Pacing Guide

Level 2 Module 2

SOUND

with Spotlight Lessons on Objects in the Sky

Each *PhD Science® Texas* Level 2 lesson requires 35 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 29 lessons plus 6 spotlight lessons on Objects in the Sky. Even with lesson splits and teacher choice days, this module should take no more than 47 days to complete. This maximum number of days ensures the implementation of all Level 2 modules within a school year that has 150 days of science instruction.

Sound

ANCHOR PHENOMENON:

The Recycled Orchestra of Cateura

ESSENTIAL QUESTION:

How does the Recycled Orchestra make music?

Concept	Recommended Number of Days	TEKS Alignment	ELPS Alignment
Concept 1 (Lessons 1–10): Making Sound **Focus Question:** What causes sound? Sound is caused by vibrating objects.	10–14 days	2.1A, 2.1B, 2.1C, 2.1D, 2.1E, 2.1F, 2.1G, 2.2B, 2.2D, 2.3A, 2.3B, 2.5A, 2.5B, 2.5D, 2.5F, 2.8A, 2.8B, 2.11B	2C, 2E, 3D, 3E, 3H
Concept 2 (Lessons 11–17): Effects of Sound **Focus Question:** What are the effects of sound? Sound can cause objects to vibrate.	7–10 days	2.1A, 2.1B, 2.1C, 2.1D, 2.1E, 2.1F, 2.1G, 2.2A, 2.2B, 2.3A, 2.3B, 2.5A, 2.5B, 2.8A, 2.8B	1A, 2E, 3B, 3E, 3F
Application of Concepts (Lessons 18–25): Engineering Challenge **Phenomenon Question:** How can we help a teacher communicate with students at recess? People can solve some communication problems by designing devices that make sound.	8–11 days	2.1A, 2.1B, 2.1C, 2.1D, 2.1E, 2.1F, 2.1G, 2.2B, 2.2C, 2.2D, 2.3A, 2.3B, 2.4A, 2.4B, 2.5A, 2.5B, 2.5D, 2.8B, 2.8C, 2.11B	3D, 3F, 3H
Applications of Concepts (Lessons 26–29): End-of-Module Socratic Seminar, Assessment, and Debrief **Essential Question:** How does the Recycled Orchestra make music? Sound is caused by vibrating matter, and sound can cause matter to vibrate.	4–5 days	2.1B, 2.1C, 2.1D, 2.1E, 2.1F, 2.2B, 2.3A, 2.3B, 2.3C, 2.5A, 2.5B, 2.5D, 2.8A, 2.8B, 2.8C, 2.11B	3E, 3F

Spotlight Lessons on Objects in the Sky

Lesson Sets	Recommended Number of Days	TEKS Alignment	ELPS Alignment
Lessons 1–2: The Sun **Phenomenon Question:** How do sea turtle hatchlings know when to leave their nest? The Sun provides Earth with light and heat.	2 days	2.1A, 2.1C, 2.1D, 2.1E, 2.4B, 2.5C, 2.5E, 2.9A, 2.9B	1A, 4D, 4F
Lessons 3–4: The Moon and Stars **Phenomenon Question:** How is the ocean illuminated at night? The Moon reflects light from the Sun, which is a star.	2 days	2.1B, 2.1C, 2.1D, 2.1G, 2.4B, 2.5E, 2.9A, 2.9B	3H
Lessons 5–6: Sandhopper Navigation **Phenomenon Question:** What helps sandhoppers return to their burrow? Sandhoppers use light from the Sun and Moon to return to their burrow.	2–3 days	2.1E, 2.2B, 2.3A, 2.3B, 2.5A, 2.5B, 2.5C, 2.5E, 2.9A, 2.9B	1A, 2I

