.

Module at a Glance

This module contains 25 lessons plus 7 spotlight lessons on Physical Properties of Matter. Even with lesson splits and teacher choice days, this module should take no more than 43 days to complete. This maximum number of days ensures the implementation of all Level 5 modules within a school year that has 150 days of science instruction.

Earth Processes

ANCHOR PHENOMENON:

Landscape of the Chihuahuan Desert

ESSENTIAL QUESTION:

What can the landscape of the Chihuahuan Desert reveal about changes to Earth's surface?

Concept	Recommended Number of Days	TEKS Alignment	ELPS Alignment
Concept 1 (Lessons 1–6): Earth's Water **Focus Question:** What can a desert reveal about Earth's water? Energy from the Sun affects weather by moving water from oceans to land in the water cycle.	6–7 days	3.6B, 3.6C, 3.11A, 4.10A, 4.10B, 4.10C, 5.1A, 5.1C, 5.1F, 5.1G, 5.3A, 5.5B, 5.5C, 5.5D, 5.5E, 5.5G, 5.6D, 5.10A, 5.10B, 5.10C, 5.11	3G, 4D, 4G
Concept 2 (Lessons 7–12): Earth's Landforms **Focus Question:** How has Earth's surface changed over time? Erosion and deposition of weathered sediment gradually shape landforms and change Earth's surface.	6–10 days	4.10B, 5.1B, 5.1C, 5.1E, 5.1F, 5.1G, 5.2A, 5.3A, 5.5A, 5.5B, 5.5C, 5.5G, 5.10C	4C, 4F, 4G
Concept 3 (Lessons 13–16): Earth's Materials **Focus Question:** What do natural materials reveal about changes to Earth's surface? Natural processes can gradually change sediment into sedimentary rock and plant and animal remains into fossil fuels.	4–6 days	4.6A, 4.6B, 4.11A, 4.11C, 5.1B, 5.1C, 5.1D, 5.1E, 5.1F, 5.1G, 5.2A, 5.3A, 5.3B, 5.3C, 5.5B, 5.5C, 5.5G, 5.6D, 5.10B, 5.10C	1E, 4C, 4F, 5B
Application of Concepts (Lessons 17–22): Engineering Challenge **Focus Question:** How can we conserve water in the Chihuahuan Desert? Humans can design solutions to reduce the impact on the environment from their use of natural resources.	6 days	3.11B, 3.11C, 4.11A, 5.1A, 5.1B, 5.1C, 5.1D, 5.1E, 5.1F, 5.1G, 5.2A, 5.2B, 5.2D, 5.3A, 5.3B, 5.3C, 5.4A, 5.4B, 5.5B, 5.5C, 5.5D, 5.5G, 5.10A, 5.11	1A, 4G, 5B

Concept	Recommended Number of Days	TEKS Alignment	ELPS Alignment
Applications of Concepts (Lessons 23–25): End-of-Module Socratic Seminar, Assessment, and Debrief **Essential Question:** What can the landscape of the Chihuahuan Desert reveal about changes to Earth's surface? Natural processes change Earth's surface and materials over time and can be affected by human activity.	3–4 days	5.1E, 5.1F, 5.1G, 5.3A, 5.3B, 5.3C, 5.5A, 5.5B, 5.5C, 5.5D, 5.5E, 5.5G, 5.6D, 5.10A, 5.10B, 5.10C, 5.11	1E

Spotlight Lessons on Physical Properties of Matter

Lesson Sets	Recommended Number of Days	TEKS Alignment	ELPS Alignment
Lessons 1–3: Physical Properties of Matter **Phenomenon Question:** What do environmental scientists need to know about the properties of pollution before it can be cleaned up? Physical properties can be used to describe and compare matter.	3–4 days	5.1C, 5.1D, 5.1E, 5.2C, 5.4A, 5.5B, 5.6A	1A
Lessons 4–5: Mixtures and Magnetism **Phenomenon Question:** What properties can we use to describe and remove pollution from water? A mixture is a combination of materials that retain their properties when mixed.	2–3 days	5.1C, 5.1D, 5.1E, 5.2B, 5.2C, 5.4A, 5.4B, 5.5B, 5.6A, 5.6B, 5.6C	2E, 3E
Lessons 6–7: Cleaning Plastic Pollution **Phenomenon Question:** How can environmental scientists clean microplastic pollution from the ocean? Properties of matter are observed, measured, and tested to compare matter samples in mixtures and solutions.	2–3 days	5.1E, 5.1G, 5.2C, 5.3A, 5.4A, 5.5B, 5.5G, 5.6A, 5.6B, 5.6C	4C

Year at a Glance

This year at a glance chart shows where all three modules fit in a year. To ensure completion of each module, it is recommended to teach science 5 days a week.

