1st Grade – Thematic Model - Bundle 3
Organisms and Sunlight

This is the third bundle of the 1st Grade Thematic Model. Each bundle has connections to the other bundles in the course, as shown in the Course Flowchart.

Bundle 3 Question: This bundle is assembled to address the question "how can we solve problems related to organisms and sunlight?"

Summary

The bundle organizes performance expectations around the theme of *organisms and sunlight.* Instruction developed from this bundle should always maintain the three-dimensional nature of the standards, but recognize that instruction is not limited to the practices and concepts directly linked with any of the bundle performance expectations.

Connections between bundle DCIs

The idea of seasonal patterns of sunrise and sunset (ESS1.B as in 1-ESS1-2) connects to the idea that plants have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow (LS1.A as in 1-LS1-1) through the concept of sunlight, which varies by season and is captured by plants, mostly through their leaves so that they can grow and survive.

The engineering design idea that designs can be conveyed through sketches, drawings, or physical models (ETS1.B as in K-2-ETS1-2) could be applied to multiple concepts, such as that plants have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow (LS1.A as in 1-LS1-1) or that seasonal patterns of sunrise and sunset can be observed, described, and predicted. (ESS1.B as in 1-ESS1-2). These ideas could connect through engineering tasks such as one in which students are asked to design a structure that mimics a way in which a plant part helps it grow and survive. Students could share their design ideas through sketches, drawings or physical models. Another possible task could be designing a solution to the problem that a plant gets too much sunlight in the summer and/or too little sunlight in the winter. Again, students could convey their solutions through sketches, drawings, or physical models. Additionally, these ideas could connect to the concept that because there is always more than one possible solution to a problem, it is useful to compare and test designs (ETS1.C as in K-2-ETS1-3) by having students compare—possibly using their sketches, drawings, or physical models—and test their solutions.

Bundle Science and Engineering Practices

Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the practices of developing and using models (K-2-ETS1-2), planning and carrying out investigations (1-ESS1-2), analyzing and interpreting data (K-2-ETS1-3), and constructing explanations and designing solutions (1-LS1-1). Many other practice elements can be used in instruction.

Bundle Crosscutting Concepts

Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the crosscutting concepts of Patterns (1-ESS1-2) and Structure and Function (1-LS1-1 and K-2-ETS1-2). Many other crosscutting concepts elements can be used in instruction.

All instruction should be three-dimensional.

Performance Expectations 1-ESS1-2, K-2-ETS1-2, and K-2-ETS1-3 are partially assessable	1-LS1-1 **Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.* [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]** 1-ESS1-2 **Make observations at different times of year to relate the amount of daylight to the time of year. [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [*Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.*]** K-2-ETS1-2 **Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.** K-2-ETS1-3 **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**
Example Phenomena	Plants sometimes grow toward a window, rather than straight up. Some people wear flippers to swim. The amount of daily sunlight changes through the year.
Additional Practices Building to the PEs	**Asking Questions and Defining Problems** ● Ask questions based on observations to find more information about the natural and/or designed world(s). Students could *ask questions based on observations* [of] ***animals' behaviors that help them survive***. 1-LS1-1 **Developing and Using Models** ● Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). Students could *develop a model to represent relationships in the natural world* [such as the relationship between animals'] ***external parts*** [and their ability to] ***see, hear, and grasp objects.*** 1-LS1-1 **Planning and Carrying Out Investigations** ● Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question. Students could *evaluate different ways of observing* [the] ***external parts of*** [different] ***organisms*** *to determine which way can answer a question* [about how the parts] ***help them survive and grow***. 1-LS1-1 **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns and/or relationships in the natural world in order to answer scientific questions. Students could *use firsthand observations to describe* ***and predict seasonal patterns of sunrise and sunset*** *in order to answer scientific questions*. 1-ESS1-2

Additional Practices Building to the PEs (Continued)	**Using Mathematical and Computational Thinking** ● Use counting and numbers to identify and describe patterns in the natural and designed world(s). Students could use *counting and numbers to identify and describe patterns in* ***designs conveyed through drawings and physical models***. K-2-ETS1-2 **Constructing Explanations and Designing Solutions** ● Make observations (firsthand or from media) to construct an evidence based account for natural phenomena. Students could *make observations (firsthand or from media) to construct an evidence-based account for* [how] ***different plant parts help them survive and grow***. 1-LS1-1 **Engaging in Argument From Evidence** ● Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence. Students could *make a claim about the effectiveness of an object* [designed to mimic a] ***way animals use their body parts to move from place to place.*** 1-LS1-1 **Obtaining, Evaluating, and Communicating Information** ● Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. Students could *read grade-appropriate texts to obtain scientific information and determine patterns* [about] ***animals' body parts that capture information***. 1-LS1-1
Additional Crosscutting Concepts Building to the PEs	**Cause and Effect** ● Events have causes that generate observable patterns. Students could describe that *events have causes that generate observable patterns,* [such as] ***animal behaviors*** [in] ***response to inputs***. 1-LS1-1 **Stability and Change** ● Some things stay the same while other things change. Students could identify *some things* [that] *stay the same* [and] *other things* [that] *change,* [such as] ***seasonal*** [changes] ***of sunrise and sunset***. 1-ESS1-2 **Systems and System Models** ● Systems in the natural and designed world have parts that work together. Students could describe ***plants*** [as an example of a] *system in the natural world* [that has] ***parts (roots, stems, leaves, flowers, fruits)*** *that work together* [to] ***help them survive and grow***. 1-LS1-1
Additional Connections to Nature of Science	**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ● Scientists use drawings, sketches, and models as a way to communicate ideas. Students could describe how they *used drawings, sketches, and models as a way to communicate ideas* [about] ***different plant parts (roots, stems, leaves, flowers, fruits) that help*** [the plants] ***survive and grow,*** *just as scientists use drawings, sketches, and models as a way to communicate ideas***.** 1-LS1-1