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

MODULE 2

Sound

CONCEPT 1

What causes sound? 10–14 days

Lessons 1–3: The Recycled Orchestra of Cateura

TEKS 2.8B, 2.11B, 2.1A, 2.1D, 2.1E, 2.1F, 2.1G, 2.3A, 2.5A, 2.5D **ELPS** 2E, 3D

Lessons	Pacing Options
Lesson 1: Identify musical instruments and explain that people use them to make music.	**Day 1:** Launch through Sort Cards by Sound **Day 2:** Learn About the Recycled Orchestra through Land
Lesson 2: Analyze data and observe recycled instruments to learn more about the Recycled Orchestra of Cateura.	None
Lesson 3: Begin developing a class model that shows how the Recycled Orchestra makes music.	**Day 1:** Launch through Develop Initial Models **Day 2:** Develop Anchor Model through Land Use Differentiation note in Develop Initial Models.

Lessons 4–6: Vibrating Instruments

TEKS 2.8A, 2.1A, 2.1B, 2.1D, 2.1E, 2.1F, 2.2B, 2.3A, 2.5A, 2.5B **ELPS** 2C

Lessons	Pacing Options
Lesson 4: Observe the pattern that instruments must be touched or moved to make sound.	Think Aloud one instrument in Explore Instruments. Prepare class chart by affixing illustrations on chart paper in Discuss Methods of Playing Instruments.
Lesson 5: Use observations as evidence to make a claim that some instruments make sound by vibrating.	Use the first Teacher Note in Prepare to Visit Instrument Stations.
Lesson 6: Use evidence from additional observations to support the claim that all instruments make sound by vibrating.	**Day 1:** Launch through Visit Instrument Stations to Feel for Vibrations **Day 2:** Watch Slow-Motion Drum Video through Land Use inline Teacher Note in Visit Instrument Stations to Feel for Vibrations. Prepare class chart by affixing illustrations on chart paper in Land. Use Teacher Note in Land.

Lesson 7: Vibrating Objects

TEKS 2.8A, 2.1A, 2.1B, 2.1C, 2.1D, 2.1E, 2.1G, 2.2B, 2.5A, 2.5B **ELPS** 3E, 3H

Lessons	Pacing Options
Lesson 7: Investigate common objects to determine that objects make sound by vibrating.	Think Aloud ruler demonstration in Observe a Ruler Making Sound. Use second inline Teacher Note in Observe Common Objects to Look for Patterns. Use an alternative collaborative conversation routine in Observe Common Objects to Look for Patterns.

Lessons 8–9: Recycled Instruments

TEKS 2.8A, 2.11B, 2.1A, 2.1B, 2.1C, 2.1D, 2.1E, 2.2B, 2.2D, 2.3A, 2.3B, 2.5A, 2.5B, 2.5D, 2.5F **ELPS** 3H

Lessons	Pacing Options
Lesson 8: Use evidence from observations to identify objects that make a particular sound.	None
Lesson 9: Confirm that objects that look similar, feel similar, and move in similar ways can make similar sounds.	**Day 1:** Launch through Create and Test Shakers **Day 2:** Share Recycled Shakers through Land

Lesson 10: Making Sound

TEKS 2.8A, 2.1B, 2.2B, 2.3A, 2.3B, 2.5B, 2.5D **ELPS** 2E

Lessons	Pacing Options
Lesson 10: Use observations to explain that a music box must vibrate to make sound.	**Conceptual Checkpoint**

CONCEPT 2
What are the effects of sound? 7–10 days

Lessons 11–13: The Way Sound Travels

TEKS 2.8A, 2.8B, 2.1A, 2.1B, 2.1C, 2.1E, 2.1F, 2.1G, 2.2B, 2.3A, 2.3B, 2.5A, 2.5B **ELPS** 1A, 3F

Lessons	Pacing Options
Lesson 11: Observe a model orchestra to determine that people can hear sound on all sides of a vibrating object.	Use an alternative collaborative conversation routine in Develop Initial Models of Sound in a Concert Hall. Use Teacher Note in Prepare to Model Sound in a Concert Hall.
Lesson 12: Compare observations to determine that sound travels away from a vibrating object in all directions.	**Day 1:** Launch through Investigate Sound Outside a Door **Day 2:** Draw a Model of Sound in a Concert Hall through Land
Lesson 13: Identify the pattern that sound gets quieter as distance from a vibrating object increases.	**Day 1:** Launch through Investigate Sound Outdoors **Day 2:** Analyze Results through Land Use first Teacher Note in Investigate Sound Outdoors.

