Pacing Guide

Level 3 Module 2

Survival

Each *PhD Science® TEKS Edition* Level 3 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 29 lessons and 4 spotlight lessons about Weather. Even with lesson splits, this module should take no more than 40 days to complete. This maximum number of days ensures the implementation of all Level 3 modules within a school year that has 150 days of science instruction.

Survival and Change

Anchor Phenomenon: Butterfly Survival **Essential Question: How do butterflies survive over time in a changing environment?**	**Recommended Number of Days**	**TEKS and ELPS Alignment**
Concept 1 (Lessons 1–8): Fossil Evidence **Focus Question:** What do fossils reveal about the past? Fossils provide evidence of the kinds of organisms that lived long ago and the nature of their environments.	8–10 days	3.2B, 3.2D, 3.2F, 3.3A, 3.3B, 3.3C, 3.4, 3.9A, 3.9C, 3.10A ELPS: 2E, 3E, 4A, 4C
Concept 2 (Lessons 9–15): Suitability to Environment **Focus Question:** How do organisms get what they need to survive? For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. Some animals form groups that help members survive.	7–10 days	3.2A, 3.2B, 3.2C, 3.2D, 3.2F, 3.3A, 3.3B, 3.4, 3.9A, 3.9B, 3.9C, 3.10A, 3.10B ELPS: 3E, 3G, 4F
Concept 3 (Lessons 16–22): Effects of Environmental Change **Focus Question:** What happens to organisms when the environment changes? When an environment changes, the kinds of organisms that live there may change. Some organisms may stay and survive, some may move in or out, and some may die.	7–9 days	3.2A, 3.2B, 3.2C, 3.2D, 3.2F, 3.3A, 3.3B, 3.4, 3.9A, 3.9C, 3.10A, 3.10B ELPS: 2E, 3F, 5F
Application of Concepts (Lessons 23–26): Engineering Challenge **Phenomenon Question:** How can we help monarchs survive in a changing environment? Humans can change an environment to make it more suitable for an organism.	4 days	3.2A, 3.2C, 3.2D, 3.2F, 3.3A, 3.3B, 3.3C, 3.4, 3.9A, 3.9B, 3.9C, 3.10A ELPS: 1C
Application of Concepts (Lessons 27–29): End-of-Module Socratic Seminar, Assessment, and Debrief **Essential Question:** How do butterflies survive over time in a changing environment? Organisms have characteristics that help them survive over time in changing environments.	3 days	3.3A, 3.4, 3.9A, 3.9C, 3.10A, 3.10B ELPS: 3E, 3F

Spotlight Lessons on Weather

Lesson Sets	Recommended Number of Days	TEKS and ELPS Alignment
Lessons 1–4: Describing Weather Conditions **Phenomenon Question:** What is the weather like where we live? Weather data collected over time reveal stable and changing conditions.	4 days	3.2B, 3.2C, 3.2D, 3.3C, 3.4, 3.8A ELPS: 1C, 3H

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: Survival and Change

Concept 1: What do fossils reveal about the past? 8–10 days

Focus 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.

3.9C Describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.

3.10A Explore how structures and functions of plants and animals allow them to survive in a particular environment.

Lessons 1–2: Butterfly Survival		**Lesson 3: Butterfly Fossils**	**Lessons 4–5: Regional Fossils**
Lesson 1: Develop a class anchor model to show how butterflies survive in their environment.	**Lesson 2:** Create a relative timeline to understand how long butterflies have survived on Earth.	**Lesson 3:** Analyze and create clay fossil models to understand how fossils form.	**Lesson 4:** Observe regional fossils to learn about the past environment of a region.
Complete Launch before the lesson. Use an alternative written response routine in Define Organisms and Environments. Set a timer to pace the drawing of sketches in Create a Butterfly Sketch and Define Organisms and Environments.	Have student pairs create a relative timeline in Create a Timeline before the lesson.	**Day 1:** Launch through Compare Fossil with Clay Fossil Model **Day 2:** Make Clay Fossil Models through Land Think aloud fossil measuring in Compare Fossil with Clay Fossil Model. Use second Teacher Note in Compare Fossil with Clay Fossil Model.	Complete sketching and writing a description of region's past environment in Land after the lesson.

