2nd Grade – Topic Model – Bundle 3
The Needs of Plants

This is the third bundle of the 2nd 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 do plants need?"

Summary

The bundle organizes performance expectations with a focus on helping students understand the needs of plants. Instruction developed from this bundle should always maintain the three-dimensional nature of the standards, and is not limited to the practices and concepts directly linked with any of the bundle performance expectations.

Connections between bundle DCIs

The concept that plants depend on animals for pollination or to move their seeds around (LS2.A as in 2-LS2-2) connects to the concept that plants depend on water and light to grow (LS2.A as in 2-LS2-1), as both ideas are about plant needs.

The engineering design idea that designs can be conveyed through sketches, drawings, or physical models (ETS1.B as in K-2-ETS1-2 and 2-LS2-2) can be connected to multiple science concepts, such as that plants depend on animals for pollination or to move their seeds around (LS2.A as in 2-LS2-2) and that plants depend on water and light to grow (LS2.A as in 2-LS2-1). The first connection could be made through challenging students to draw a design of a way to increase the dispersal of grass seeds that move by sticking to animals' fur. And the second connection could be made by students designing and then drawing a garden or greenhouse, showing how the needs for water and light are met.

Bundle Science and Engineering Practices

Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the practices of planning and carrying out investigations (2-LS2-1) and developing and using models (2-LS2-2 and K-2-ETS1-2). 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 Cause and Effect (2-PS1-4 and 2-LS2-1) and Structure and Function (2-LS2-2 and K-2-ETS1-2). Many other crosscutting concepts elements can be used in instruction.

All instruction should be three-dimensional.

Performance Expectations	2-LS2-1. **Plan and conduct an investigation to determine if plants need sunlight and water to grow. [*Assessment Boundary: Assessment is limited to testing one variable at a time.*]** 2-LS2-2. **Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*** 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	An indoor plant wilts when it doesn't get water. Two very different greenhouses can be built from the same basic materials.

Additional Practices Building to the PEs	**Asking Questions and Defining Problems** ● Ask and/or identify questions that can be answered by an investigation. Students could *ask questions that can be answered by an investigation* [about what] ***plants*** [need in order to] ***to grow, pollinate, and to move their seeds around***. 2-LS2-1 and 2-LS2-2 **Developing and Using Models** ● Compare models to identify common features and differences. Students could *compare models* [about how] ***plants depend on animals for pollination*** *to identify common features and differences* [of the models]. 2-LS2-2 **Planning and Carrying Out Investigations** ● Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons. Students could *make measurements* [of different] ***plants*** [with different amounts of] ***water*** *to collect data that can be used to make comparisons*. 2-LS2-1 **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. Students could *use observations from* [videos] *to describe relationships* [between] ***animals*** [and] ***plant pollination*** *in order to answer scientific questions*. 2-LS2-2 **Using Mathematical and Computational Thinking** ● Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs. Students could *measure and compare* [the height] *of different* ***plants*** [that have been given different amounts of] ***light*** *and display the data using simple graphs*. 2-LS2-1 **Constructing Explanations and Designing Solutions** ● Use information from observations (firsthand or from the media) to construct an evidence-based account of natural phenomena. Students could *use information from firsthand observations to construct an evidence-based account* [that] ***plants depend on animals to move their seeds around***. 2-LS2-2 **Engaging in Argument from Evidence** ● Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence. Students can *make a claim that is supported by evidence about the effectiveness of a solution* [that will help] ***plants move their seeds around***. 2-LS2-1 and 2-LS2-2

Additional Practices Building to the PEs (Continued)	**Obtaining, Evaluating, and Communicating Information** ● Describe how specific images (e.g. a diagram showing how a machine works) support a scientific or engineering idea. Students could *describe how a specific diagram* [showing how to mimic the function of a bee in] ***pollinating plants*** *supports the engineering idea* [that] ***drawings can be useful in communicating ideas for a problem's solution to other people***. 2-LS2-2 and K-2-ETS1-2
Additional Crosscutting Concepts Building to the PEs	**Patterns** ● Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. Students could *observe patterns* [and] *use the patterns as evidence to describe* [that] plants depend on water and light to grow. 2-LS2-1 **Scale, Proportion, and Quantity** ● Standard units are used to measure length. Students could describe why *standard units are used to measure length* [when investigating whether] ***plants depend on water and light to grow***. 2-LS2-1 **Systems and System Models** ● Objects and organisms can be described in terms of their parts. Students could describe ***animals*** *in terms of their parts,* [including the parts that aid] ***plants*** [with] ***pollination***. 2-LS2-2
Additional Connections to Nature of Science	**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ● Scientists search for cause and effect relationships to explain natural events. Students could communicate the idea that they, like *scientists, searched for cause and effect relationships to explain* [that] ***plants depend on water and light to grow***. 2-LS2-1 **Science Addresses Questions About the Natural and Material World** ● Scientists study the natural and material world. Students could describe that [studying how] ***plants depend on animals for pollination*** [is a] *study* [of] *the natural and material world*. 2-LS2-2

2-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

2-LS2-1. **Plan and conduct an investigation to determine if plants need sunlight and water to grow.** [*Assessment Boundary: Assessment is limited to testing one variable at a time.*]

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.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow.

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns.

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 answering a question about whether plants need sunlight and water to grow.
2	Identifying the evidence to address the purpose of the investigation	
	a	Students describe* the evidence to be collected, including:
		i. Plant growth with both light and water.
		ii. Plant growth without light but with water.
		iii. Plant growth without water but with light.
		iv. Plant growth without water and without light.
	b	Students describe* how the evidence will allow them to determine whether plants need light and water to grow.
3	Planning the investigation	
	a	Students collaboratively develop an investigation plan. In the investigation plan, students describe* the features to be part of the investigation, including:
		i. The plants to be used.
		ii. The source of light.
		iii. How plants will be kept with/without light in both the light/dark test and the water/no water test.
		iv. The amount of water plants will be given in both the light/dark test and the water/no water test.
		v. How plant growth will be determined (e.g., observations of plant height, number and size of leaves, thickness of the stem, number of branches).
	b	Students individually describe* how this plan allows them to answer the question.
4	Collecting the data	
	a	According to the investigation plan developed, students collaboratively collect and record data on the effects on plant growth by:
		i. Providing both light and water,
		ii. Withholding light but providing water,
		iii. Withholding water but providing light, or
		iv. Withholding both water and light.

2-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

2-LS2-2. **Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.***

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

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on animals for pollination or to move their seeds around.

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.*(secondary)*

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 simple model that mimics the function of an animal in seed dispersal or pollination of plants. Students identify the relevant components of their model, including those components that mimic the natural structure of an animal that helps it disperse seeds (e.g., hair that snares seeds, squirrel cheek pouches that transport seeds) or that mimic the natural structure of an animal that helps it pollinate plants (e.g., bees have fuzzy bodies to which pollen sticks, hummingbirds have bills that transport pollen). The relevant components of the model include:
		i. Relevant structures of the animal.
		ii. Relevant structures of the plant.
		iii. Pollen or seeds from plants.
2	Relationships	
	a	In the model, students describe* relationships between components, including evidence that the developed model mimics how plant and animal structures interact to move pollen or disperse seeds.
		i. Students describe* the relationships between components that allow for movement of pollen or seeds.
		ii. Students describe* the relationships between the parts of the model they are developing and the parts of the animal they are mimicking.
3	Connections	
	a	Students use the model to describe*:
		i. How the structure of the model gives rise to its function.
		ii. Structure-function relationships in the natural world that allow some animals to disperse seeds or pollinate plants.

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.