# Pacing Guide

## Level 4 Module 3

### PLANTS IN THE ENVIRONMENT

Each *PhD Science® Texas* 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. 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.

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# Module at a Glance

This module contains 24 lessons on Plants in the Environment. Even with lesson splits and teacher choice days, this module should take no more than 30 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.

## Plants in the Environment

**ANCHOR PHENOMENON:**

**Carnivorous Plants in Big Thicket National Preserve**

**ESSENTIAL QUESTION:**

**Why are some plants in Big Thicket National Preserve carnivorous?**

| Concept | Recommended Number of Days | TEKS Alignment | ELPS Alignment |
|---|---|---|---|
| **Concept 1 (Lessons 1–7):** Plant Structures and Their Functions<br>**Focus Question:** How do the structures of different plants compare?<br>Plants inherit traits that can help them survive in their environment. | 7–9 days | 4.1A, 4.1C, 4.1D, 4.1E, 4.1F, 4.1G, 4.2A, 4.3A, 4.5A, 4.5C, 4.5D, 4.5F, 4.13A, 4.13B | 1A, 2I, 3D, 3G, 4F |
| **Application of Concepts (Lessons 8–9):** Science Challenge Part 1<br>**Phenomenon Question:** How do the available resources in an environment affect the way a plant grows and survives?<br>Plants can make their own food and grow when they get water, sunlight, carbon dioxide, and nutrients from their environment. | 2–3 days | 4.1B, 4.1C, 4.1D, 4.1E, 4.2A, 4.5E, 4.5G, 4.12A | 2C |
| **Concept 2 (Lessons 10–14):** Environmental Conditions for Plants<br>**Focus Question:** How does the environment help plants get what they need to survive?<br>The climate of their environment, which includes the water cycle, helps plants meet their needs. | 5 days | 4.1A, 4.1C, 4.1D, 4.1E, 4.1F, 4.1G, 4.2A, 4.2B, 4.2C, 4.3A, 4.5A, 4.5C, 4.5E, 4.10A, 4.10C | 1E, 3D, 3E |
| **Concept 3 (Lessons 15–19):** Interactions in the Environment<br>**Focus Question:** How do organisms get what they need from their environment?<br>A food web model shows the interactions between organisms and how matter cycles and energy flows in an environment. | 5–7 days | 4.1A, 4.1C, 4.1D, 4.1E, 4.1F, 4.1G, 4.2A, 4.2B, 4.3A, 4.5A, 4.5C, 4.5D, 4.5E, 4.10A, 4.12A, 4.12B | 1D, 4D, 4G, 5B |

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| Concept | Recommended Number of Days | TEKS Alignment | ELPS Alignment |
|---|---|---|---|
| **Application of Concepts (Lessons 20–21):** Science Challenge Part 2<br>**Phenomenon Question:** How do the available resources in an environment affect the way a plant grows and survives?<br>Plants can make their own food and grow when they get water, sunlight, carbon dioxide, and nutrients from their environment. | 2 days | 4.1B, 4.1C, 4.1D, 4.1E, 4.1F, 4.2B, 4.5B, 4.5E, 4.5G, 4.12A | 4F |
| **Applications of Concepts (Lessons 22–24):** End-of-Module Socratic Seminar, Assessment, and Debrief<br>**Essential Question:** Why are some plants in Big Thicket National Preserve carnivorous?<br>Organisms depend on energy from the Sun and the cycling of matter in their environment. | 3–4 days | 4.1E, 4.1F, 4.1G, 4.2A, 4.2B, 4.3A, 4.3B, 4.3C, 4.5A, 4.5C, 4.5D, 4.5E, 4.5F, 4.10A, 4.10C, 4.12A, 4.12B, 4.13A, 4.13B | 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.