Lessons 4–5: Regional Fossils	Lessons 6–8: Fossil Evidence		
Lesson 5: Compare the past environment with the present-day environment to learn that environments can change over time.	**Lesson 6:** Observe fossils to learn about the past environment of the Florissant area.	**Lesson 7:** Observe organisms that live in the Florissant area today to understand that the environment has changed over time.	**Lesson 8:** Compare the past environment of the Florissant area with the present-day environment to explain how the environment has changed over time.
 Use first Teacher Note in Make Observations About the Present-Day Environment.	 **Day 1:** Launch through Observe Fossils **Day 2:** Organize Information Obtained from Fossils through Land  Use Jigsaw routine in Observe Fossils.  Use an alternative collaborative conversation routine in Organize Information Obtained from Fossils.	 Share photographs as students check organisms lists in Analyze Present-Day Florissant Organisms.	 Use an alternative written response routine in Launch. **Conceptual Checkpoint**

Concept 2: How do organisms get what they need to survive? 7–10 days

Focus 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.

3.9B 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.

3.9C Describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.

3.10A Explore how structures and functions of plants and animals allow them to survive in a particular environment.

3.10B 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.

Lessons 9–12: Suitability

Lesson 9: Describe how a habitat is a system in which all components depend on one another.	**Lesson 10:** Identify an organism's characteristics and explain how these characteristics help the organism survive.	**Lesson 11:** Describe and analyze an organism's suitability to a particular environment.	**Lesson 12:** Evaluate an organism's ability to survive in a particular environment based on the organism's characteristics.
Use an alternative collaborative conversation routine in Determine Needs of Caterpillars in an Artificial Habitat.	**Day 1:** Launch through Analyze Characteristics of Caterpillars and Plants **Day 2:** Analyze Characteristics of Other Organisms through Land Use Differentiation note in Analyze Characteristics of Caterpillars and Plants. Use a Jigsaw Routine in Analyze Characteristics of Other Organisms.	Use an alternative collaborative conversation routine in Launch.	Use an alternative collaborative conversation routine in Evaluate Organisms' Ability to Survive.

Lessons 13–15: Animal Groups		
Lesson 13: Use evidence from models to explain that animals can benefit from living in a group.	**Lesson 14:** Obtain, evaluate, and communicate information about why different animals live in groups.	**Lesson 15:** Apply prior knowledge of systems to understand how animal groups cope with change.
 **Day 1:** Launch through Model Other Group Behaviors (station instructions) **Day 2:** Model Other Group Behaviors (station rotations) through Land	 Use Differentiation note in Research Animal Groups.	 **Day 1:** Launch through Model Meerkat Behavior **Day 2:** Determine How Other Animal Groups Cope with Change through Land
 Use first Teacher Note in Model Other Group Behaviors.	 Use English Language Development note in Compare Animal Groups.	 Use an alternative collaborative conversation routine in Launch.
 Use fourth Teacher Note in Model Other Group Behaviors.		 Think aloud one group in Determine How Other Animal Groups Cope with Change.
		Conceptual Checkpoint

Concept 3: What happens to organisms when the environment changes? 7–9 days

Focus 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.

3.9C Describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.

3.10A Explore how structures and functions of plants and animals allow them to survive in a particular environment.

3.10B 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.

Lessons 16–20: Surviving Seasonal Changes

Lesson 16: Make observations to determine that monarch butterflies migrate in response to seasonal changes in their environment.	**Lesson 17:** Observe and compare the life cycle stages of different organisms.	**Lesson 18:** Investigate how other butterflies survive seasonal changes.	**Lesson 19:** Describe how seasonal changes affect the suitability of animals to their environment.
Day 1: Launch through Analyze Sighting Maps **Day 2:** Notice and Wonder about Migration Map through Land Sequence the flipbook maps in order of the months in Analyze Sighting Maps before the lesson. Use Differentiation note in Land.		Share images of butterfly life cycles while students record and sketch instead of stations in Explore Other Butterfly Life Cycles.	Think aloud 1–2 animal cards in Categorize Animals. Use Differentiation note in Describe Strategies to Survive Seasonal Changes.

