Pacing Guide

Level 5 Module 2

Ecosystems

Each *PhD Science® TEKS Edition* 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.

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.

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

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.

Daily Video: This symbol identifies specific Level 3 and Level 4 lessons on the digital platform that review readiness standards for the module. Resources within the digital platform to support these lessons include the Learn Anywhere Plan, Daily Videos, Science Journal, and Science Journal Support.

Module at a Glance

This module contains 29 lessons and 3 spotlight lessons about Weather and Climate. Even with lesson splits, this module should take no more than 49 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.

Ecosystems

Anchor Phenomenon: Life Around a Mangrove Tree Essential Question: How can trees support so much life?	**Recommended Number of Days**	**TEKS and ELPS Alignment**
Concept 1 (Lessons 1–7): Plant Matter **Focus Question:** How do plants grow? Plants get the matter they need for growth from air and water.	8–13 days	3.9A, 5.2A, 5.2B, 5.2C, 5.2D, 5.2F, 5.2G, 5.3A, 5.3B, 5.4, 5.9A, 5.9B, 5.10A ELPS: 3F, 3G, 3H, 4A, 5F
Concept 2 (Lessons 8–17): Life's Matter **Focus Question:** Where does life's matter come from? Life's matter moves between plants, animals, decomposers, and the environment as it cycles through an ecosystem.	11–16 days	3.9A, 4.7A, 5.2A, 5.2B, 5.2C, 5.2D, 5.2F, 5.2G, 5.3A, 5.3B, 5.4, 5.9A, 5.9B, 5.10A, 5.10B ELPS: 1C, 3E, 3J, 3H, 4A, 5F
Concept 3 (Lessons 18–22): Life's Energy **Focus Question:** Where does life's energy come from? Life's energy can be traced from the Sun to plants and then to animals and decomposers as it flows through an ecosystem.	6–8 days	3.9A, 5.2B, 5.2C, 5.2D, 5.2F, 5.2G, 5.3A, 5.3B, 5.3C, 5.4, 5.9A, 5.9B, 5.9C, 5.10A ELPS: 2E, 4K, 5G
Application of Concepts (Lessons 23–26): Engineering Challenge **Phenomenon Question:** How can we reduce the damage an invasive species causes to an ecosystem? Reducing the impact of invasive species can protect the balance of an ecosystem.	4–5 days	3.9A, 5.2B, 5.2C, 5.2D, 5.2F, 5.2G, 5.3A, 5.3B, 5.3C, 5.4, 5.9A, 5.9C ELPS: 3E, 4J, 5F
Application of Concepts (Lessons 27–29): End-of-Module Socratic Seminar, Assessment, and Debrief **Essential Question:** How can trees support so much life? Ecosystems support the needs of living things as matter and energy move between organisms and the environment.	3 days	3.9A, 5.2F, 5.3A, 5.3B, 5.4, 5.9A, 5.9B, 5.9C ELPS: 3F, 5G

Spotlight Lessons on Weather and Climate

Lesson Sets	Recommended Number of Days	TEKS and ELPS Alignment
Lessons 1–2: Seasonal Weather Patterns **Phenomenon Question:** Does weather follow the same pattern every year? Climate remains relatively stable over time.	2 days	4.8A, 4.8C, 5.2C, 5.2D, 5.2F, 5.2G, 5.4, 5.8A ELPS: 1A, 2I
Lesson 3: The Water Cycle **Phenomenon Question:** What causes rain clouds to form? The Sun and the ocean interact to form rain clouds as part of the water cycle.	2 days	3.5C, 4.8B, 5.2D, 5.3B, 5.8B ELPS: 4A

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 five days a week.

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Module 1			Module 2			Module 3				

Level 5 Considerations

Teacher Choice Days

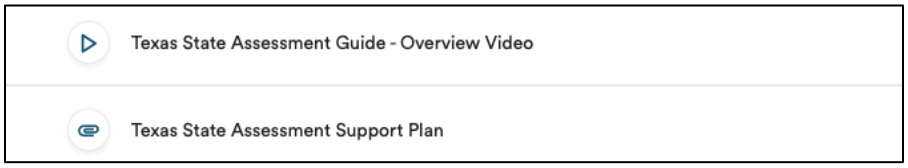
Teacher choice days are included in the pacing guide to reteach or review to help prepare students for the **Texas State Assessment for Level 5**.

