



# Pacing Guide

## Level 3 Module 2

### SURVIVAL AND CHANGE

Each *PhD Science*® *Texas* 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. 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 32 lessons. Even with lesson splits and teacher choice days, this module should take no more than 41 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?

Concept	Recommended Number of Days	TEKS Alignment	ELPS Alignment
<p><b>Concept 1 (Lessons 1–11):</b> Fossil Evidence</p> <p><b>Focus Question:</b> What do fossils reveal about the past?</p> <p>Fossils provide evidence of the kinds of organisms that lived long ago and the nature of their environments.</p>	11–14 days	3.1A, 3.1B, 3.1C, 3.1D, 3.1E, 3.1G, 3.2A, 3.2B, 3.3A, 3.3B, 3.3C, 3.5A, 3.5B, 3.5C, 3.5D, 3.5F, 3.5G, 3.10A, 3.12B, 3.12C, 3.12D, 3.13A	1A, 1D, 2C, 2I, 3E, 4C, 4D, 4F
<p><b>Concept 2 (Lessons 12–18):</b> Suitability to Environment</p> <p><b>Focus Question:</b> How do organisms get what they need to survive?</p> <p>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.</p>	7–10 days	3.1A, 3.1C, 3.1D, 3.1E, 3.1F, 3.1G, 3.2A, 3.2B, 3.3A, 3.3B, 3.3C, 3.4A, 3.5A, 3.5B, 3.5D, 3.5E, 3.5F, 3.12B, 3.12C, 3.12D, 3.13A	3B, 4D, 4F, 4G
<p><b>Concept 3 (Lessons 19–25):</b> Effects of Environmental Change</p> <p><b>Focus Question:</b> What happens to organisms when the environment changes?</p> <p>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.</p>	7–9 days	3.1A, 3.1C, 3.1D, 3.1E, 3.1F, 3.1G, 3.2B, 3.2D, 3.3A, 3.3B, 3.3C, 3.4A, 3.5A, 3.5B, 3.5D, 3.5F, 3.5G, 3.10A, 3.12A, 3.12C, 3.13B	2E, 3F, 4G
<p><b>Application of Concepts (Lessons 26–29):</b> Engineering Challenge</p> <p><b>Focus Question:</b> How can we help monarchs survive in a changing environment?</p> <p>Humans can change an environment to make it more suitable for an organism.</p>	4 days	3.1A, 3.1B, 3.1C, 3.1D, 3.1F, 3.1G, 3.2B, 3.2D, 3.3A, 3.3B, 3.3C, 3.4A, 3.5A, 3.5B, 3.5D, 3.5F, 3.12B, 3.12C, 3.13A	3E, 4C

Concept	Recommended Number of Days	TEKS Alignment	ELPS Alignment
<p><b>Applications of Concepts (Lessons 30–32):</b> End-of-Module Socratic Seminar, Assessment, and Debrief</p> <p><b>Essential Question:</b> How do butterflies survive over time in a changing environment? Organisms have characteristics that help them survive over time in changing environments.</p>	3–4 days	3.1E, 3.1F, 3.1G, 3.2B, 3.3A, 3.3B, 3.3C, 3.5A, 3.5B, 3.5F, 3.5G, 3.10A, 3.12A, 3.12B, 3.12C, 3.12D, 3.13A, 3.13B	3E, 3F

## 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.

<p><b>Module 1</b></p> <p>August September October</p>	<p><b>Module 2</b></p> <p>November December January</p>	<p><b>Module 3</b></p> <p>February March April</p>
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## MODULE 2 Survival and Change

### CONCEPT 1

## What do fossils reveal about the past? 11–14 days

### Lessons 1–2: Butterfly Survival

**TEKS** 3.12C, 3.12D, 3.1A, 3.1G, 3.3B, 3.5C, 3.5D **ELPS** 2C, 4C, 4D

Lessons	Pacing Options
<p><b>Lesson 1:</b> Develop a class anchor model to show how butterflies survive in their environment.</p>	<p> <b>Day 1:</b> Launch through Create a Butterfly Drawing</p> <p><b>Day 2:</b> Define Organisms and Environments through Land</p> <p> Set a timer to pace the drawing of sketches in Create a Butterfly Sketch and Define Organisms and Environments.</p>
<p><b>Lesson 2:</b> Create a relative timeline to understand how long butterflies have survived on Earth.</p>	<p>None</p>

### Lesson 3: Butterfly Fossils

**TEKS** 3.12D, 3.1A, 3.1C, 3.1D, 3.1E, 3.1G, 3.2A, 3.2B, 3.3A, 3.5A, 3.5C **ELPS** 2I

Lessons	Pacing Options
<p><b>Lesson 3:</b> Analyze and create clay fossil models to understand how fossils form.</p>	<p> <b>Day 1:</b> Launch through Compare Fossil with Clay Fossil Model</p> <p><b>Day 2:</b> Make Clay Fossil Models through Land</p> <p> Use second Teacher Note in Compare Fossil with Clay Fossil Model.</p>