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

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MODULE 3

# Plants in the Environment

## CONCEPT 1

## How do the structures of different plants compare? 7–9 days

### Lessons 1–2: Plants in Big Thicket

**TEKS** 4.13A, 4.1A, 4.1D, 4.1G, 4.2A, 4.5D, 4.5F **ELPS** 1A, 2I, 3G

| Lessons | Pacing Options |
|---|---|
| **Lesson 1:** Observe carnivorous plants. | Use Differentiation note in Land. |
| **Lesson 2:** Develop a model of carnivorous plants in Big Thicket. | **Day 1:** Launch through Explore Plants in Big Thicket<br>**Day 2:** Develop Anchor Model through Land |

### Lessons 3–4: Traits

**TEKS** 4.13B, 4.1A, 4.1C, 4.1E, 4.1F, 4.5A **ELPS** 3D

| Lessons | Pacing Options |
|---|---|
| **Lesson 3:** Observe similarities in the characteristics of parents and their offspring, and identify those characteristics as inherited traits. | Share picture of plants in the environment outside the school (taken before the lesson) while students draw and label characteristics in Launch.<br>**Day 1:** Launch through Observe Apple Characteristics<br>**Day 2:** Analyze Plant Traits through Land |
| **Lesson 4:** Find and use patterns to identify inherited and acquired traits. | Use an alternative collaborative conversation routine in Analyze Traits That Change. |

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### Lessons 5–7: Plant Structures and Survival

**TEKS** 4.13A, 4.13B, 4.1A, 4.1C, 4.1E, 4.1F, 4.1G, 4.2A, 4.3A, 4.5A, 4.5C, 4.5F **ELPS** 4F

| Lessons | Pacing Options |
|---|---|
| **Lesson 5:** Compare plants and plant structures in different environments. | Think Aloud one environment card in Explore Big Thicket Environments. |
| **Lesson 6:** Model how the structures of plants help plants survive in their environment. | Use second Differentiation note in Visit Plant Structure and Function Stations.<br>Think Aloud Big Bluestem Grass Station in Visit Plant Structure and Function Stations. |
| **Lesson 7:** Apply knowledge of how specialized structures help plants survive in their environment. | **Conceptual Checkpoint** |

SCIENCE CHALLENGE

## How do the available resources in an environment affect the way a plant grows and survives? 2–3 days

### Lessons 8–9: Science Challenge Part 1

**TEKS** 4.12A, 4.1B, 4.1C, 4.1D, 4.1E, 4.2A, 4.5E, 4.5G **ELPS** 2C

| Lessons | Pacing Options |
|---|---|
| **Lesson 8:** Plan a fair test to determine how limiting access to water, light, and air affects a plant's ability to make food and grow. | **Day 1:** Launch through Discuss Fair Test Investigations<br>**Day 2:** Plan a Fair Test Investigation through Land<br>Use inline Teacher Note in Discuss Fair Test Investigations. |
| **Lesson 9:** Set up and conduct an investigation to determine how different resource conditions affect a plant's ability to make food and grow. | Use inline Teacher Note in Launch.<br>Use Teacher Note in Observe and Record Initial Data. |

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CONCEPT 2

# How does the environment help plants get what they need to survive?

5 days

### Lessons 10–11: Climate in Big Thicket

**TEKS** 4.10A, 4.10C, 4.1E, 4.2B, 4.2C, 4.5A **ELPS** 3D

| Lessons | Pacing Options |
|---|---|
| **Lesson 10:** Analyze historical weather data to determine that climate remains relatively stable over time. | Use inline Teacher Note in Analyze Historical Weather Graphs.<br>Use Differentiation note in Prepare to Analyze Historical Weather Graphs. |
| **Lesson 11:** Compare climates to determine that the pale pitcher plant lives in different locations with similar climates. | Think Aloud data for one season in Compare Climates. |

### Lessons 12–14: Movement of Water in an Environment

**TEKS** 4.10A, 4.10C, 4.1A, 4.1C, 4.1D, 4.1E, 4.1F, 4.1G, 4.2A, 4.2B, 4.3A, 4.5A, 4.5C, 4.5E **ELPS** 1E, 3E

| Lessons | Pacing Options |
|---|---|
| **Lesson 12:** Use a model to illustrate the processes of the water cycle. | Use first Teacher Note in Observe Water Model. |
| **Lesson 13:** Gather evidence to explain the water cycle in Big Thicket. | Use Differentiation note in Develop Model of Water Movement in Big Thicket.<br>Use an alternative collaborative conversation routine in Explain Water Movement.<br>Use Teacher Note in Land. |
| **Lesson 14:** Apply knowledge of the water cycle to a new phenomenon. | Use Differentiation note in Launch.<br>**Conceptual Checkpoint** |

