

### 3rd Grade – Thematic Model – Bundle 2

#### Similarities and Differences in Organisms

*This is the second bundle of the 3<sup>rd</sup> Grade Thematic Model. Each bundle has connections to the other bundles in the course, as shown in the [Course Flowchart](#).*

*Bundle 2 Questions: This bundle is assembled to address the question “what causes the differences between organisms?”*

#### **Summary**

The bundle organizes performance expectations with a focus on helping students build an understanding of how organisms are similar and different, and about the life cycles 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 some kinds of plants and animals that once lived on Earth are no longer found anywhere (LS4.A as in 3-LS4-1) 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 in fossils, patterns of reproduction across organisms, and patterns of characteristics of organisms, both inherited and from interactions with the environment. Exploring these applications of patterns can also connect to 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).

#### **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, 3-LS4-1, and 3-ESS2-1), and constructing explanations and designing solutions (3-LS3-2). 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 (3-LS1-1, 3-LS3-1, and 3-ESS2-1), Cause and Effect (3-LS3-2), and Scale, proportion, and quantity (3-LS4-1). Many other crosscutting concepts elements can be used in instruction.

*All instruction should be three-dimensional.*

<p><b>Performance Expectations</b></p> <p>3-LS4-1 and 3-ESS2-1 are partially assessable.</p>	<p><b>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.</b> [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.]</p> <p><b>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.</b> [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.]</p> <p><b>3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.</b> [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.]</p> <p><b>3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.</b> [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]</p> <p><b>3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.</b> [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.]</p>
<p><b>Example Phenomena</b></p>	<p>Some trees grow at an angle on windy plains.</p> <p>Seedlings from the same parent plant all look slightly different.</p>
<p><b>Additional Practices Building to the PEs</b></p>	<p><b>Asking Questions and Defining Problems</b></p> <ul style="list-style-type: none"> <li>Identify scientific (testable) and non-scientific (non-testable) questions.</li> </ul> <p>Students could ask questions about the <i>effect</i> [of] <i>the environment</i> [on an individuals'] <i>traits</i>, [and then] <i>identify</i> [which are] <i>scientific (testable) and non-scientific (non-testable) questions</i>. 3-LS3-2</p> <p><b>Developing and Using Models</b></p> <ul style="list-style-type: none"> <li>Develop and/or use models to describe and/or predict phenomena.</li> </ul> <p>Students could <i>use a model to describe</i> [that] <i>different organisms vary in how they look and function</i>. 3-LS3-1</p> <p><b>Planning and Carrying Out Investigations</b></p> <ul style="list-style-type: none"> <li>Make predictions about what would happen if a variable changes.</li> </ul> <p>Students could <i>make predictions about what would happen</i> [to] <i>characteristics</i> [of an individual] <i>if</i> [the] <i>individuals' interactions with the environment changes</i>. 3-LS3-2</p>

<p><b>Additional Practices Building to the PEs (Continued)</b></p>	<p><b>Analyzing and Interpreting Data</b></p> <ul style="list-style-type: none"> <li>● Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. Students could <i>compare and contrast data</i> [on the] <b>life cycles</b> [of different] <b>plants and animals</b> collected by different groups in order to discuss similarities and differences in their findings. 3-LS1-1</li> </ul> <p><b>Using Mathematical and Computational Thinking</b></p> <ul style="list-style-type: none"> <li>● Organize simple data sets to reveal patterns that suggest relationships. Students could <i>organize simple data sets</i> [from] <b>fossils</b> [(e.g., type, size, and distributions of fossil organisms) to] <b>provide evidence about the types of organisms that lived long ago</b> [and] <i>to reveal patterns</i>. 3-LS4-1</li> </ul> <p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>● Identify the evidence that supports particular points in an explanation. Students could <i>identify the evidence that supports particular points in an explanation</i> [that] <b>different organisms vary in how they look and function because they have different inherited information</b>. 3-LS3-1</li> </ul> <p><b>Engaging in Argument from Evidence</b></p> <ul style="list-style-type: none"> <li>● Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. Students could <i>respectfully provide critiques to peers about a proposed model</i> [of] <b>life cycles</b> [of] <b>plants and animals</b> by <i>citing relevant evidence and posing specific questions</i>. 3-LS1-1</li> </ul> <p><b>Obtaining, Evaluating, and Communicating Information</b></p> <ul style="list-style-type: none"> <li>● 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 <i>combine information in written text</i> [regarding how] <b>some kinds of plants and animals that once lived on Earth are no longer found anywhere</b> with [information] <i>contained in corresponding tables, diagrams, and/or charts to support an argument</i>. 3-LS4-1</li> </ul>
<p><b>Additional Crosscutting Concepts Building to the PEs</b></p>	<p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>● Patterns can be used as evidence to support an explanation. Students could describe how <i>patterns</i> [across] <b>individuals' characteristics</b> <i>can be used as evidence to support an explanation</i> [that] <b>characteristics</b> [can] <b>result from individuals' interactions with the environment</b>. 3-LS3-2</li> </ul> <p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>● Cause and effect relationships are routinely identified, tested, and used to explain change. Students could describe why they <i>identified the cause and effect relationship</i> [between the variation] <b>in how different organisms look and function</b> [and their] <b>different inherited information</b>. 3-LS3-1</li> </ul>