TEKS and Texas State Assessment

The TEKS addressed in this module are included at the end of this document.

This symbol is used in the pacing guide to indicate lessons with review content to prepare students for the **Texas State Assessment for Level 5.**

Refer to the **Texas State Assessment Support Plan** for additional information on planning for the **Texas State Assessment for Level 5**. This plan as well as an overview video can be found on Great Minds' digital platform.



Module 2: Ecosystems

Concept 1: How do plants grow? 8–13 days

Focus Standards

5.9A Observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components.

5.9B Describe the flow of energy within a food web, including the roles of the Sun, producers, consumers, and decomposers.

5.10A 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.

Review Standards

3.9A Observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem.

Lessons 1–2: Life around One Tree		**Lessons 3–5: Seed to Tree**	
Lesson 1: Observe an ecosystem containing a tree.	**Lesson 2:** Develop a model of feeding interactions among organisms.	**Lesson 3:** Design a fair test to determine factors that affect plant growth.	**Lesson 4:** Plan and conduct an investigation to determine how plants get matter for growth.
Day 1: Launch through Read and Discuss *The Mangrove Tree* (Roth and Trumbore 2011) **Day 2:** Explore Organism Interactions through Land	**Day 1:** Launch through Model Organism Interactions **Day 2:** Develop Anchor Model through Land	**Day 1:** Launch through Develop Initial Claim **Day 2:** Develop Fair Test Criteria through Land	Weigh soil and place in bottles before the lesson.
Read *The Mangrove Tree* before the lesson.		Use Differentiation note in Develop Initial Claim.	

Lessons 3–5: Seed to Tree	Lessons 6–7: Gas Exchange		Teacher Choice Day
Lesson 5: Use evidence to argue that plants use matter from air and water to form plant tissue.	**Lesson 6:** Model the chemical process that enables plants to form new tissue.	**Lesson 7:** Describe the exchange of gases between organisms and the environment.	**Objective:** Support mastery of 3.9A.
Have groups measure plant growth in Launch before the lesson.	**Day 1:** Launch through Read About Plant Interactions with Air **Day 2:** Revise Model of Plant Tissue Formation through Land	**Day 1:** Launch through Update Anchor Model **Day 2:** Conceptual Checkpoint through Land	**Reteach or review day to help prepare students for the Texas State Assessment for Level 5.**
Use an alternative collaborative conversation routine in Gather Evidence of Plant Matter Sources.		Use an alternative collaborative conversation routine in Demonstrate Animal Breathing. **Conceptual Checkpoint**	

Concept 2: Where does life's matter come from? 11–16 days

Focus Standards

5.9A Observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components.

5.9B Describe the flow of energy within a food web, including the roles of the Sun, producers, consumers, and decomposers.

5.10A 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.

5.10B 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.

Review Standards

3.9A Observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem.

4.7A Examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants.

Lessons 8–9: Movement of Matter		Lessons 10–12: Survival	
Lesson 8: Make a claim about how animals use matter from the environment.	**Lesson 9:** Model the movement of matter in the environment from plants to animals.	**Lesson 10:** Model animals' characteristics to determine how they enable the animals to survive in their environment.	**Lesson 11:** Analyze plants' characteristics to determine how they enable the plants to survive in their environment.
Day 1: Launch through Develop Initial Claim **Day 2:** Examine Historical Yellowstone Data through Land	**Day 1:** Launch through Model Feeding Interactions **Day 2:** Update Anchor Model through Land	**Day 1:** Launch through Model Bird Beaks **Day 2:** Identify Animals' Environments through Land	Share videos and allow students to record observations and evidence in Analyze Plants in Different Environments.
Use Differentiation note in Develop Initial Claim.	Use an alternative collaborative conversation routine in Launch.		Use Differentiation note in Land.