Lesson 14: The Eardrum

TEKS 2.8A, 2.1B, 2.1C, 2.1D, 2.1E, 2.1G, 2.2A, 2.3A, 2.5B **ELPS** 2E

Lessons	Pacing Options
Lesson 14: Use evidence from observations to explain that sound causes the eardrum to vibrate.	Display eardrum model under document camera while students make observations.

Lessons 15–16: Feeling Sound

TEKS 2.8A, 2.8B, 2.1A, 2.1B, 2.2B, 2.3A, 2.5A, 2.5B **ELPS** 3E

Lessons	Pacing Options
Lesson 15: Observe that sound can cause balloons to vibrate.	**Day 1:** Launch through Make a Prediction **Day 2:** Test a Prediction through Land Read designated pages from *Moses Goes to a Concert* (Millman 1998) in Make a Prediction before the lesson. Use an alternative collaborative conversation routine in Make a Prediction.
Lesson 16: Determine that people can feel objects vibrate in response to loud, nearby sounds.	Use Differentiation note in Test Sounds.

Lesson 17: Effects of Sound

TEKS 2.8A, 2.8B, 2.1A, 2.2B, 2.3A, 2.3B, 2.5B **ELPS** 3B

Lessons	Pacing Options
Lesson 17: Predict whether sound from an airplane causes a nearby house to vibrate.	Use an alternative collaborative conversation routine in Land. **Conceptual Checkpoint**

ENGINEERING CHALLENGE

How can we help a teacher communicate with students at recess? 8–11 days

Lessons 18–19: Preparation for Engineering Challenge (Talking Drums)

TEKS 2.8B, 2.8C, 2.1A, 2.1B, 2.1D, 2.1E, 2.1F, 2.2B, 2.3A, 2.3B, 2.5A, 2.5B **ELPS** 3H

Lessons	Pacing Options
Lesson 18: Explain how people can use instruments to communicate.	Use Differentiation note in Launch.
Lesson 19: Make a claim about which instruments people can use to communicate.	**Day 1:** Launch through Visit Message Stations **Day 2:** Make a Claim About the Effectiveness of Instruments through Land Use second sidebar Teacher Note in Prepare to Visit Message Stations. Use inline Teacher Note in Prepare to Visit Message Stations.

Lesson 20: Preparation for Engineering Challenge (Communication Devices)

TEKS 2.8B, 2.8C, 2.1A, 2.1B, 2.1E, 2.1F, 2.2B, 2.2D, 2.3A, 2.4A, 2.4B, 2.5A, 2.5B **ELPS** 3D

Lessons	Pacing Options
Lesson 20: Use observations to explain that devices can use sound, light, and color to help people communicate over a distance.	**Day 1:** Launch through Visit Communication Device Stations **Day 2:** Compare Communication Devices through Land Use inline Teacher Note in Visit Communication Device Stations.

Lessons 21–25: Engineering Challenge

TEKS 2.8B, 2.8C, 2.11B, 2.1A, 2.1B, 2.1C, 2.1D, 2.1E, 2.1F, 2.1G, 2.2B, 2.2C, 2.2D, 2.3A, 2.3B, 2.4A, 2.4B, 2.5B, 2.5D
ELPS 3D, 3F