### Lessons 4–5: Regional Fossils

**TEKS** 3.12C, 3.12D, 3.1A, 3.1D, 3.1E, 3.1G, 3.2B, 3.3A, 3.3B, 3.5A, 3.5B **ELPS** 1D

Lessons	Pacing Options
<b>Lesson 4:</b> Observe regional fossils to learn about the past environment of a region.	 Complete sketching and writing a description of region’s past environment in Land after the lesson.
<b>Lesson 5:</b> Compare the past environment with the present-day environment to learn that environments can change over time.	 Use first Teacher Note in Make Observations About the Present-Day Environment.

### Lessons 6–8: Describing and Comparing Weather

**TEKS** 3.10A, 3.1B, 3.1C, 3.1D, 3.1E, 3.2B, 3.5G **ELPS** 1A, 4F

Lessons	Pacing Options
<b>Lesson 6:</b> Measure and describe weather conditions in the present-day environment.	None
<b>Lesson 7:</b> Make and use a wind vane to determine wind direction.	 Use an alternative instructional routine in Explore Wind Direction.
<b>Lesson 8:</b> Analyze data to compare weather conditions in two locations where monarch butterflies live.	 Use Differentiation note in Analyze Daily Weather Conditions.

### Lessons 9–11: Fossil Evidence

**TEKS** 3.10A, 3.12C, 3.12D, 3.13A, 3.1A, 3.1D, 3.1E, 3.1G, 3.2B, 3.3A, 3.3B, 3.3C, 3.5A, 3.5B, 3.5F **ELPS** 3E

Lessons	Pacing Options
<b>Lesson 9:</b> Observe fossils to learn about the past environment of the Florissant area.	 <b>Day 1:</b> Launch through Observe Fossils  <b>Day 2:</b> Organize Information Obtained from Fossils through Land  Use Jigsaw routine in Observe Fossils.  Have Jigsaw groups report ideas in Organize Information Obtained from Fossils.
<b>Lesson 10:</b> Observe organisms that live in the Florissant area today to understand that the environment has changed over time.	 Share photographs as students check organisms list in Analyze Present-Day Florissant Organisms.
<b>Lesson 11:</b> Use an alternative collaborative conversation routine in Launch.	 Use an alternative collaborative conversation routine in Launch. <b>Conceptual Checkpoint</b>

**CONCEPT 2**

**How do organisms get what they need to survive?** 7-10 days

**Lessons 12–16: Suitability**

**TEKS** 3.12B, 3.12C, 3.12D, 3.13A, 3.1A, 3.1C, 3.1D, 3.1E, 3.1G, 3.2A, 3.2B, 3.3A, 3.3B, 3.3C, 3.5B, 3.5D, 3.5E, 3.5F

**ELPS** 3B, 4D, 4G

Lessons	Pacing Options
<p><b>Lesson 12:</b> Describe how a habitat is a system in which all components depend on one another.</p>	<p> Use an alternative collaborative conversation routine in Determine Needs of Caterpillars in an Artificial Habitat.</p> <p> Use second Teacher Note in Determine Needs of Caterpillars in an Artificial Habitat.</p>
<p><b>Lesson 13:</b> Describe how energy flows through a food chain and predict the effects of changes to a food chain.</p>	<p> Use second Teacher Note in Predict Effects of Changes to a Food Chain.</p>
<p><b>Lesson 14:</b> Identify an organism’s characteristics and explain how these characteristics help the organism survive.</p>	<p> <b>Day 1:</b> Launch through Analyze Characteristics of Caterpillars and Plants</p> <p><b>Day 2:</b> Analyze Characteristics of Other Organisms through Land</p> <p> Use Differentiation note in Analyze Characteristics of Caterpillars and Plants.</p> <p> Use an alternative collaborative routine in Analyze Characteristics of Other Organisms.</p>
<p><b>Lesson 15:</b> Describe and analyze an organism’s suitability to a particular environment.</p>	<p> <b>Day 1:</b> Launch through Read and Analyze <i>Amos &amp; Boris</i></p> <p><b>Day 2:</b> Apply Understanding of Suitability through Land</p> <p> Use an alternative collaborative conversation routine in Launch.</p>
<p><b>Lesson 16:</b> Evaluate an organism’s ability to survive in a particular environment based on the organism’s characteristics.</p>	<p> Use an alternative collaborative conversation routine in Evaluate Organisms’ Ability to Survive.</p> <p> Use Differentiation note in Evaluate Organisms’ Ability to Survive.</p>