Module 1	Module 2	Module 3
August	November	February
September	December	March
October	January	April

MODULE 1

Earth Processes

CONCEPT 1

What can a desert reveal about Earth's water? 6–7 days

Lessons 1–2: Landscape of the Chihuahuan Desert

TEKS 3.11A, 4.10B, 5.10A, 5.10B, 5.10C, 5.11, 5.1A, 5.1F, 5.1G, 5.3A, 5.5B, 5.5G **ELPS** 4D, 4G

Lessons	Pacing Options
Lesson 1: Observe and describe features of the Chihuahuan Desert.	None
Lesson 2: Develop models of natural processes that have shaped the Chihuahuan Desert landscape.	**Day 1:** Launch through Develop Anchor Evidence Organizer **Day 2:** Identify Natural Resources of the Chihuahuan Desert through Land Think Aloud one landscape card in Develop Models of Chihuahuan Desert Features. Use an alternative collaborative conversation routine in Develop Models of Chihuahuan Desert Features.

Lessons 3–6: Mountains and Deserts

TEKS 3.6B, 3.6C, 4.10A, 4.10C, 5.6D, 5.10A, 5.1A, 5.1C, 5.1F, 5.1G, 5.3A, 5.5B, 5.5C, 5.5D, 5.5E **ELPS** 3G, 4G

Lessons	Pacing Options
Lesson 3: Develop models to show how the Sun and the oceans interact to move water through the water cycle.	Use first Teacher Note in Observe an Ocean Model.
Lesson 4: Develop a model of water particles in water vapor condensing to form a cloud.	Use a timer to pace drawings of model in Model Cloud Formation.
Lesson 5: Describe the effect of mountain ranges surrounding the Chihuahuan Desert on precipitation that falls in the desert.	Use an alternative instructional routine in Determine Effects of Rain Shadows on Weather.
Lesson 6: Explain how the water cycle and natural features create precipitation in the Great Lakes region.	**Conceptual Checkpoint**

CONCEPT 2

How has Earth's surface changed over time? 6–10 days

Lessons 7–9: Erosion

TEKS 4.10B, 5.10C, 5.1B, 5.1C, 5.1E, 5.1F, 5.1G, 5.2A, 5.3A, 5.5A, 5.5B, 5.5C, 5.5G **ELPS** 4C, 4F

Lessons	Pacing Options
Lesson 7: Observe how precipitation can form a river when it falls on land.	**Day 1:** Launch through Observe Mountain Model **Day 2:** Plan River Models through Land Think Aloud water observation in Launch. Use second Teacher Note in Observe Mountain Model. Use second Differentiation note in Observe Mountain Model. Use an alternative collaborative conversation routine in Land.
Lesson 8: Explore the effects of rivers on desert landscapes.	**Day 1:** Launch through Build and Observe River Models **Day 2:** Discuss River Model Results through Land Use an alternative instructional routine in Build and Observe River Models.
Lesson 9: Explain how water erosion forms different valleys than glacial erosion.	**Day 1:** Launch through Describe Valley Formation **Day 2:** Observe Glacier Model through Land Use an alternative collaborative conversation routine in Launch. Use inline Teacher Note in Land.

Lessons 10–12: Deposition

TEKS 4.10B, 5.10C, 5.1B, 5.1C, 5.1E, 5.1F, 5.1G, 5.3A, 5.5A, 5.5B, 5.5G **ELPS** 4G

Lessons	Pacing Options
Lesson 10: Observe how the deposition of sediment by a river results in the formation of a delta.	Use first Teacher Note in Launch.
Lesson 11: Observe how the deposition of sediment by wind results in the formation of sand dunes.	**Day 1:** Launch through Update Anchor Chart **Day 2:** Model Sand Dune Formation through Land
Lesson 12: Explain how erosion and deposition result in the formation of landforms in the Great Lakes region.	Use an alternative collaborative conversation routine in Launch. **Conceptual Checkpoint**

CONCEPT 3

What do natural materials reveal about changes to Earth's surface?

