

Pacing Guide

Level 4 Module 2

Traits

Each *PhD Science® TEKS Edition* Level 4 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.

Module at a Glance

This module contains 28 lessons and 6 spotlight lessons about Weather and Sky. Even with lesson splits, this module should take no more than 45 days to complete. This maximum number of days ensures the implementation of all Level 4 modules within a school year that has 150 days of science instruction.

Traits

Anchor Phenomenon: Individual Variation in Humpback Whales Essential Question: What makes an individual humpback whale unique?	Recommended Number of Days	TEKS and ELPS Alignment
Concept 1 (Lessons 1–6): Describing Organisms Focus Question: How can we identify individuals? Individuals of the same species have the same characteristics but can have different traits.	6–9 days	4.2A, 4.2B, 4.2C, 4.2D, 4.2F, 4.3A, 4.3C, 4.4, 4.10A, 4.10B ELPS: 2E, 3B, 3H, 4A
Concept 2 (Lessons 7–11): Growth, Development, and Environmental Influences Focus Question: How do individuals change over time? Traits can be influenced by growth and development and interactions between an individual and its environment.	5–7 days	4.2A, 4.2B, 4.2C, 4.2D, 4.2F, 4.3A, 4.3B, 4.4, 4.10B, 4.10C ELPS: 3E, 3F, 3J
Application of Concepts (Lessons 12–13): Science Challenge Phenomenon Question: How does the water in a plant’s environment influence the plant’s traits? Different environmental conditions can influence the development of an individual’s traits in different ways.	2–3 days	4.2A, 4.2B, 4.2C, 4.4, 4.10A, 4.10B ELPS: 1C, 3G
Concept 3 (Lessons 14–18): Inherited Traits Focus Question: How do individuals get their traits? Individuals inherit traits from both parents. Different individuals inherit different combinations of traits.	5–6 days	4.2A, 4.2B, 4.2C, 4.2D, 4.2F, 4.3A, 4.3C, 4.4, 4.10B ELPS: 3B, 3D, 5G
Application of Concepts (Lessons 19–20): Science Challenge Phenomenon Question: How does the water in a plant’s environment influence the plant’s traits? An individual’s inherited traits can be influenced by interactions between the individual and its environment.	2–3 days	4.2B, 4.2C, 4.2D, 4.2E, 4.2F, 4.3A, 4.4, 4.10B ELPS: 3H

<p>Concept 4 (Lessons 21–25): Advantages of Traits</p> <p>Focus Question: How do individuals’ traits affect their lives?</p> <p>Some traits provide individuals with advantages in surviving and reproducing. These advantageous traits help a species’ life cycle continue.</p>	<p>5–8 days</p>	<p>4.2A, 4.2B, 4.2C, 4.2D, 4.2E, 4.2F, 4.3A, 4.3B, 4.3C, 4.4, 4.10A, 4.10B, 4.10C</p> <p>ELPS: 1F, 2E, 3G, 3J, 4J</p>
<p>Application of Concepts (Lessons 26–28): End-of-Module Socratic Seminar, Assessment, and Debrief</p> <p>Essential Question: What makes an individual humpback whale unique?</p> <p>Traits are influenced by inheritance, growth and development, and interactions between an individual and its environment. Some traits provide an individual with advantages in surviving and reproducing.</p>	<p>3 days</p>	<p>4.2B, 4.2D, 4.2F, 4.3A, 4.10A, 4.10B, 4.10C</p> <p>ELPS 3F, 5G</p>

Spotlight Lessons on Weather and Sky

Lesson Sets	Recommended Number of Days	TEKS and ELPS Alignment
<p>Lessons 1–3: Weather and Patterns</p> <p>Phenomenon Question: How does the weather change throughout a year?</p> <p>Seasonal changes in weather conditions occur throughout a year.</p>	<p>3 days</p>	<p>4.2B, 4.4, 4.5A, 4.8A, 4.8C</p> <p>ELPS: 1A, 1C</p>
<p>Lessons 4–5: Change in Shadows</p> <p>Phenomenon Question: Why do shadows change?</p> <p>The appearance of a shadow can change depending on the time of day.</p>	<p>2–3 days</p>	<p>4.2D, 4.2F, 4.8C</p> <p>ELPS: 3F</p>
<p>Lesson 6: Shape of the Moon</p> <p>Phenomenon Question: How can we predict what the Moon will look like?</p> <p>The observable appearance of the Moon changes in a predictable pattern each month.</p>	<p>1 days</p>	<p>4.2D, 4.8C</p> <p>ELPS: 3J</p>