**Lessons 17–18: Animal Groups**

**TEKS** 3.12B, 3.13A, 3.1D, 3.1E, 3.1F, 3.1G, 3.2B, 3.3A, 3.3C, 3.4A, 3.5A, 3.5B, 3.5D, 3.5E, 3.5F **ELPS** 4F

Lessons	Pacing Options
<p><b>Lesson 17:</b> Obtain, evaluate, and communicate information about why different animals live in groups.</p>	<p> Use Differentiation note in Research Animal Groups.</p> <p> Use English Language Development note in Compare Animal Groups.</p>
<p><b>Lesson 18:</b> Apply knowledge of how organisms' characteristics help them to survive in their environment.</p>	<p> <b>Day 1:</b> Launch through Determine How Other Animal Groups Cope with Change</p> <p><b>Day 2:</b> Conceptual Checkpoint through Land</p> <p><b>Conceptual Checkpoint</b></p>

**CONCEPT 3**

**What happens to organisms when the environment changes?** 7–9 days

**Lessons 19–23: Surviving Seasonal Changes**

**TEKS** 3.10A, 3.12A, 3.12C, 3.13B, 3.1A, 3.1C, 3.1D, 3.1E, 3.1G, 3.2B, 3.3A, 3.3B, 3.4A, 3.5A, 3.5B, 3.5G **ELPS** 2E, 3F

Lessons	Pacing Options
<p><b>Lesson 19:</b> Make observations to determine that monarch butterflies migrate in response to seasonal changes in their environment.</p>	<p> <b>Day 1:</b> Launch through Analyze Sighting Maps</p> <p><b>Day 2:</b> Notice and Wonder about Migration Map through Land</p> <p> Sequence the flipbook maps in order of the months in Analyze Sighting Maps before the lesson.</p> <p> Use Differentiation note in Land.</p>
<p><b>Lesson 20:</b> Observe and compare the life cycle stages of different organisms.</p>	<p>None</p>
<p><b>Lesson 21:</b> Investigate how other kinds of butterflies survive seasonal changes.</p>	<p> Share images of butterfly life cycles while students record and sketch instead of stations in Explore Other Butterfly Life Cycles.</p>
<p><b>Lesson 22:</b> Describe how seasonal changes cause some animals to migrate and others to hibernate.</p>	<p> Think Aloud 1–2 animal cards in Categorize Animals.</p> <p> Use Differentiation note in Describe Strategies to Survive Seasonal Changes.</p>
<p><b>Lesson 23:</b> Investigate how seasonal changes cause some plants to become dormant.</p>	<p> Use Differentiation note in Observe Plants.</p>

**Lessons 24–25: Long-Term Changes in an Environment**

**TEKS** 3.12A, 3.12C, 3.1A, 3.1F, 3.1G, 3.2B, 3.2D, 3.3A, 3.3B, 3.3C, 3.4A, 3.5A, 3.5B, 3.5D, 3.5F, 3.5G **ELPS** 4G

Lessons	Pacing Options
<p><b>Lesson 24:</b> Analyze the effects of a long-term change in an environment on the organisms that live there.</p>	<p> <b>Day 1:</b> Launch through Model a Change in an Environment (Check for Understanding)</p> <p><b>Day 2:</b> Model a Change in an Environment (response chart) through Land</p> <p> Use Differentiation note in Model a Change in an Environment.</p>
<p><b>Lesson 25:</b> Evaluate potential solutions to help organisms survive after a long-term change in an environment.</p>	<p> Use an alternative collaborative conversation routine in Discuss Possible Solutions.</p> <p> Use English Language Development note in Discuss Possible Solutions.</p> <p><b>Conceptual Checkpoint</b></p>

## APPLICATION OF CONCEPTS

**How can we help monarchs survive in a changing environment?** 4 days**Lessons 26–29: Engineering Challenge****TEKS** 3.12B, 3.12C, 3.13A, 3.1A, 3.1B, 3.1C, 3.1D, 3.1F, 3.1G, 3.2B, 3.2D, 3.3A, 3.3B, 3.3C, 3.4A, 3.5A, 3.5B, 3.5D, 3.5F**ELPS** 3E, 4C

Lessons	Pacing Options
<b>Lesson 26:</b> Apply the engineering design process to help monarchs survive in a changing environment.	<b>Engineering Challenge</b>
<b>Lesson 27:</b> Apply the engineering design process to help monarchs survive in a changing environment.	 Use Differentiation note in Plan a Solution. <b>Engineering Challenge</b>
<b>Lesson 28:</b> Apply the engineering design process to help monarchs survive in a changing environment.	<b>Engineering Challenge</b>
<b>Lesson 29:</b> Apply the engineering design process to help monarchs survive in a changing environment.	 Use Differentiation note in Share a Solution. <b>Engineering Challenge</b>

