Pacing Guide

Level 2 Module 1

Matter with Spotlight Lessons on Forces and Motion

Each *PhD Science® TEKS Edition* 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 the needs of their students. 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 31 lessons with 3 spotlight lessons on Forces and Motion. Even with lesson splits, this module should take no more than 45 days to complete. This maximum number of days ensures the implementation of all Level 2 modules within a school year that has 150 days of science instruction.

Matter

Anchor Phenomenon: Birds Building Nests **Essential Question: Why do different kinds of birds use certain materials to build their nests?**	**Recommended Number of Days**	**TEKS and ELPS Alignment**
Concept 1 (Lessons 1–13): Properties of Matter **Focus Question:** How can we describe and classify matter? Matter can be described and classified by its properties.	13–21 days	2.2A,2.2C, 2.2D, 2.2E, 2.4A, 2.4B, 2.5A, 2.5D ELPS: 2E, 3D, 3E, 3H, 4A, 4C
Concept 2 (Lessons 14–19): Matter Can Change **Focus Question:** How can matter change? Matter can change in different ways.	6–8 days	2.2C, 2.2E, 2.2F, 2.4B, 2.5A, 2.5B, 2.5C, 2.6A ELPS: 3D, 3F, 3G
Concept 3 (Lessons 20–23): Suitability **Focus Question:** Why is understanding the properties of matter useful? The properties of matter make materials suited to different purposes.	4–5 days	2.2C, 2.2D, 2.2F, 2.3A, 2.4B, 2.5A, 2.5C, 2.5D, 2.7C ELPS: 3H, 4F, 5G
Application of Concepts (Lessons 24–28): Engineering Challenge **Phenomenon Question:** What materials are suited to building a shelter that provides protection from rain? People can apply their knowledge of materials and their properties to solve problems.	5 days	2.2A, 2.2B, 2.2C, 2.2F, 2.3A, 2.4B, 2.5A, 2.5C, 2.5D, 2.7C ELPS: 3D, 3E
Application of Concepts (Lessons 29–31): End-of-Module Socratic Seminar, Assessment, and Debrief **Essential Question:** Why do different kinds of birds use certain materials to build their nests? The properties of matter and the ways matter can change make materials suited to specific purposes.	3 days	2.5A, 2.5B, 2.5C, 2.5D, 2.6A ELPS: 3E, 3G

Spotlight Lessons on Forces and Motion

Lesson Sets	Recommended Number of Days	TEKS and ELPS Alignment
Lessons 1–2: Motion **Phenomenon Question:** How can we describe motion? People can observe, describe, and predict the motion of objects.	2 days	2.2A, 2.2B, 2.2C, 2.2D, 2.2E, 2.2F, 2.3B, 2.3C, 2.4A, 2.6C ELPS: 3F, 3H
Lesson 3: Uses of Magnets **Phenomenon Question:** How do we use magnets to solve problems? People can use magnets to solve everyday problems.	1 day	2.3A, 2.6B ELPS: 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 five days a week.

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Module 1			Module 2			Module 3				

Module 1: Matter

Concept 1: How can we describe and classify matter? 13–21 days

Focus Standards

2.5A Classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid.

2.5D Combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties.

Lessons 1–3: Bird Nests			Lessons 4–7: Solids and Liquids
Lesson 1: Develop an initial model of a bird nest by exploring materials birds might use to build nests.	**Lesson 2:** Observe materials different kinds of birds use to build their nests.	**Lesson 3:** Compare spoons and forks to describe properties of materials and objects.	**Lesson 4:** Observe objects and materials to describe their properties.
Day 1: Launch through Develop Initial Models **Day 2:** Compare Bird Nests through Land	**Day 1:** Launch through Read *A Nest Is Noisy* (Aston and Long 2015) **Day 2:** Develop Anchor Model through Land Use first Teacher Note in Read *A Nest Is Noisy* (Aston and Long 2015) before the lesson.	**Day 1:** Launch through Examine Objects and Materials **Day 2:** Develop Anchor Chart and Update Anchor Model through Land	**Day 1:** Launch through Observe Samples (solids) **Day 2:** Observe Samples (liquids) through Land Think Aloud one sample in Observe Samples.
Lessons 4–7: Solids and Liquids			**Lessons 8–9: Defining Matter**
Lesson 5: Classify objects and materials by their properties.	**Lesson 6:** Investigate solids and liquids to observe their properties.	**Lesson 7:** Gather evidence to determine that sand is a solid.	**Lesson 8:** Investigate objects and materials to determine that weight is a property of matter.
Think Aloud first round of classification of samples in Classify Objects and Materials.	**Day 1:** Launch through Explore Solids and Liquids (groups visit 3 stations) **Day 2:** Explore Solids and Liquids (groups visit remaining 3 stations) through Land Use Differentiation note in Explore Solids and Liquids.	When doing the Vote-Discuss-Revote routine in Launch, consider using polling technology. Use Differentiation note in Observe Sand.	Think Aloud a weight comparison in Compare Weight of Objects.

