1st Grade - Topic Model - Bundle 3
Structures and Behaviors in Organisms

This is the third bundle of the 1st Grade Topic 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 "what structures and behaviors help plants and animals survive?"

Summary

The bundle organizes performance expectations with a focus on the theme of *structures and behaviors in organisms.* 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) can be connected 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 idea of organism survival also connects to the concept that, in many kinds of animals, parents and their offspring engage in behaviors that help the offspring survive (LS1.B as in 1-LS1-2). This concept connects to the idea that young animals are very much, but not exactly like, their parents (LS3.A as in 1-LS3-1).

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 animals respond to inputs with behaviors that help them survive (LS1.D as in 1-LS1-1). Connections could be made through 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 can share their design ideas through sketches, drawings, or physical models. Another connection could be through a task in which students design a device that has different responses for different inputs, and then students can compare their device to an animal's response to the same inputs.

Bundle Science and Engineering Practices

Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the practices of asking questions and defining problems (K-2-ETS1-1), planning and carrying out investigations (1-ESS1-2), developing and using models (K-2-ETS1-2), analyzing and interpreting data (1-ESS1-1), constructing explanations and designing solutions (1-LS1-1 and 1-LS3-1), and obtaining, evaluating, and communicating information (1-LS1-2). 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, 1-LS3-1, and 1-LS1-2), Structure and Function (K-2-ETS1-2 and 1-LS1-2), and Cause and Effect (1-PS4-1). Many other crosscutting concepts elements can be used in instruction.

All instruction should be three-dimensional.

Performance Expectations 1-ESS1-2 is 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-LS1-2 **Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]** 1-LS3-1 **Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [*Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.*]** 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.**
Example Phenomena	Almonds have shells that have to be removed before you can eat the nut. Ducks have webbed feet but people do not.
Additional Practices Building to the PEs	**Asking Questions and Defining Problems** • Ask questions based on observations to find more information about the natural world. Student could *ask questions based on observations* [of how] ***different animals use their body parts in different ways to protect themselves***. 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] ***move from place to place.*** 1-LS1-1 **Planning and Carrying Out Investigations** • Make observations (firsthand or from media) to collect data that can be used to make comparisons. Students could *make observations from media to collect data that can be used to make comparisons* [between] ***behaviors parents*** [versus] ***offspring engage in that help the offspring survive.*** 1-LS1-2

Additional Practices Building to the PEs (Continued)	**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 observations (firsthand or from media) to describe* ***seasonal patterns of sunrise and sunset*** *in order to answer scientific questions*. 1-ESS1-2 **Using Mathematical and Computational Thinking** • Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs. Students could *describe, measure, and/or compare quantitative attributes of* ***young animals and their parents*** *and display the data using simple graphs* [to determine if the] ***young animals are exactly like their parents***. 1-LS3-1 **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 the] ***roots*** [of] ***plants 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 a* ***behavior*** [that] ***parents engage in*** [to help their] ***offspring survive***. 1-LS1-2 **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 and use media to obtain scientific information* [about patterns of the structure of] ***animals' body parts that capture and convey different kinds of information***. 1-LS1-1
Additional Crosscutting Concepts Building to the PEs	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes. Students could describe *simple tests that can be designed to gather evidence to support or refute student ideas about* [how] ***different plant parts*** *cause* [plant survival]. 1-LS1-1 **Scale, Proportion, and Quantity** • Standard units are used to measure length. Students could use standard units to measure length [of plants to determine if] ***plants are exactly like their parents***. 1-LS3-1 **Systems and System Models** • Objects and organisms can be described in terms of their parts. Students could describe ***plants*** *in terms of their parts* ***(roots, stems, leaves, flowers, fruits)***. 1-LS1-1

Additional Connections to Nature of Science	**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 the students did when they] ***observed, described, and predicted seasonal patterns of sunrise and sunset***. 1-ESS1-2 **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Scientists search for cause and effect relationships to explain natural events. Students could describe how *scientists search for cause and effect relationships to explain natural events* [just as the students did when they] *searched for cause and effect relationships [between]* ***organisms' external parts*** *[and their]* ***survival and growth***. 1-LS1-2

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-LS1-2 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

1-LS1-2. **Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.** [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

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

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

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Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed 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	Obtaining information	
	a	Students use grade-appropriate books and other reliable media to obtain the following scientific information:
		i. Information about the idea that both plants and animals can have offspring.
		ii. Information about behaviors of animal parents that help offspring survive (e.g., keeping offspring safe from predators by circling the young, feeding offspring).
		iii. Information about behaviors of animal offspring that help the offspring survive (e.g., crying, chirping, nuzzling for food).
2	Evaluating information	
	a	Students evaluate the information to determine and describe* the patterns of what animal parents and offspring do to help offspring survive (e.g., when a baby cries, the mother feeds it; when danger is present, parents protect offspring; some young animals become silent to avoid predators).

1-LS3-1 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

1-LS3-1. **Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.** [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [*Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.*]

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.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents.

LS3.B: Variation of Traits

- Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed 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	Articulating the explanation of phenomena		
	a	Students articulate a statement that relates a given phenomenon to a scientific idea, including the idea that young plants and animals are like, but not exactly like, their parents (not to include animals that undergo complete metamorphoses, such as insects or frogs).	
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.	
2	Evidence		
	a	Students describe* evidence from observations (firsthand or from media) about patterns of features in plants and animals, including:	
		i.	Key differences between different types of plants and animals (e.g., features that distinguish dogs versus those that distinguish fish, oak trees vs. bean plants).
		ii.	Young plants and animals of the same type have similar, but not identical features (e.g., size and shape of body parts, color and/or type of any hair, leaf shape, stem rigidity).
		iii.	Adult plants and animals (i.e., parents) of the same type have similar, but not identical features (e.g., size and shape of body parts, color and/or type of any hair, leaf shape, stem rigidity).
		iv.	Patterns of similarities and differences in features between parents and offspring.
3	Reasoning		
	a	Students logically connect the evidence of observed patterns in features to support the evidence-based account by describing* chains of reasoning that include:	
		i.	Young plants and animals are very similar to their parents.
		ii.	Young plants and animals are not exactly the same as their parents.
		iii.	Similarities and differences in features are evidence that young plants and animals are very much, but not exactly, like their parents.
		iv.	Similarities and differences in features are evidence that although individuals of the same type of animal or plant are recognizable as similar, they can also vary in many ways.

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.