4–6 days

Lessons 13–14: Sedimentary Rock Formation

TEKS 4.6A, 4.6B, 5.6D, 5.10B, 5.10C, 5.1B, 5.1C, 5.1D, 5.1E, 5.1G, 5.2A, 5.3A, 5.5B, 5.5C, 5.5G **ELPS** 4C, 4F

Lessons	Pacing Options
Lesson 13: Use models to investigate how sedimentary rocks form.	Use Teacher Note in Launch.
Lesson 14: Develop a model to explain the processes that lead to the formation of sedimentary rocks.	**Day 1:** Launch through Update Sedimentary Rock Model **Day 2:** Read About Sedimentary Rocks through Land Use timer to pace model update in Update Sedimentary Rock Model.

Lessons 15–16: Formation of Fossil Fuels

TEKS 4.11A, 4.11C, 5.6D, 5.10B, 5.1E, 5.1F, 5.1G, 5.3A, 5.3B, 5.3C, 5.5B, 5.5G **ELPS** 1E, 5B

Lessons	Pacing Options
Lesson 15: Use models to explain the formation of fossil fuels.	**Day 1:** Launch through Gather Information About Fossil Fuels **Day 2:** Develop a Fossil Fuel Formation Model through Land Use third Teacher Note in Gather Information About Fossil Fuels.
Lesson 16: Explain how sedimentary rocks and fossil fuels formed in the Great Lakes region.	**Conceptual Checkpoint**

APPLICATION OF CONCEPTS

How can we conserve water in the Chihuahuan Desert? 6 days

Lessons 17–21: Engineering Challenge

TEKS 4.11A, 5.10A, 5.11, 5.1A, 5.1B, 5.1C, 5.1D, 5.1E, 5.1F, 5.1G, 5.2A, 5.2D, 5.3B, 5.3C, 5.4A, 5.4B, 5.5B, 5.5C, 5.5D, 5.5G
ELPS 4G, 5B

Lessons	Pacing Options
Lesson 17: Apply the engineering design process to design and test a sustainable irrigation system.	**Engineering Challenge**
Lesson 18: Apply the engineering design process to design and test a sustainable irrigation system.	Use second Teacher Note in Launch. **Engineering Challenge**
Lesson 19: Apply the engineering design process to design and test a sustainable irrigation system.	Use Differentiation note in Create and Test a Solution. **Engineering Challenge**
Lesson 20: Apply the engineering design process to design and test a sustainable irrigation system.	Use an alternative collaborative conversation routine in Improve and Retest Solutions. **Engineering Challenge**
Lesson 21: Apply the engineering design process to design and test a sustainable irrigation system.	Use first Differentiation note in Prepare to Share Solutions. Use Differentiation note in Share Solutions. **Engineering Challenge**

Lesson 22: Post-Engineering Challenge (Water Conservation)

TEKS 3.11B, 3.11C, 5.11, 5.1F, 5.2B, 5.3A, 5.5C **ELPS** 1A

Lessons	Pacing Options
Lesson 22: Evaluate the effectiveness of water conservation methods for increasing the water supply in Texas.	None

APPLICATION OF CONCEPTS

What can the landscape of the Chihuahuan Desert reveal about changes to Earth's surface? 3–4 days

Lessons 23–25: End-of-Module Socratic Seminar, Assessment, and Debrief

TEKS 5.6D, 5.10A, 5.10B, 5.10C, 5.11, 5.1E, 5.1F, 5.1G, 5.3A, 5.3B, 5.3C, 5.5A, 5.5B, 5.5C, 5.5D, 5.5E, 5.5G **ELPS** 1E

Lessons	Pacing Options
Lesson 23: Explain how natural processes change Earth's surface and materials and can be affected by human activity. (Socratic Seminar)	**Socratic Seminar**
Lesson 24: Explain how natural processes change Earth's surface and materials and can be affected by human activity. (End-of-Module Assessment)	**End-of-Module Assessment**
Lesson 25: Explain how natural processes change Earth's surface and materials and can be affected by human activity. (End-of-Module Assessment Debrief)	**End-of-Module Assessment Debrief**
Teacher Choice Day	Review, reteach, assess, or complete extension activities.