<p><b>Additional Crosscutting Concepts Building to the PEs (Continued)</b></p>	<p><b>Scale, Proportion, and Quantity</b></p> <ul style="list-style-type: none"> <li>Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. Students could construct an argument about why <i>standard units</i> [are useful in describing] <i>characteristics of organisms</i> [such as height and weight]. 3-LS3-1 and 3-LS3-2</li> </ul>
<p><b>Additional Connections to Nature of Science</b></p>	<p><b>Scientific Investigations Use a Variety of Methods</b></p> <ul style="list-style-type: none"> <li>Science investigations use a variety of methods, tools, and techniques. Students could identify that a <i>science investigation</i> [about the] <i>patterns of the weather across different areas</i> [may] <i>use</i> [different] <i>methods, tools, and techniques than a</i> [different type of investigation]. 3-ESS2-1</li> </ul> <p><b>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</b></p> <ul style="list-style-type: none"> <li>Science assumes consistent patterns in natural systems. Students could construct an explanation that that we can <i>make predictions about what kind of weather might happen next because science assumes consistent patterns in natural systems</i>. 3-ESS2-1</li> </ul>

### 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: <table border="1"> <tr><td>i.</td><td>Organisms (both plant and animal).</td></tr> <tr><td>ii.</td><td>Birth.</td></tr> <tr><td>iii.</td><td>Growth.</td></tr> <tr><td>iv.</td><td>Reproduction.</td></tr> <tr><td>v.</td><td>Death.</td></tr> </table>	i.	Organisms (both plant and animal).	ii.	Birth.	iii.	Growth.	iv.	Reproduction.	v.	Death.
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: <table border="1"> <tr><td>i.</td><td>Organisms are born, grow, and die in a pattern known as a life cycle.</td></tr> <tr><td>ii.</td><td>Different organisms' life cycles can look very different.</td></tr> <tr><td>iii.</td><td>A causal direction of the cycle (e.g., without birth, there is no growth; without reproduction, there are no births).</td></tr> </table>	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).				
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-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: <ol style="list-style-type: none"> <li>Traits of plant and animal parents.</li> <li>Traits of plant and animal offspring.</li> <li>Variations in similar traits in a grouping of similar organisms.</li> </ol>
2	Identifying relationships
a	Students identify and describe* patterns in the data, including: <ol style="list-style-type: none"> <li>Similarities in the traits of a parent and the traits of an offspring (e.g., tall plants typically have tall offspring).</li> <li>Similarities in traits among siblings (e.g., siblings often resemble each other).</li> <li>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).</li> <li>Differences in traits of parents and offspring (e.g., offspring do not look exactly like their parents).</li> <li>Differences in traits among siblings (e.g., kittens from the same mother may not look exactly like their mother).</li> </ol>
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: <table border="1"> <tr> <td>i.</td><td>Environmental factors that vary for organisms of the same type (e.g., amount of food, amount of water, amount of exercise an animal gets, chemicals in the water) that may influence organisms' traits.</td></tr> <tr> <td>ii.</td><td>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).</td></tr> <tr> <td>iii.</td><td>Observable inherited traits of organisms in varied environmental conditions</td></tr> </table>	i.	Environmental factors that vary for organisms of the same type (e.g., amount of 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
i.	Environmental factors that vary for organisms of the same type (e.g., amount of 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-LS4-1 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

- 3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.** [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]

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

##### LS4.A: Evidence of Common Ancestry and Diversity

- Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (Note: moved from K-2)
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.

#### Crosscutting Concepts

##### Scale, Proportion, and Quantity

- Observable phenomena exist from very short to very long time periods.

##### Connections to Nature of Science

##### Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems.

### 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, including data about: <ol style="list-style-type: none"> <li>Fossils of animals (e.g., information on type, size, type of land on which it was found).</li> <li>Fossils of plants (e.g., information on type, size, type of land on which it was found).</li> <li>The relative ages of fossils (e.g., from a very long time ago).</li> <li>Existence of modern counterparts to the fossilized plants and animals and information on where they currently live.</li> </ol>
2	Identifying relationships
a	Students identify and describe* relationships in the data, including: <ol style="list-style-type: none"> <li>That fossils represent plants and animals that lived long ago.</li> <li>The relationships between the fossils of organisms and the environments in which they lived (e.g., marine organisms, like fish, must have lived in water environments).</li> <li>The relationships between types of fossils (e.g., those of marine animals) and the current environments where similar organisms are found.</li> <li>That some fossils represent organisms that lived long ago and have no modern counterparts.</li> <li>The relationships between fossils of organisms that lived long ago and their modern counterparts.</li> <li>The relationships between existing animals and the environments in which they currently live.</li> </ol>
3	Interpreting data
a	Students describe* that: <ol style="list-style-type: none"> <li>Fossils provide evidence of organisms that lived long ago but have become extinct (e.g., dinosaurs, mammoths, other organisms that have no clear modern counterpart).</li> <li>Features of fossils provide evidence of organisms that lived long ago and of what types of environments those organisms must have lived in (e.g., fossilized seashells indicate shelled organisms that lived in aquatic environments).</li> </ol>



	iii.	By comparing data about where fossils are found and what those environments are like, fossilized plants and animals can be used to provide evidence that some environments look very different now than they did a long time ago (e.g., fossilized seashells found on land that is now dry suggest that the area in which those fossils were found used to be aquatic; tropical plant fossils found in Antarctica, where tropical plants cannot live today, suggests that the area used to be tropical).
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### 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: <ol style="list-style-type: none"> <li>Weather condition data from the same area across multiple seasons (e.g., average temperature, precipitation, wind direction).</li> <li>Weather condition data from different areas (e.g., hometown and nonlocal areas, such as a town in another state).</li> </ol>
2	Identifying relationships
a	Students identify and describe* patterns of weather conditions across: <ol style="list-style-type: none"> <li>Different seasons (e.g., cold and dry in the winter, hot and wet in the summer; more or less wind in a particular season).</li> <li>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).</li> </ol>
3	Interpreting data
a	Students use patterns of weather conditions in different seasons and different areas to predict: <ol style="list-style-type: none"> <li>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.").</li> <li>The typical weather conditions expected during a particular season in different areas.</li> </ol>