Lessons	Pacing Options
Lesson 21: Apply the engineering design process to create a device that helps a teacher communicate with students over a long distance.	**Day 1:** Launch through Ask About an Engineering Problem (Record problem on class problem and solution chart.) **Day 2:** Ask About an Engineering Problem (Divide the class into groups for the Engineering Challenge.) to Make Sound through Land **Engineering Challenge**
Lesson 22: Apply the engineering design process to create a device that helps a teacher communicate with students over a long distance.	Use second Teacher Note in Imagine a Communication Device. Use Differentiation note in Plan a Communication Device. **Engineering Challenge**
Lesson 23: Apply the engineering design process to create a device that helps a teacher communicate with students over a long distance.	**Engineering Challenge**
Lesson 24: Apply the engineering design process to create a device that helps a teacher communicate with students over a long distance.	Use Differentiation note in Improve a Communication Device. **Engineering Challenge**
Lesson 25: Apply the engineering design process to create a device that helps a teacher communicate with students over a long distance.	Use an alternative collaborative conversation routine in Share Communication Devices. **Engineering Challenge**

APPLICATION OF CONCEPTS

How does the Recycled Orchestra make music? 4–5 days

Lessons 26–29: End-of-Module Socratic Seminar, Assessment, and Debrief

TEKS 2.8A, 2.8B, 2.8C, 2.11B, 2.1B, 2.1C, 2.1D, 2.1E, 2.1F, 2.2B, 2.3A, 2.3B, 2.3C, 2.5A, 2.5B, 2.5D **ELPS** 3E, 3F

Lessons	Pacing Options
Lesson 26: Explain how the Recycled Orchestra makes music. (Socratic Seminar)	Use Teacher Note in Engage in Socratic Seminar. Use Differentiation note in Land. **Socratic Seminar**
Lesson 27: Use observations to predict whether people can use a cup telephone to communicate. (End-of-Module Assessment Part A)	Use second Teacher Note in Observe a Cup with String. **End-of-Module Assessment Part A**
Lesson 28: Explain how a cup telephone works as a communication device. (End-of-Module Assessment Part B)	**End-of-Module Assessment Part B**
Lesson 29: Explain how objects make sound and how sound can affect objects. (End-of-Module Debrief)	**End-of-Module Debrief**
Teacher Choice Day	Review, reteach, assess, or complete extension activities.

SPOTLIGHT LESSONS ON

Objects in the Sky

What helps sea turtle hatchlings get to the ocean? 6–7 days

Lessons 1–2: The Sun

TEKS 2.9A, 2.9B, 2.1A, 2.1C, 2.1D, 2.1E, 2.4B, 2.5C, 2.5E **ELPS** 1A, 4D, 4F

Lessons	Pacing Options
Lesson 1: Use observations and gather information from text to determine that sea turtle hatchlings follow sunlight to the ocean.	Read *One Tiny Turtle* (Davies and Chapman 2024) in Read About Sea Turtles before the lesson. Use second Teacher Note in Land.
Lesson 2: Observe telescope images of the Sun to determine it provides Earth with light and heat.	None

Lessons 3–4: The Moon and Stars

TEKS 2.9A, 2.9B, 2.1B, 2.1C, 2.1D, 2.1G, 2.4B, 2.5E **ELPS** 3H

Lessons	Pacing Options
Lesson 3: Observe and compare the Sun, Moon, and stars to identify objects in the sky that give off their own light.	Use an alternative collaborative conversation routine in Develop Initial Model. Use an alternative collaborative conversation routine in Update Anchor Chart.
Lesson 4: Conduct an investigation to determine that the Moon reflects sunlight toward Earth.	None

Lessons 5–6: Sandhopper Navigation

TEKS 2.9A, 2.9B, 2.1E, 2.2B, 2.3A, 2.3B, 2.5A, 2.5B, 2.5C, 2.5E **ELPS** 1A, 2I

Lessons	Pacing Options
Lesson 5: Explain that sandhoppers use light from the Sun and Moon to return to their burrow after feeding. (End-of-Spotlight Assessment)	Use an alternative collaborative conversation routine in Launch. **End-of-Spotlight Assessment**
Lesson 6: Explain that sandhoppers use light from the Sun and Moon to return to their burrow after feeding. (End-of-Spotlight Assessment Debrief)	**End-of-Spotlight Assessment Debrief**
Teacher Choice Day	Review, reteach, assess, or complete extension activities.