Concept 1: How can we describe and classify matter? (continued)

Lessons 8–9: Defining Matter	Lessons 10–11: Pieces of Objects		Lessons 12–13: Properties of Matter
Lesson 9: Investigate objects and materials to determine that volume is a property of matter.	**Lesson 10:** Build two different structures by using the same set of smaller pieces.	**Lesson 11:** Observe parts of an orange to identify their different properties.	**Lesson 12:** Observe and classify the materials in honey bee nests.
Day 1: Launch through Observe Water Displacement **Day 2:** Define Matter through Land	**Day 1:** Launch through Build Block Structures **Day 2:** Compare Block Structures through Land	**Day 1:** Launch through Observe Orange Parts **Day 2:** Debrief Orange Parts Observation through Land Use Differentiation note in Observe Orange Parts.	Use Differentiation note in Conceptual Checkpoint Part A. **Conceptual Checkpoint Part A**

Lessons 12–13: Properties of Matter
Lesson 13: Observe the materials in honey bee nests to determine whether the materials are solid or liquid.
Conceptual Checkpoint Part B

Concept 2: How can matter change? 6–8 days

Focus Standards

2.5A Classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid.

2.5B Compare changes in materials caused by heating and cooling.

2.5C Demonstrate that things can be done to materials such as cutting, folding, sanding, and melting to change their physical properties.

2.6A Investigate the effects on objects by increasing or decreasing amounts of light, heat, and sound energy such as how the color of an object appears different in dimmer light or how heat melts butter.

Lessons 14–16: Reversible Changes			Lessons 17–18: Irreversible Changes
Lesson 14: Heat objects to determine a cause and effect relationship between heating and type of matter.	**Lesson 15:** Compare the properties of objects before heating, during heating, and after cooling.	**Lesson 16:** Model the reversible changes that heating and cooling cause in type of matter.	**Lesson 17:** Observe the properties of a slice of bread before and after toasting.
Day 1: Launch through Observe and Record Object Properties (butter and ice cubes) **Day 2:** Observe and Record Object Properties (chocolate chips, plastic spoon, marbles) through Land Think aloud properties of an object in Observe and Record Object Properties.	Think Aloud color band thermometer in Launch.	Think Aloud butter in Model Changes in Type of Matter.	Project bread slices in Observe Bread before and after Toasting.

Lessons 17–18: Irreversible Changes	Lesson 19: Matter Can Change
Lesson 18: Gather evidence that toasting bread demonstrates an irreversible change.	**Lesson 19:** Investigate and explain the changes beeswax undergoes during heating and cooling.
Think Aloud one property of toast in Analyze Observations.	**Day 1:** Launch through Conceptual Checkpoint **Day 2:** Debrief Conceptual Checkpoint through Land
	Conceptual Checkpoint

Concept 3: Why is understanding the properties of matter useful? 4–5 days

Focus Standards

2.5A Classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid.

2.5C Demonstrate that things can be done to materials such as cutting, folding, sanding, and melting to change their physical properties.

2.5D Combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties.

2.7C Distinguish between natural and manmade resources.

Lessons 20–22: Materials Suitability			**Lesson 23: Suitability**
Lesson 20: Explain how the properties of a crayon make it suited to writing and drawing.	**Lesson 21:** Test different writing tools to determine how well each is suited to writing on different surfaces.	**Lesson 22:** Model how the properties of nest building materials are suited to building bird nests.	**Lesson 23:** Explain why beeswax is suited to building honey bee nests.
Read *The Crayon Man: The True Story of the Invention of Crayola Crayons* by Natascha Biebow and Steven Salerno (2019) before the lesson.	**Day 1:** Launch through Test Writing Tools **Day 2:** Graph and Analyze Data through Land Use first Teacher Note in Test Writing Tools.	Read *The Crayon Man: The True Story of the Invention of Crayola Crayons* before the lesson.	**Conceptual Checkpoint**

Engineering Challenge: What materials are suited to building a shelter that provides protection from rain? — 5 days

Focus Standards

2.5A Classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid.

2.5C Demonstrate that things can be done to materials such as cutting, folding, sanding, and melting to change their physical properties.

2.5D Combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties.

2.7C Distinguish between natural and manmade resources.

