3rd Grade – Topic Model – Bundle 1
Organism Traits

This is the first bundle of the 3rd Grade Topic Model. Each bundle has connections to the other bundles in the course, as shown in the Course Flowchart.

Bundle 1 Question: This bundle is assembled to address the question of "Why are organisms different from one another?"

Summary

The bundle organizes performance expectations with a focus on helping students build understanding of traits of organisms. Instruction developed from this bundle should always maintain the three-dimensional nature of the standards, and 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 that being part of a group helps animals obtain food, defend themselves, and cope with changes (LS2.D as in 3-LS2-1) connects to the idea that reproduction is essential to the continued existence of every kind of organism (LS1.B as in 3-LS1-1) through the concept of survival of organisms. Reproduction also connects to the concept of inheritance and that many characteristics of organisms are inherited from their parents (LS3.A as in 3-LS3-1). Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment (LS3.A as in 3-LS3-2).

All the previous concepts also connect to each other through the concept of patterns: patterns of reproduction and life cycles across organisms, and patterns of characteristics of organisms, both inherited and from interactions with the environment. The concept of patterns also allows students to begin studying the idea that scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next (ESS2.D as in 3-ESS2-1). This idea will be further developed in subsequent bundles.

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 (3-LS1-1), analyzing and interpreting data (3-LS3-1 and 3-ESS2-1), constructing explanations and designing solutions (3-LS3-2), and engaging in argument from evidence (3-LS2-1). 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 (3-LS1-1, 3-LS3-1, and 3-ESS2-1) and Cause and Effect (3-LS2-1 and 3-LS3-2). Many other crosscutting concepts elements can be used in instruction.

All instruction should be three-dimensional.

Performance Expectations 3-LS2-1 and 3-ESS2-1 are partially assessable.	3-LS1-1. **Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death**. [Clarification Statement: Changes organisms go through during their life form a pattern.] [*Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.*] 3-LS2-1. **Construct an argument that some animals form groups that help members survive.** 3-LS3-1. **Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [*Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.*]

Performance Expectations (Continued)	3-LS3-2. **Use evidence to support the explanation that traits can be influenced by the environment.** [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.] 3-ESS2-1**. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.** [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.] [*Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.*]
Example Phenomena	On average, humans are taller now than they were in the past. There are "worker bees" in bee colonies.
Additional Practices Building to the PEs	**Asking Questions and Defining Problems** ● Use prior knowledge to describe problems that can be solved. Students could use prior knowledge [about] ***patterns of the weather across different times and areas*** *to describe problems that can be solved*. 3-ESS2-1 **Developing and Using Models** ● Develop and/or use models to describe and/or predict phenomena. Students could *develop models to predict* [which] ***animals form groups***. 3-LS2-1 **Planning and Carrying Out Investigations** ● Evaluate appropriate methods and/or tools for collecting data. Students could *evaluate appropriate methods for collecting data* [on] ***patterns of the weather across different times***. 3-ESS2-1 **Analyzing and Interpreting Data** ● Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. Students could *compare and contrast data* [on] ***individuals' interactions with the environment*** *collected by different groups in order to discuss similarities and differences in their findings*. 3-LS3-2 **Using Mathematical and Computational Thinking** ● Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems. Students could *describe, estimate, and graph quantities to address scientific questions* [about] ***variations in group sizes***. 3-LS2-1 **Constructing Explanations and Designing Solutions** ● Construct an explanation of observed relationships Students could *construct an explanation of* [the] *observed relationships* [between] ***different inherited information*** [and] ***variations in how different organisms look and function***. 3-LS3-1