SPOTLIGHT LESSONS ON

Physical Properties of Matter

How can we use the properties of pollution to clean up the environment?

7–10 days

Lessons 1–3: Physical Properties of Matter

TEKS 5.6A, 5.1C, 5.1D, 5.1E, 5.2C, 5.4A, 5.5B **ELPS** 1A

Lessons	Pacing Options
Lesson 1: Describe matter by using observable properties.	Use first Teacher Note in Classify Observable Properties.
Lesson 2: Measure the mass and volume of solid, liquid, and gas samples.	**Day 1:** Launch through Measure Volume **Day 2:** Determine Mass and Volume of Gas through Land Use inline Teacher Note in Determine Mass. Use second Differentiation note in Determine Mass. Use inline Teacher Note in Measure Volume.
Lesson 3: Test and compare the density of different materials.	None

Lesson 4–5: Mixtures and Magnetism

TEKS 5.6A, 5.6B, 5.6C, 5.1C, 5.1D, 5.1E, 5.2B, 5.2C, 5.4A, 5.4B, 5.5B **ELPS** 2E, 3E

Lessons	Pacing Options
Lesson 4: Compare the properties of materials before and after mixing to determine that matter is conserved.	**Day 1:** Launch through Investigate Materials Before Mixing **Day 2:** Investigate Materials After Mixing through Land Use Differentiation note in Investigate Materials Before Mixing. Use English Language Development note in Investigate Materials Before Mixing.
Lesson 5: Investigate the properties of materials to determine that some physical properties remain the same after forming mixtures.	None

Lessons 6–7: Cleaning Plastic Pollution

TEKS 5.6A, 5.6B, 5.6C, 5.1E, 5.1G, 5.2C, 5.3A, 5.4A, 5.5B, 5.5G **ELPS** 4C

Lessons	Pacing Options
Lesson 6: Explain how the properties of matter are used to clean up microplastics in water. (End-of-Spotlight Assessment)	**End-of-Spotlight Assessment**
Lesson 7: Explain how the properties of matter are used to clean up microplastics in water. (End-of-Spotlight Debrief)	**End-of-Spotlight Debrief**
Teacher Choice Day	Review, reteach, assess, or complete extension activities. Optional Assessment: Benchmark 1

Texas Essential Knowledge and Skills (TEKS)

Content Standards

3.6 Matter and energy. The student knows that matter has measurable physical properties that determine how matter is identified, classified, changed, and used. The student is expected to

- **3.6B** 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; and
- **3.6C** predict, observe, and record changes in the state of matter caused by heating or cooling in a variety of substances such as ice becoming liquid water, condensation forming on the outside of a glass, or liquid water being heated to the point of becoming water vapor (gas).

3.11 Earth and space. The student understands how natural resources are important and can be managed. The student is expected to

- **3.11A** explore and explain how humans use natural resources such as in construction, in agriculture, in transportation, and to make products;
- **3.11B** explain why the conservation of natural resources is important; and
- **3.11C** identify ways to conserve natural resources through reducing, reusing, or recycling.

4.6 Matter and energy. The student knows that matter has measurable physical properties that determine how matter is identified, classified, changed, and used. The student is expected to

- **4.6A** classify and describe matter using observable physical properties, including temperature, mass, magnetism, relative density (the ability to sink or float in water), and physical state (solid, liquid, gas); and
- **4.6B** investigate and compare a variety of mixtures, including solutions that are composed of liquids in liquids and solids in liquids.

4.10 Earth and space. The student knows that there are processes on Earth that create patterns of change. The student is expected to

- **4.10A** 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;
- **4.10B** model and describe slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice; and
- **4.10C** differentiate between weather and climate.

4.11 Earth and space. The student understands how natural resources are important and can be managed. The student is expected to

- **4.11A** identify and explain advantages and disadvantages of using Earth's renewable and nonrenewable natural resources such as wind, water, sunlight, plants, animals, coal, oil, and natural gas; and
- **4.11C** determine the physical properties of rocks that allow Earth's natural resources to be stored there.