Lessons 10–12: Survival	Lessons 13–14: Decomposition		Lessons 15–16: Decomposers and the Environment
Lesson 12: Analyze characteristics of young and adult animals to describe and identify innate and learned behaviors.	**Lesson 13:** Make a claim supported by evidence about how mold grows.	**Lesson 14:** Explain how decomposers recycle matter in an ecosystem.	**Lesson 15:** Use evidence to make a claim about the presence of decomposers in sand and soil.
	Share visual of raspberries after purchase and allow students to make observations and record raspberry weight in Observe Mold on Raspberries.		Use an alternative collaborative conversation routine in Discuss Sand and Soil Formation.
Lessons 15–16: Decomposers and the Environment	**Lesson 17: Matter Cycling**	**Teacher Choice Day**	
Lesson 16: Gather and analyze data to compare the amount of nutrients in sand and soil.	**Lesson 17:** Model and explain how matter cycles among plants, animals, decomposers, and the environment.	**Objective:** Support mastery of 4.7A.	
Day 1: Launch through Study Nutrient-Deficient Plants **Day 2:** Analyze Data through Land Use Differentiation note in Read About Nutrients and Growth.	**Day 1:** Launch through Model Movement of Matter **Day 2:** Update Anchor Model through Land **Conceptual Checkpoint**	Use digital platform resources to review Level 4 Module 3 Lessons 11 and 12 Daily Videos. **Reteach or review day to help prepare students for the Texas State Assessment for Level 5.**	

Concept 3: Where does life's energy come from? 6–8 days

Focus Standards

5.9A Observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components.

5.9B Describe the flow of energy within a food web, including the roles of the Sun, producers, consumers, and decomposers.

5.9C Predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.

5.10A 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.

Review Standards

3.9A Observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem.

Lessons 18–20: Food and Energy Reteach or review day to help prepare students for the Texas State Assessment for Level 5.			**Lessons 21–22: Sunlight**
Lesson 18: Use evidence to support the claim that food is a source of both matter and energy.	**Lesson 19:** Identify ways that animals use energy from food.	**Lesson 20:** Analyze data to determine that animals can store energy from food for later use.	**Lesson 21:** Gather evidence to support the claim that plants harness energy from sunlight.
Use second Differentiation note in Identify Relationships. Use an alternative collaborative conversation routine in Land.	**Day 1:** Launch through Gather Evidence **Day 2:** Support Claims with Evidence through Land Use Differentiation note in Support Claims with Evidence.		Use an alternative collaborative conversation routine in Read *Living Sunlight* (Bang and Chisholm 2009). Share *Living Sunlight* under document camera as students record evidence in Support Claims with Evidence.

Lessons 21–22: Sunlight	Teacher Choice Day
Lesson 22: Model the flow of energy through an ecosystem.	**Objective:** Support mastery of 3.9A.
Day 1: Launch through Update Anchor Chart **Day 2:** Conceptual Checkpoint through Land	Use digital platform resources to review Level 3 Module 2 Lessons 11 and 12 Daily Videos.
Conceptual Checkpoint	**Reteach or review day to help prepare students for the Texas State Assessment for Level 5.**

Engineering Challenge: How can we reduce the damage an invasive species causes to an ecosystem? 4–5 days

Focus Standards

5.9A Observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components.

5.9C Predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.

Review Standards

3.9A Observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem.

Lesson 23: Ecosystem Balance	Lessons 24–26: Reducing the Impact of Invasive Species		
☆ **Lesson 23:** Explain how an organism can affect the ability of other organisms to meet their needs.	☆ **Lesson 24:** Apply the engineering design process to research, propose, and improve solutions to reduce the impact of an invasive species on an ecosystem.	☆ **Lesson 25:** Apply the engineering design process to research, propose, and improve solutions to reduce the impact of an invasive species on an ecosystem.	☆ **Lesson 26:** Apply the engineering design process to research, propose, and improve solutions to reduce the impact of an invasive species on an ecosystem.
Day 1: Launch through Learn About the Emerald Ash Borer **Day 2:** Analyze Ash Tree Data through Land	**Engineering Challenge**	**Engineering Challenge**	Use Teacher Note in Share a Design Solution. **Engineering Challenge**

Application of Concepts: How can trees support so much life? 3 days

Focus Standards

5.9A Observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components.