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CONCEPT 3

# How do organisms get what they need from their environment? 5–7 days

**Lessons 15–16: Organism Interactions**

**TEKS** 4.12A, 4.12B, 4.1A, 4.1G, 4.2A, 4.3A, 4.5C, 4.5D, 4.5E **ELPS** 4D

| Lessons | Pacing Options |
|---|---|
| **Lesson 15:** Determine that organisms from different food chains interact in a food web. | Read *Trout Are Made of Trees* (Sayre and Endle 2008) in Read About and Discuss Organism Interactions before the lesson.<br>Precut organism cards in Develop Big Thicket Food Chains.<br>Use an alternative instructional routine in Develop Big Thicket Food Chains. |
| **Lesson 16:** Investigate the flow of energy through a food web. | **Day 1:** Launch through Trace Energy Through a Food Web<br>**Day 2:** Analyze Energy in a Food Web through Land<br>Use Differentiation note in Analyze Food Web. |

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**Lessons 17–19: Organism Roles**

**TEKS** 4.10A, 4.12A, 4.12B, 4.1A, 4.1C, 4.1D, 4.1E, 4.1F, 4.1G, 4.2A, 4.2B, 4.3A, 4.5A, 4.5C, 4.5D, 4.5E

**ELPS** 1D, 4G, 5B

| Lessons | Pacing Options |
|---|---|
| **Lesson 17:** Gather evidence that fungi are decomposers, which break down dead organisms. | Share photographs from Types of Fungi station while students record observations in Observe Fungi.<br><br>Use an alternative collaborative conversation routine in Observe Fungi. |
| **Lesson 18:** Investigate the cycling of matter through a food web. | Use second Differentiation note in Model Matter Movement.<br><br>Use first Teacher Note in Land.<br><br>Focus on pages 1–18, 24–26 of *Trout Are Made of Trees* in Land. |
| **Lesson 19:** Apply knowledge of organism interactions in a food web to a new phenomenon. | **Day 1:** Launch through Update Anchor Chart<br>**Day 2:** Conceptual Checkpoint through Land<br><br>Use Teacher Note in Compare Models.<br><br>Use Differentiation note in Compare Models.<br><br>**Conceptual Checkpoint** |

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APPLICATION OF CONCEPTS

# How do the available resources in an environment affect the way a plant grows and survives? 2 days

**Lessons 20–21: Science Challenge Part 2**

**TEKS** 4.12A, 4.1B, 4.1C, 4.1D, 4.1E, 4.1F, 4.2B, 4.5B, 4.5E, 4.5G **ELPS** 4F

| Lessons | Pacing Options |
|---|---|
| **Lesson 20:** Analyze data to draw conclusions about how available resources in an environment affect the way a plant makes food and grows. | Use first Teacher Note in Analyze Investigation Data.<br>Use Differentiation note in Debrief Investigation Results.<br>Use Differentiation note in Land. |
| **Lesson 21:** Support a claim with evidence that available resources in an environment affect the way a plant makes food and grows. | Use inline Teacher Note in Launch.<br>Use Differentiation note in Gather Evidence to Support or Refute a Claim.<br>Use Differentiation note in Share Evidence and Reasoning. |