Additional Practices Building to the PEs (Continued)	**Engaging in Argument from Evidence** ● Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. Students could *respectfully provide and receive critiques from peers about a proposed explanation* [that] ***the environment affects the traits that an organism develops***. 3-LS3-2 **Obtaining, Evaluating, and Communicating Information** ● Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. Students could *combine information in written text* [about the] ***life cycles*** [of different] ***plants and animals*** *with that contained in corresponding tables, diagrams, and/or charts to support* [claims about the diversity of life cycles]. 3-LS1-1
Additional Crosscutting Concepts Building to the PEs	**Cause and Effect** ● Cause and effect relationships are routinely identified, tested, and used to explain change. Students could describe why scientists *identify the cause and effect relationships* [between the variation] ***in how different organisms look and function*** [and their] ***different inherited information***. 3-LS3-1 **Systems and System Models** ● A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. Students could describe ***plants' and animals' life cycles*** *as systems of related* [stages] *that make up a whole and can carry out functions its individual* [stages] *cannot*. 3-LS1-1 **Stability and Change** ● Change is measured in terms of differences over time and may occur at different rates. Students could use ***patterns of the weather across different times and areas*** [to describe] *that change may occur at different rates*. 3-ESS2-1
Additional Connections to Nature of Science	**Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ● Science assumes consistent patterns in natural systems. Students could describe how we know that ***the environment affects the traits that an organism develops*** *because science assumes consistent patterns in natural systems.* 3-LS3-2 **Science is a Human Endeavor** ● Science affects everyday life. Students could describe that *science affects everyday life* [using examples of ways people apply their understanding that] ***the environment affects the traits that an organism develops***. 3-LS3-2

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

Students who demonstrate understanding can:

3-LS1-1. **Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.** [Clarification Statement: Changes organisms go through during their life form a pattern.] [*Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.*]

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 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop models to describe phenomena.

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns.

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions.

Observable features of the student performance by the end of the grade:		
1	Components of the model	
	a	Students develop models (e.g., conceptual, physical, drawing) to describe* the phenomenon. In their models, students identify the relevant components of their models including:
		i. Organisms (both plant and animal).
		ii. Birth.
		iii. Growth.
		iv. Reproduction.
		v. Death.
2	Relationships	
	a	In the models, students describe* relationships between components, including:
		i. Organisms are born, grow, and die in a pattern known as a life cycle.
		ii. Different organisms' life cycles can look very different.
		iii. A causal direction of the cycle (e.g., without birth, there is no growth; without reproduction, there are no births).
3	Connections	
	a	Students use the models to describe* that although organisms can display life cycles that look different, they all follow the same pattern.
	b	Students use the models to make predictions related to the phenomenon, based on patterns identified among life cycles (e.g., prediction could include that if there are no births, deaths will continue and eventually there will be no more of that type of organism).

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

Students who demonstrate understanding can:

3-LS2-1. **Construct an argument that some animals form groups that help members survive.**

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

Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence, data, and/or a model.

Disciplinary Core Ideas

LS2.D: Social Interactions and Group Behavior

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size *(Note: Moved from K–2)*.

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Observable features of the student performance by the end of the grade:

1	Supported claims	
	a	Students make a claim to be supported about a phenomenon. In their claim, students include the idea that some animals form groups and that being a member of that group helps each member survive.
2	Identifying scientific evidence	
	a	Students describe* the given evidence, data, and/or models necessary to support the claim, including:
		i. Identifying types of animals that form or live in groups of varying sizes.
		ii. Multiple examples of animals in groups of various sizes:
		1. Obtaining more food for each individual animal compared to the same type of animal looking for food individually.
		2. Displaying more success in defending themselves than those same animals acting alone.
		3. Making faster or better adjustments to harmful changes in their ecosystem than would those same animals acting alone.
3	Evaluating and critiquing evidence	
	a	Students evaluate the evidence to determine its relevance, and whether it supports the claim that being a member of a group has a survival advantage.
	b	Students describe* whether the given evidence is sufficient to support the claim and whether additional evidence is needed.
4	Reasoning and synthesis	
	a	Students use reasoning to construct an argument connecting the evidence, data and/or models to the claim. Students describe* the following reasoning in their argument:
		i. The causal evidence that being part of a group can have the effect of animals being more successful in obtaining food, defending themselves, and coping with change supports the claim that being a member of a group helps animals survive.
		ii. The causal evidence that an animal losing its group status can have the effect of the animal obtaining less food, not being able to defend itself, and not being able to cope with change supports the claim that being a member of a group helps animals survive.

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

Students who demonstrate understanding can:

3-LS3-1. **Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [*Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.*]

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

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning.