Texas Essential Knowledge and Skills (TEKS)

Content Standards

2.8 Force, motion, and energy. The student knows that energy is everywhere and can be observed in everyday life. The student is expected to

- **2.8A** demonstrate and explain that sound is made by vibrating matter and that vibrations can be caused by a variety of means, including sound;
- **2.8B** explain how different levels of sound are used in everyday life such as a whisper in a classroom or a fire alarm; and
- **2.8C** design and build a device using tools and materials that uses sound to solve the problem of communicating over a distance.

2.9 Earth and space. The student knows that there are recognizable patterns in the natural world and among objects in the sky. The student is expected to

- **2.9A** describe the Sun as a star that provides light and heat and explain that the Moon reflects the Sun's light; and
- **2.9B** observe objects in the sky using tools such as a telescope and compare how objects in the sky are more visible and can appear different with a tool than with an unaided eye.

2.11 Earth and space. The student knows that earth materials and products made from these materials are important to everyday life. The student is expected to

- **2.11B** describe how human impact can be limited by making choices to conserve and properly dispose of materials such as reducing use of, reusing, or recycling paper, plastic, and metal.

Scientific and Engineering Practices

2.1 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

- **2.1A** ask questions and define problems based on observations or information from text, phenomena, models, or investigations;
- **2.1B** use scientific practices to plan and conduct simple descriptive investigations and use engineering practices to design solutions to problems;
- **2.1C** identify, describe, and demonstrate safe practices during classroom and field investigations as outlined in Texas Education Agency–approved safety standards;
- **2.1D** use tools, including hand lenses, goggles, heat-resistant gloves, trays, cups, bowls, beakers, notebooks, stream tables, soil, sand, gravel, flowering plants, student thermometer, demonstration thermometer, rain gauge, flashlights, ramps, balls, spinning tops, drums, tuning forks, sandpaper, wax paper, items that are flexible, non-flexible items, magnets, hot plate, aluminum foil, Sun-Moon-Earth model, and frog and butterfly life cycle models to observe, measure, test, and compare;
- **2.1E** collect observations and measurements as evidence;
- **2.1F** record and organize data using pictures, numbers, words, symbols, and simple graphs; and
- **2.1G** develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem.

2.2 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

- **2.2A** identify basic advantages and limitations of models such as their size, properties, and materials;
- **2.2B** analyze data by identifying significant features and patterns;
- **2.2C** use mathematical concepts to compare two objects with common attributes; and
- **2.2D** evaluate a design or object using criteria to determine if it works as intended.

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

- **2.3A** develop explanations and propose solutions supported by data and models;
- **2.3B** communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and
- **2.3C** listen actively to others' explanations to identify important evidence and engage respectfully in scientific discussion.

2.4 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

- **2.4A** explain how science or an innovation can help others; and
- **2.4B** identify scientists and engineers such as Alexander Graham Bell, Marie Daly, Mario Molina, and Jane Goodall and explore what different scientists and engineers do.

Recurring Themes and Concepts

2.5 Recurring themes and concepts. The student uses recurring themes and concepts to make connections across disciplines. The student is expected to

- **2.5A** identify and use patterns to describe phenomena or design solutions;
- **2.5B** investigate and predict cause-and-effect relationships in science;
- **2.5C** measure and describe the properties of objects in terms of size and quantity;
- **2.5D** examine the parts of a whole to define or model a system;
- **2.5E** identify forms of energy and properties of matter; and
- **2.5F** describe the relationship between structure and function of objects, organisms, and systems.

English Language Proficiency Standards (ELPS)

1A Use prior knowledge and experiences to understand meanings in English.

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.

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.

3H Narrate, describe, and explain with increasing specificity and detail as more English is acquired.

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.