Lessons 24–28: Engineering Challenge			
Lesson 24: Apply the engineering design process to build a shelter that provides protection from rain.	**Lesson 25:** Apply the engineering design process to build a shelter that provides protection from rain.	**Lesson 26:** Apply the engineering design process to build a shelter that provides protection from rain.	**Lesson 27:** Apply the engineering design process to build a shelter that provides protection from rain.
Read *A Nest is Noisy* before the lesson.	Use Teacher Note in Launch. **Engineering Challenge**		Use Differentiation note in Create a Shelter. **Engineering Challenge**

Lessons 24–28: Engineering Challenge
Lesson 28: Apply the engineering design process to build a shelter that provides protection from rain.
Engineering Challenge

Application of Concepts: Why do different kinds of birds use certain materials to build their nests? — 3 days

Focus Standards

2.5A Classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid.

2.5B Compare changes in materials caused by heating and cooling.

2.5C Demonstrate that things can be done to materials such as cutting, folding, sanding, and melting to change their physical properties.

2.5D Combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties.

2.6A Investigate the effects on objects by increasing or decreasing amounts of light, heat, and sound energy

Lessons 29–31: Bird Nests		
Lesson 29: Explain why different kinds of birds use certain materials to build their nests.	**Lesson 30:** Explain how the materials of the original *Little Dancer Aged Fourteen* sculpture are each suited to their purpose.	**Lesson 31:** Explain how matter can be described and used.
 Use Teacher Note in Engage in Socratic Seminar.		
Socratic Seminar	**End-of-Module Assessment**	**End-of-Module Debrief**

Spotlight Lessons: Forces and Motion

Focus Standards		3days
2.6B	Observe and identify how magnets are used in everyday life.	
2.6C	Trace and compare patterns of movement of objects such as sliding, rolling, and spinning over time.	
Lessons 1–2: Motion		**Lesson 3: Uses of Magnets**
Lesson 1: Observe, measure, and describe motion.	**Lesson 2:** Identify patterns people can use to predict the motion of objects.	**Lesson 3:** Explore how people use magnets to solve problems.
		Use Differentiation note in Land.

Texas Essential Knowledge and Skills (TEKS)

Focus Standards	
2.5	Matter and energy. The student knows that matter has physical properties and those properties determine how it is described, classified, changed, and used. The student is expected to
2.5A	classify matter by physical properties, including relative temperature, texture, flexibility, and whether material is a solid or liquid;
2.5B	compare changes in materials caused by heating and cooling;
2.5C	demonstrate that things can be done to materials such as cutting, folding, sanding, and melting to change their physical properties; and
2.5D	combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties.
2.6	Force, motion, and energy. The student knows that forces cause change and energy exists in many forms. The student is expected to
2.6A	investigate the effects on objects by increasing or decreasing amounts of light, heat, and sound energy such as how the color of an object appears different in dimmer light or how heat melts butter.
2.6B	observe and identify how magnets are used in everyday life.
2.6C	trace and compare patterns of movement of objects such as sliding, rolling, and spinning over time.

Investigation and Reasoning Standards	
2.2	Scientific investigation and reasoning. The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations. The student is expected to
	2.2A ask questions about organisms, objects, and events during observations and investigations;
	2.2B plan and conduct descriptive investigations;
	2.2C collect data from observations using scientific tools;
	2.2D record and organize data using pictures, numbers, and words;
	2.2E communicate observations and justify explanations using student-generated data from simple descriptive investigations; and
	2.2F compare results of investigations with what students and scientists know about the world.
2.3	Scientific investigation and reasoning. The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to
	2.3A identify and explain a problem and propose a task and solution for the problem.
	2.3B Make predictions based on observable patterns.
	2.3C Identify what a scientist is and explore what different scientists do.
2.4	Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to
	2.4A collect, record, and analyze information using tools, including computers, hand lenses, rulers, plastic beakers, magnets, collecting nets, notebooks, and safety goggles or chemical splash goggles, as appropriate; timing devices; weather instruments such as thermometers, wind vanes, and rain gauges; and materials to support observations of habitats of organisms such as terrariums and aquariums; and
	2.4B measure and compare organisms and objects.

Works Cited

Aston, Dianna Hutts, and Sylvia Long (illustrator). 2015. *A Nest Is Noisy*. San Francisco: Chronicle Books. [All references to *A Nest Is Noisy* are from this source.]

Biebow, Natascha, and Steven Salerno (illustrator). 2019. *The Crayon Man: The True Story of the Invention of Crayola Crayons*. Boston: Houghton Mifflin Harcourt. [All references to *The Crayon Man* are from this source.]

Credits

Page 14, Edgar Degas, *Little Dancer Aged Fourteen* (detail), 1878–1881. Image Credit: National Gallery of Art, New York, NY, USA Collection of Mr. and Mrs. Paul Mellon.