5.6 Matter and energy. The student knows that matter has measurable physical properties that determine how matter is identified, classified, changed, and used. The student is expected to

- **5.6A** compare and contrast matter based on measurable, testable, or observable physical properties, including mass, magnetism, relative density (sinking and floating using water as a reference point), physical state (solid, liquid, gas), volume, solubility in water, and the ability to conduct or insulate thermal energy and electric energy;
- **5.6B** demonstrate and explain that some mixtures maintain physical properties of their substances such as iron filings and sand or sand and water;

5.6C compare the properties of substances before and after they are combined into a solution and demonstrate that matter is conserved in solutions; and

5.6D illustrate how matter is made up of particles that are too small to be seen such as air in a balloon.

5.10 Earth and space. The student knows that there are recognizable patterns and processes on Earth. The student is expected to

5.10A explain how the Sun and the ocean interact in the water cycle and affect weather;

5.10B model and describe the processes that led to the formation of sedimentary rocks and fossil fuels; and

5.10C model and identify how changes to Earth's surface by wind, water, or ice result in the formation of landforms, including deltas, canyons, and sand dunes.

5.11 Earth and space. The student understands how natural resources are important and can be managed. The student is expected to

5.11 design and explain solutions such as conservation, recycling, or proper disposal to minimize environmental impact of the use of natural resources.

Scientific and Engineering Practices

5.1 Scientific and Engineering Practices. The student asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to

- **5.1A** ask questions and define problems based on observations or information from text, phenomena, models, or investigations;
- **5.1B** use scientific practices to plan and conduct descriptive and simple experimental investigations and use engineering practices to design solutions to problems;
- **5.1C** demonstrate safe practices and the use of safety equipment during classroom and field investigations as outlined in Texas Education Agency–approved safety standards;
- **5.1D** use tools, including calculators, microscopes, hand lenses, metric rulers, Celsius thermometers, prisms, concave and convex lenses, laser pointers, mirrors, digital scales, balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, notebooks, timing devices, materials for building circuits, materials to support observations of habitats or organisms such as terrariums and aquariums, and materials to support digital data collection such as computers, tablets, and cameras to observe, measure, test, and analyze information;
- **5.1E** collect observations and measurements as evidence;
- **5.1F** construct appropriate graphic organizers used to collect data, including tables, bar graphs, line graphs, tree maps, concept maps, Venn diagrams, flow charts or sequence maps, and input-output tables that show cause and effect; and
- **5.1G** develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem.

5.2 Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to

- **5.2A** identify advantages and limitations of models such as their size, scale, properties, and materials;
- **5.2B** analyze data by identifying any significant features, patterns, or sources of error;
- **5.2C** use mathematical calculations to compare patterns and relationships; and
- **5.2D** evaluate experimental and engineering designs.

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

- **5.3A** develop explanations and propose solutions supported by data and models;
- **5.3B** communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
- **5.3C** listen actively to others' explanations to identify relevant evidence and engage respectfully in scientific discussion.

5.4 Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation for society. The student is expected to

- **5.4A** explain how scientific discoveries and innovative solutions to problems impact science and society and
- **5.4B** research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field to investigate STEM careers.

Recurring Themes and Concepts

5.5 Recurring Themes and Concepts. The student understands that recurring themes and concepts provide a framework for making connections across disciplines. The student is expected to

- **5.5A** identify and use patterns to explain scientific phenomena or to design solutions;
- **5.5B** identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems;
- **5.5C** use scale, proportion, and quantity to describe, compare, or model different systems;
- **5.5D** examine and model the parts of a system and their interdependence in the function of the system;
- **5.5E** investigate how energy flows and matter cycles through systems and how matter is conserved; and
- **5.5G** explain how factors or conditions impact stability and change in objects, organisms, and systems.

English Language Proficiency Standards (ELPS)

- **1A** Use prior knowledge and experiences to understand meanings in English.
- **1E** Internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment.
- **2E** Use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language.
- **3E** Share information in cooperative learning interactions.
- **3G** Express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics.
- **4C** Develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials.
- **4D** Use prereading supports such as graphic organizers, illustrations, and pretaught topic-related vocabulary and other prereading activities to enhance comprehension of written text.
- **4F** Use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language.
- **4G** Demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade-level needs.
- **5B** Write using newly acquired basic vocabulary and content-based grade-level vocabulary.