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				






Module 2: Traits






Concept 1: How can we identify individuals?			6-9 days
Focus Standards			
<p>4.10A Explore how structures and functions enable organisms to survive in their environment.</p> <p>4.10B 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.</p>			
Lessons 1–3: Whale Watching			Lessons 4–6: Individuals and Their Traits
Lesson 1: Ask questions based on observations of humpback whales.	Lesson 2: Classify organisms of the same species based on their characteristics.	Lesson 3: Ask questions about the traits of individual humpback whales.	Lesson 4: Analyze data to describe the relationship between characteristics and traits.
<p> Day 1: Launch through Read About Humpback Whales</p> <p>Day 2: Observe Whales through Land</p>	<p> Use Differentiation note in Sort Other Organisms by Species.</p> <p> Draw humpback whale diagram in Identify Humpback Whale Characteristics before the lesson.</p> <p> Use a timer to pace the drawing of whale diagrams in Identify Humpback Whale Characteristics.</p>	<p> Day 1: Launch through Describe Individual Humpback Whales</p> <p>Day 2: Develop Anchor Evidence Organizer through Land</p> <p> Use a timer to pace the completion of whale drawings in Describe Individual Humpback Whales.</p>	<p> Use first Teacher Note in Launch</p> <p> Think aloud one station in Observe Traits at Species Stations.</p> <p> Display humpback whale pictures and northern leopard frog pictures while students record their observations in Observe Traits at Species Stations.</p>



Lessons 4–6: Individuals and Their Traits	
Lesson 5: Support a claim that individuals of the same species have the same characteristics but can have different traits.	Lesson 6: Describe differences between individuals of the same species.
 Use an alternative collaborative conversation routine in Observe and Discuss Traits at Species Stations.	 Day 1: Launch through Update Anchor Evidence Organizer Day 2: Conceptual Checkpoint through Land
 Use Differentiation note in Land.	Conceptual Checkpoint








Concept 2: How do individuals change over time?		5-7 days	
Focus Standards			
<p>4.10B 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.</p> <p>4.10C Explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans.</p>			
Lessons 7–8: Growth and Development		Lessons 9–11: Environmentally Influenced Traits	
Lesson 7: Describe patterns in the processes that all individuals go through during their lives.	Lesson 8: Analyze data to describe how growth and development affect the traits of individuals.	Lesson 9: Model changes in an individual’s traits.	Lesson 10: Explain how interactions between an individual and its environment can influence the individual’s traits.
 Use a timer to pace the comparison of card sequences in Compare Organism Card Sequences.	 Day 1: Launch through Observe Rabbits’ Growth and Development Day 2: Observe Chickens’ Growth and Development through Land  Think aloud timeline in Observe Rabbits’ Growth and Development.	 Use a timer to pace station work in Visit Trait Influence Stations.  Think aloud one station in Visit Trait Influence Stations.	 Use a timer to pace station work in Visit Trait Influence Stations.
Lessons 9–11: Environmentally Influenced Traits			
Lesson 11: Identify and describe traits influenced by growth and development and by interactions between an individual and its environment.			
 Day 1: Launch through Update Anchor Evidence Organizer Day 2: Conceptual Checkpoint through Land			
Conceptual Checkpoint			




<p>Science Challenge: How does the water in a plant’s environment influence the plant’s traits? 2 days</p>	
<p>Focus Standards</p>	
<p>4.10A Explore how structures and functions enable organisms to survive in their environment.</p>	
<p>4.10B 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.</p>	
<p>Lessons 12–13: Science Challenge</p>	
<p>Lesson 12: Plan a fair test to determine how different water conditions influence a plant’s traits.</p>	<p>Lesson 13: Set up and conduct an investigation to determine how different water conditions influence a plant’s traits.</p>
<p> Day 1: Launch through Develop Fair Test Guidelines</p> <p>Day 2: Discuss Investigation Ideas through Land</p>	<p> Label plants with each group’s number or with the names of each group member before the lesson.</p> <p> Use a timer to pace plant observations in Observe and Record Data: Day 1.</p>



Concept 3: How do individuals get their traits?				5-6 days
Focus Standards				
4.10B 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.				
Lessons 14–15: Inherited Traits in Offspring		Lessons 16–18: Inherited Traits in Siblings		
Lesson 14: Make a claim that offspring inherit traits from both parents.	Lesson 15: Collect evidence to determine whether plant offspring inherit traits from both parents.	Lesson 16: Analyze data to explain that siblings inherit different combinations of traits from their parents.	Lesson 17: Use evidence to support an argument in which an individual’s family members are identified based on patterns of inherited traits.	
 Use second Differentiation note in Observe Finch Family Traits.	 Use second Teacher note in Observe Plant Parents and Offspring.	 Use first suggestion in Differentiation note in Record Traits of Finch Families.	 Use Differentiation note in Examine Frog Families.	
Lessons 16–18: Inherited Traits in Siblings				
Lesson 18: Identify inherited traits and explain how inheritance contributes to variation within a species.				
 Day 1: Launch through Conceptual Checkpoint Day 2: Update Anchor Evidence Organizer through Land				
Conceptual Checkpoint				

<p>Science Challenge: How does the water in a plant’s environment influence the plant’s traits? 2-3 days</p> <p>Focus Standards</p> <p>4.10B 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.</p>	
<p>Lessons 19–20: Science Challenge</p>	
<p>Lesson 19: Analyze data to draw conclusions about how different water conditions influence a plant’s traits.</p>	<p>Lesson 20: Support a claim with evidence that a plant’s inherited traits can be influenced by the plant’s environment.</p>
<p> Day 1: Launch through Analyze Investigation Data</p> <p>Day 2: Compare Investigation Results through Land</p>	<p> Use a timer to pace the reviewing of data in Gather Evidence to Support or Refute a Claim.</p>