<table>
<tr><th>Lessons 16–20: Surviving Seasonal Changes</th><th colspan="2">Lessons 21–22: Long-Term Changes in an Environment</th></tr>
<tr><td>Lesson 20: Investigate plants to determine that they are also affected by seasonal changes.</td><td colspan="2">Lesson 21: Analyze the effects of a long-term change in an environment on the organisms that live there.</td><td>Lesson 22: Evaluate potential solutions to help organisms survive after a long-term change in an environment.</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Day 1: Launch through Model a Change in an Environment (Check for Understanding)
Day 2: Model a Change in an Environment (response chart) through Land
Use Differentiation note in Model a Change in an Environment.</td><td>Use an alternative collaborative conversation routine in Discuss Possible Solutions.</td></tr>
<tr><td>Conceptual Checkpoint</td></tr>
</table>

Engineering Challenge: How can we help monarchs survive in a changing environment? 4 days

Focus 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.

3.9B 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.

3.9C Describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.

3.10A Explore how structures and functions of plants and animals allow them to survive in a particular environment.

Lessons 23–26: Saving Monarch Butterflies			
Lesson 23: Apply the engineering design process to help monarchs survive in a changing environment.	**Lesson 24:** Apply the engineering design process to help monarchs survive in a changing environment.	**Lesson 25:** Apply the engineering design process to help monarchs survive in a changing environment.	**Lesson 26:** Apply the engineering design process to help monarchs survive in a changing environment.
	Use Differentiation note in Plan a Design Solution.		
Engineering Challenge	**Engineering Challenge**	**Engineering Challenge**	**Engineering Challenge**

Application of Concepts: How do butterflies survive over time in a changing environment? 3 days

Focus 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.

3.9C Describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.

3.10A Explore how structures and functions of plants and animals allow them to survive in a particular environment; and

3.10B 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.

<table>
<tr><th colspan="3">Lessons 27–29: Butterfly Survival</th></tr>
<tr><td>Lesson 27: Explain how organisms survive over time in changing environments.</td><td>Lesson 28: Explain how organisms survive over time in changing environments.</td><td>Lesson 29: Explain how organisms survive over time in changing environments.</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 Debrief</td></tr>
<tr><td>Socratic Seminar</td></tr>
</table>

Spotlight Lessons: Weather

Focus Standards			4 days
3.8A 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.			
Lessons 1–4: Describing Weather Conditions			
Lesson 1: Describe types of weather conditions.	**Lesson 2:** Observe weather conditions to describe cloud cover and wind speed and direction.	**Lesson 3:** Build a rain gauge to measure precipitation and use a thermometer to measure temperature.	**Lesson 4:** Analyze data to compare local weather conditions with weather conditions in another city.
	Use alternative collaborative conversation routine in Determine Cloud Cover.		Use Differentiation note in Analyze Daily Weather Conditions.

Texas Essential Knowledge and Skills (TEKS)

Focus Standards	
3.8	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
3.8A	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.
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;
3.9B	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
3.9C	describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.
3.10	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
3.10A	explore how structures and functions of plants and animals allow them to survive in a particular environment; and
3.10B	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.
Investigation and Reasoning Standards	
3.1	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
3.1A	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
3.1B	make informed choices in the use and conservation of natural resources by recycling or reusing materials such as paper, aluminum cans, and plastics.
3.2	Scientific investigation and reasoning. The student uses scientific practices during laboratory and outdoor investigations. The student is expected to
3.2A	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;
3.2B	collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data;
3.2C	construct maps, graphic organizers, simple tables, charts, and bar graphs using tools and current technology to organize, examine, and evaluate measured data;

	3.2D analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations; and
	3.2F communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.
3.3	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
	3.3A analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing;
	3.3B 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
	3.3C connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.
3.4	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
	3.4 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.