5.9B Describe the flow of energy within a food web, including the roles of the Sun, producers, consumers, and decomposers.

5.9C Predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.

Review Standards

3.9A Observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem.

<table>
<tr><th colspan="3">Lessons 27–29: The Cycle of Life</th></tr>
<tr><td>☆ Lesson 27: Explain the cycle of matter and flow of energy through organisms and ecosystems.</td><td>☆ Lesson 28: Explain the cycle of matter and flow of energy through organisms and ecosystems.</td><td>☆ Lesson 29: Explain the cycle of matter and flow of energy through organisms and ecosystems.</td></tr>
<tr><td>Use English Language Development note in Engage in Socratic Seminar.</td><td rowspan="2">End-of-Module Assessment</td><td rowspan="2">End-of-Module Assessment Debrief</td></tr>
<tr><td>Socratic Seminar</td></tr>
</table>

Spotlight Lessons: Weather and Climate

Focus Standards: 4 days

5.8A Differentiate between weather and climate; and

5.8B Explain how the Sun and the ocean interact in the water cycle.

Review Standards

3.5C 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.

4.8A Measure, record, and predict changes in weather.

4.8B 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.

4.8C Collect and analyze data to identify sequences and predict patterns of change in shadows, seasons, and the observable appearance of the Moon over time.

Lessons 1–2: Seasonal Weather Patterns		**Lesson 3: The Water Cycle**	**Teacher Choice Day**
Lesson 1: Establish a routine to collect daily weather data.	**Lesson 2:** Analyze historical weather data to determine that climate remains relatively stable over time.	**Lesson 3:** Explain how the Sun and the ocean interact to form rain clouds as part of the water cycle.	☆ **Objective:** Support mastery of 3.5C, 4.8A, 4.8B, and 4.8C.
	Use Differentiation note in Introduce Historical Weather Graphs.		**Reteach or review day to help prepare students for the Texas State Assessment for Level 5.**

Texas Essential Knowledge and Skills (TEKS)

Focus Standards	
3.5	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
	3.5C 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.
3.9	Organisms and environments. The student knows and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to
	3.9A observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem.
4.7	Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to
	4.7A examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants.
4.8	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
	4.8A measure, record, and predict changes in weather;
	4.8B 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
	4.8C collect and analyze data to identify sequences and predict patterns of change in shadows, seasons, and the observable appearance of the Moon over time.
5.8	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
	5.8A differentiate between weather and climate; and
	5.8B explain how the Sun and the ocean interact in the water cycle.
5.9	Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to
	5.9A observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components;
	5.9B describe the flow of energy within a food web, including the roles of the Sun, producers, consumers, and decomposers; and
	5.9C predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.

5.10	Organisms and environments. The student knows that organisms have structures and behaviors that help them survive within their environments. The student is expected to
	5.10A 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.
	5.10B 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.
	Investigation and Reasoning Standards
5.1	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
	5.1A 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
	5.1B make informed choices in the conservation, disposal, and recycling of materials.
5.2	Scientific investigation and reasoning. The student uses scientific practices during laboratory and outdoor investigations. The student is expected to
	5.2A describe, plan, and implement simple experimental investigations testing one variable;
	5.2B ask well defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology;
	5.2C collect and record information using detailed observations and accurate measuring;
	5.2D analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence;
	5.2F communicate valid conclusions in both written and verbal forms; and
	5.2G construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.
5.3	Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to
	5.3A analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing;
	5.3B 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
	5.3C connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.
5.4	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
	5.4 collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, prisms, mirrors, balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices; and materials to support observations of habitats or organisms such as terrariums and aquariums.