<p>Concept 4: How do individuals’ traits affect their lives?</p>			<p>5-8 days</p>
<p>Focus Standards</p>			
<p>4.10A Explore how structures and functions enable organisms to survive in their environment.</p>			
<p>4.10B 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.</p>			
<p>4.10C Explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans.</p>			
<p>Lessons 21–22: Traits That Provide an Advantage</p>		<p>Lessons 23–25: Life Cycles and Reproduction</p>	
<p>Lesson 21: Identify traits that provide an individual with an advantage.</p>		<p>Lesson 22: Explain how an advantageous trait can affect an individual’s survival.</p>	
<p>Lesson 23: Explain how having an advantageous trait can affect an individual’s ability to reproduce.</p>		<p>Lesson 24: Analyze evidence to explain that certain traits can provide an individual with an advantage in finding a mate.</p>	
<p> Think aloud one station in Visit Trait Function Stations.</p>	<p> Day 1: Launch through Model Predator and Prey Day 2: Discuss Results through Land</p>	<p> Day 1: Launch through Share Results Day 2: Develop Life Cycle Model through Land</p> <p> Use an alternative collaborative conversation routine in Share Results.</p>	<p> Think aloud Southern Elephant Seal Station in Prepare to Visit Reproductive Success Stations.</p>
<p> Use second Differentiation note in Visit Trait Function Stations.</p>			
<p>Lessons 23–25: Life Cycles and Reproduction</p>			
<p>Lesson 25: Construct an explanation for how different traits can provide individuals with advantages in surviving, finding mates, and reproducing.</p>			
<p> Day 1: Launch through Update Anchor Chart and Anchor Evidence Organizer Day 2: Conceptual Checkpoint through Land</p>			
<p>Conceptual Checkpoint</p>			

<p>Application of Concepts: What makes an individual humpback whale unique? 3 days</p> <p>Focus Standards</p> <p>4.10A Explore how structures and functions enable organisms to survive in their environment.</p> <p>4.10B 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.</p> <p>4.10C Explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans.</p>		
<p>Lessons 26–28: Individual Variation in Humpback Whales</p>		
<p>Lesson 26: Describe factors that influence traits and explain how traits affect an individual’s life.</p>	<p>Lesson 27: Describe factors that influence traits and explain how traits affect an individual’s life.</p>	<p>Lesson 28: Describe factors that influence traits and explain how traits affect an individual’s life.</p>
<p> Use English Language Development Note in Engage in Socratic Seminar.</p>	<p>End-of-Module Assessment</p>	<p>End-of-Module Debrief</p>
<p>Socratic Seminar</p>		

Spotlight Lessons: Weather and Sky

Focus Standards:			6-7 days
4.5A	Measure, compare, and contrast physical properties of matter, including mass, volume, states (solid, liquid, gas), temperature, magnetism, and the ability to sink or float.		
4.8A	Measure, record, and predict changes in weather.		
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 1–3: Weather and Patterns			Lessons 4–5: Change in Shadows
Lesson 1: Develop data collection routines to gather information about daily weather conditions.	Lesson 2: Analyze yearlong temperature and precipitation data to describe seasonal weather trends.	Lesson 3: Use knowledge of seasonal weather patterns to make a prediction about weather conditions.	Lesson 4: Use a model to collect data about the appearance of shadows.
	 Use Content Area Connection: Mathematics in Analyze Weather Data.		
Lessons 4–5: Change in Shadows		Lesson 6: Shape of the Moon	
Lesson 5: Predict the appearance of a shadow at a given time of day.		Lesson 6: Identify patterns in the observable appearance of the Moon and use these patterns to make a prediction.	
 Day 1: Launch through Observe Shadows and Identify Patterns	Day 2: Make a Prediction About Shadows through Land		

Texas Essential Knowledge and Skills (TEKS)

Focus Standards
<p>4.10 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</p> <ul style="list-style-type: none"> 4.10A explore how structures and functions enable organisms to survive in their environment; 4.10B 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 4.10C explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans.
Investigation and Reasoning Standards
<p>4.1 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</p> <ul style="list-style-type: none"> 4.1A 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 4.1B 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. <p>4.2 Scientific investigation and reasoning. The student uses scientific practices during laboratory and outdoor investigations. The student is expected to</p> <ul style="list-style-type: none"> 4.2A 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; 4.2B 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; 4.2C construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data; 4.2D analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured; 4.2E perform repeated investigations to increase the reliability of results; and 4.2F communicate valid oral and written results supported by data. <p>4.3 Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to</p> <ul style="list-style-type: none"> 4.3A analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing; 4.3B represent the natural world using models such as the water cycle and stream tables and identify their limitations, including accuracy and size; and 4.3C connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

4.4 Scientific investigation and reasoning. The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry. The student is expected to

4.4 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.