**APPLICATION OF CONCEPTS**

**How do butterflies survive over time in a changing environment?** 3–4 days

**Lessons 30–32: End-of-Module Socratic Seminar, Assessment, and Debrief**

**TEKS** 3.10A, 3.12A, 3.12B, 3.12C, 3.12D, 3.13A, 3.13B, 3.1E, 3.1F, 3.1G, 3.2B, 3.3A, 3.3B, 3.3C, 3.5A, 3.5B, 3.5F, 3.5G

**ELPS** 3E, 3F

Lessons	Pacing Options
<p><b>Lesson 30:</b> Explain how organisms survive over time in changing environments. (Socratic Seminar)</p>	 Use English Language Development note in Engage in Socratic Seminar.  <p><b>Socratic Seminar</b></p>
<p><b>Lesson 31:</b> Explain how organisms survive over time in changing environments. (End-of-Module Assessment)</p>	<p><b>End-of-Module Assessment</b></p>
<p><b>Lesson 32:</b> Explain how organisms survive over time in changing environments. (End-of-Module Assessment Debrief)</p>	<p><b>End-of-Module Assessment Debrief</b></p>
<p><b>Teacher Choice Day</b></p>	<p>Review, reteach, assess, or complete extension activities. Optional Assessment: Benchmark 1</p>

# Texas Essential Knowledge and Skills (TEKS)

## Content Standards

- 3.10** Earth and space. The student knows that there are recognizable processes that change Earth over time. The student is expected to
- 3.10A** compare and describe day-to-day weather in different locations at the same time, including air temperature, wind direction, and precipitation.
- 3.12** Organisms and environments. The student describes patterns, cycles, systems, and relationships within environments. The student is expected to
- 3.12A** explain how temperature and precipitation affect animal growth and behavior through migration and hibernation and plant responses through dormancy;
  - 3.12B** identify and describe the flow of energy in a food chain and predict how changes in a food chain such as removal of frogs from a pond or bees from a field affect the ecosystem;
  - 3.12C** describe how natural changes to the environment such as floods and droughts cause some organisms to thrive and others to perish or move to new locations; and
  - 3.12D** identify fossils as evidence of past living organisms and environments, including common Texas fossils.
- 3.13** Organisms and environments. The student knows that organisms undergo similar life processes and have structures that function to help them survive within their environments. The student is expected to
- 3.13A** explore and explain how external structures and functions of animals such as the neck of a giraffe or webbed feet on a duck enable them to survive in their environment; and
  - 3.13B** explore, illustrate, and compare life cycles in organisms such as beetles, crickets, radishes, or lima beans.

## Scientific and Engineering Practices

- 3.1** 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
- 3.1A** ask questions and define problems based on observations or information from text, phenomena, models, or investigations;
  - 3.1B** use scientific practices to plan and conduct descriptive investigations and use engineering practices to design solutions to problems;
  - 3.1C** demonstrate safe practices and the use of safety equipment during classroom and field investigations as outlined in Texas Education Agency–approved safety standards;
  - 3.1D** use tools, including hand lenses; metric rulers; Celsius thermometers; wind vanes; rain gauges; graduated cylinders; beakers; digital scales; hot plates; meter sticks; magnets; notebooks; Sun, Earth, Moon system models; timing devices; materials to support observation of habitats of organisms such as terrariums, aquariums, and collecting nets; and materials to support digital data collection such as computers, tablets, and cameras, to observe, measure, test, and analyze information;
  - 3.1E** collect observations and measurements as evidence;
  - 3.1F** construct appropriate graphic organizers 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
- 3.1G** develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem.
- 3.2** 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
- 3.2A** identify advantages and limitations of models such as their size, scale, properties, and materials;
  - 3.2B** analyze data by identifying any significant features, patterns, or sources of error; and
  - 3.2D** evaluate a design or object using criteria.
- 3.3** Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to
- 3.3A** develop explanations and propose solutions supported by data and models;
  - 3.3B** communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
  - 3.3C** listen actively to others' explanations to identify relevant evidence and engage respectfully in scientific discussion.
- 3.4** 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
- 3.4A** explain how scientific discoveries and innovative solutions to problems impact science and society.

## Recurring Themes and Concepts

- 3.5** 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
- 3.5A** identify and use patterns to explain scientific phenomena or to design solutions;
  - 3.5B** identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems;
  - 3.5C** use scale, proportion, and quantity to describe, compare, or model different systems;
  - 3.5D** examine and model the parts of a system and their interdependence in the function of the system;
  - 3.5E** investigate the flow of energy and cycling of matter through systems;
  - 3.5F** explain the relationship between the structure and function of objects, organisms, and systems; and
  - 3.5G** 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.
- 1D** Speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known).
- 2C** Learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions.
- 2E** Use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language.
- 2I** Demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs.
- 3B** Expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, and objects, by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication.
- 3E** Share information in cooperative learning interactions.
- 3F** Ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments.
- 4A** Learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words.
- 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.