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APPLICATION OF CONCEPTS

## Why are some plants in Big Thicket National Preserve carnivorous? 3–4 days

**Lessons 22–24: End-of-Module Socratic Seminar, Assessment, and Debrief**

**TEKS** 4.10A, 4.10C, 4.12A, 4.12B, 4.13A, 4.13B, 4.1E, 4.1F, 4.1G, 4.2A, 4.2B, 4.3A, 4.3B, 4.3C, 4.5A, 4.5C, 4.5D, 4.5E, 4.5F **ELPS** 3F

| Lessons | Pacing Options |
|---|---|
| **Lesson 22:** Explain how organisms depend on energy from the Sun and the cycling of matter in their environment. (Socratic Seminar) | Use English Language Development note in Engage in Socratic Seminar.<br>**Socratic Seminar** |
| **Lesson 23:** Explain how organisms depend on energy from the Sun and the cycling of matter in their environment. (End-of-Module Assessment) | **End-of-Module Assessment** |
| **Lesson 24:** Explain how organisms depend on energy from the Sun and the cycling of matter in their environment. (End-of-Module Assessment Debrief) | **End-of-Module Assessment Debrief** |
| **Teacher Choice Day** | Review, reteach, assess, or complete extension activities. Optional Assessment: Benchmark 2. |

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# Texas Essential Knowledge and Skills (TEKS)

## Content Standards

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

- **4.10A** describe and illustrate the continuous movement of water above and on the surface of Earth through the water cycle and explain the role of the Sun as a major source of energy in this process; and
- **4.10C** differentiate between weather and climate.

**4.12** Organisms and environments. The student describes patterns, cycles, systems, and relationships within environments. The student is expected to

- **4.12A** investigate and explain how most producers can make their own food using sunlight, water, and carbon dioxide through the cycling of matter; and
- **4.12B** describe the cycling of matter and flow of energy through food webs, including the roles of the Sun, producers, consumers, and decomposers.

**4.13** 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

- **4.13A** explore and explain how structures and functions of plants such as waxy leaves and deep roots enable them to survive in their environment; and
- **4.13B** differentiate between inherited and acquired physical traits of organisms.

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## Scientific and Engineering Practices

**4.1** 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

- **4.1A** ask questions and define problems based on observations or information from text, phenomena, models, or investigations;
- **4.1B** use scientific practices to plan and conduct descriptive investigations and use engineering practices to design solutions to problems;
- **4.1C** demonstrate safe practices and the use of safety equipment during classroom and field investigations as outlined in Texas Education Agency–approved safety standards;
- **4.1D** use tools, including hand lenses; metric rulers; Celsius thermometers; calculators; laser pointers; mirrors; digital scales; balances; graduated cylinders; beakers; hot plates; meter sticks; magnets; notebooks; timing devices; sieves; materials for building circuits; 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;
- **4.1E** collect observations and measurements as evidence;
- **4.1F** construct appropriate graphic organizers used to collect data, including tables, bar graphs, line graphs, tree maps, concept maps, Venn diagrams, flow charts or sequence maps, and input-output tables that show cause and effect; and
- **4.1G** develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem.

**4.2** 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

- **4.2A** identify advantages and limitations of models such as their size, scale, properties, and materials;
- **4.2B** analyze data by identifying any significant features, patterns, or sources of error; and
- **4.2C** use mathematical calculations to compare patterns and relationships.

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

- **4.3A** develop explanations and propose solutions supported by data and models;
- **4.3B** communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
- **4.3C** listen actively to others' explanations to identify relevant evidence and engage respectfully in scientific discussion.

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## Recurring Themes and Concepts

**4.5** 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

- **4.5A** identify and use patterns to explain scientific phenomena or to design solutions;
- **4.5B** identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems;
- **4.5C** use scale, proportion, and quantity to describe, compare, or model different systems;
- **4.5D** examine and model the parts of a system and their interdependence in the function of the system;
- **4.5E** investigate how energy flows and matter cycles through systems and how matter is conserved;
- **4.5F** explain the relationship between the structure and function of objects, organisms, and systems; and
- **4.5G** 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).
- **1E** Internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment.
- **2C** Learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions.
- **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.
- **3D** Speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency.
- **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.
- **3G** Express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics.
- **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.

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**4G** Demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade level needs.

**5B** Write using newly acquired basic vocabulary and content-based grade-level vocabulary.

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