Additional Connections to Nature of Science (Continued) .	**Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. Students could describe how *scientists look for patterns and order when making observations about the world* [just as they did when they] ***observed, described, and predicted seasonal patterns of sunrise and sunset***. 1-ESS1-2

1-LS1-1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

1-LS1-1. **Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*** [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use materials to design a device that solves a specific problem or a solution to a specific problem.

Disciplinary Core Ideas

LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.

LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering and Technology on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

Observable features of the student performance by the end of the grade:			
1	Using scientific knowledge to generate design solutions		
	a	Students describe* the given human problem to be solved by the design.	
	b	With guidance, students use given scientific information about plants and/or animals to design the solution, including:	
		iii.	How external structures are used to help the plant and/or animal grow and/or survive.
		iv.	How animals use external structures to capture and convey different kinds of information they need.
		v.	How plants and/or animals respond to information they receive from the environment.
	c	Students design a device (using student-suggested materials) that provides a solution to the given human problem by mimicking how plants and/or animals use external structures to survive, grow, and/or meet their needs. This may include:	
		i.	Mimicking the way a plant and/or animal uses an external structure to help it survive, grow, and/or meet its needs.
		ii.	Mimicking the way an external structure of an animal captures and conveys information.
		iii.	Mimicking the way an animal and/or plant responds to information from the environment.
2	Describing* specific features of the design solution, including quantification when appropriate		
	a	Students describe* the specific expected or required features in their designs and devices, including:	
		i.	The device provides a solution to the given human problem.
		ii.	The device mimic plant and/or animal external parts, and/or animal information-processing

		iii. The device use the provided materials to develop solutions.
3	Evaluating potential solutions	
	a	Students describe* how the design solution is expected to solve the human problem.
	b	Students determine and describe* whether their device meets the specific required features.

1-ESS1-2 Earth's Place in the Universe

Students who demonstrate understanding can:

1-ESS1-2. **Make observations at different times of year to relate the amount of daylight to the time of year.** [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [*Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons.

Disciplinary Core Ideas

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Observable features of the student performance by the end of the grade:		
1	Identifying the phenomenon under investigation	
	a	Students identify and describe* the phenomenon and purpose of the investigation, which include the following idea: the relationship between the amount of daylight and the time of year.
2	Identifying evidence to address the purpose of the investigation	
	a	Based on the given plan for the investigation, students (with support) describe* the data and evidence that will result from the investigation, including observations (firsthand or from media) of relative length of the day (sunrise to sunset) throughout the year.
	b	Students individually describe* how these observations could reveal the pattern between the amount of daylight and the time of year (i.e., relative lightness and darkness at different relative times of the day and throughout the year).
3	Planning the investigation	
	a	Based on the given investigation plan, students describe* (with support):
		i. How the relative length of the day will be determined (e.g., whether it will be light or dark when waking in the morning, at breakfast, when having dinner, or going to bed at night).
		ii. When observations will be made and how they will be recorded, both within a day and across the year.
4	Collecting the data	
	a	According to the given investigation plan, students collaboratively make and record observations about the relative length of the day in different seasons to make relative comparisons between the amount of daylight at different times of the year (e.g., summer, winter, fall, spring).

K-2-ETS1-2 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-2. **Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.**

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool.

Disciplinary Core Ideas

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

Observable features of the student performance by the end of the grade:		
1	Components of the model	
	a	Students develop a representation of an object and the problem it is intended to solve. In their representation, students include the following components:
		i. The object.
		ii. The relevant shape(s) of the object.
		iii. The function of the object.
	b	Students use sketches, drawings, or physical models to convey their representations.
2	Relationships	
	a	Students identify relationships between the components in their representation, including:
		i. The shape(s) of the object and the object's function.
		ii. The object and the problem is it designed to solve.
3	Connections	
	a	Students use their representation (simple sketch, drawing, or physical model) to communicate the connections between the shape(s) of an object, and how the object could solve the problem.

K-2-ETS1-3 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-3. **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Analyze data from tests of an object or tool to determine if it works as intended.	**ETS1.C: Optimizing the Design Solution** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	

Observable features of the student performance by the end of the grade:		
1	Organizing data	
	a	With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
2	Identifying relationships	
	a	Students use their organization of the data to find patterns in the data, including:
		i. How each of the objects performed, relative to:
		1. The other object.
		2. The intended performance.
		ii. How various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength).
3	Interpreting data	
	a	Students use the patterns they found in object performance to describe*:
		i. The way (e.g., physical process, qualities of the solution) each object will solve the problem.
		ii. The strengths and weaknesses of each design.
		iii. Which object is better suited to the desired function, if both solve the problem.