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents.

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information.

Crosscutting Concepts

Patterns

- Similarities and differences in patterns can be used to sort and classify natural phenomena.

Observable features of the student performance by the end of the grade:		
1	Organizing data	
	a	Students organize the data (e.g., from students' previous work, grade-appropriate existing datasets) using graphical displays (e.g., table, chart, graph). The organized data include:
		i. Traits of plant and animal parents.
		ii. Traits of plant and animal offspring.
		iii. Variations in similar traits in a grouping of similar organisms.
2	Identifying relationships	
	a	Students identify and describe* patterns in the data, including:
		i. Similarities in the traits of a parent and the traits of an offspring (e.g., tall plants typically have tall offspring).
		ii. Similarities in traits among siblings (e.g., siblings often resemble each other).
		iii. Differences in traits in a group of similar organisms (e.g., dogs come in many shapes and sizes, a field of corn plants have plants of different heights).
		iv. Differences in traits of parents and offspring (e.g., offspring do not look exactly like their parents).
		v. Differences in traits among siblings (e.g., kittens from the same mother may not look exactly like their mother).
3	Interpreting data	
	a	Students describe* that the pattern of similarities in traits between parents and offspring, and between siblings, provides evidence that traits are inherited.
	b	Students describe* that the pattern of differences in traits between parents and offspring, and between siblings, provides evidence that inherited traits can vary.
	c	Students describe* that the variation in inherited traits results in a pattern of variation in traits in groups of organisms that are of a similar type.

3-LS3-2 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

3-LS3-2. **Use evidence to support the explanation that traits can be influenced by the environment.** [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

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 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to support an explanation.

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.

LS3.B: Variation of Traits

- The environment also affects the traits that an organism develops.

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Observable features of the student performance by the end of the grade:

1	Articulating the explanation of phenomena		
	a	Students identify the given explanation to be supported, including a statement that relates the phenomenon to a scientific idea, including that many inherited traits can be influenced by the environment.	
2	Evidence		
	a	Students describe* the given evidence that supports the explanation, including:	
		i.	Environmental factors that vary for organisms of the same type (e.g., amount or food, amount of water, amount of exercise an animal gets, chemicals in the water) that may influence organisms' traits.
		ii.	Inherited traits that vary between organisms of the same type (e.g., height or weight of a plant or animal, color or quantity of the flowers).
		iii.	Observable inherited traits of organisms in varied environmental conditions
3	Reasoning		
	a	Students use reasoning to connect the evidence and support an explanation about environmental influences on inherited traits in organisms. In their chain of reasoning, students describe* a cause-and-effect relationship between a specific causal environmental factor and its effect of a given variation in a trait (e.g., not enough water produces plants that are shorter and have fewer flowers than plants that had more water available).	

3-ESS2-1 Earth's Systems

Students who demonstrate understanding can:

3-ESS2-1. **Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.** [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.] [*Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.*]

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

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions.

Observable features of the student performance by the end of the grade:		
1	Organizing data	
	a	Students use graphical displays (e.g., table, chart, graph) to organize the given data by season using tables, pictographs, and/or bar charts, including:
		i. Weather condition data from the same area across multiple seasons (e.g., average temperature, precipitation, wind direction).
		ii. Weather condition data from different areas (e.g., hometown and nonlocal areas, such as a town in another state).
2	Identifying relationships	
	a	Students identify and describe* patterns of weather conditions across:
		i. Different seasons (e.g., cold and dry in the winter, hot and wet in the summer; more or less wind in a particular season).
		ii. Different areas (e.g., certain areas (defined by location, such as a town in the Pacific Northwest), have high precipitation, while a different area (based on location or type, such as a town in the Southwest) have very little precipitation).
3	Interpreting data	
	a	Students use patterns of weather conditions in different seasons and different areas to predict:
		i. The typical weather conditions expected during a particular season (e.g., "In our town in the summer it is typically hot, as indicated on a bar graph over time, while in the winter it is typically cold; therefore, the prediction is that next summer it will be hot and next winter it will be cold.").
		ii. The typical weather conditions expected during a particular season in different areas.