

## Grade 3 Science, Unit 5

# Continuing the Cycle

### Overview

#### Unit abstract

In this unit of study, students are expected to develop an understanding of the similarities and differences in organisms' life cycles. In addition, students are able to use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. The crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these disciplinary core ideas. In the third grade performance expectations, students are expected to demonstrate grade-appropriate proficiency by developing and using models and constructing explanations and designing solutions. Students are expected to use these practices to demonstrate understanding of the core ideas.

#### Essential questions

- How do organisms vary in their traits?
- How are plants, animals, and environments of the past similar to or different from current plants, animals, and environments?

## Written Curriculum

### Next Generation Science Standards

<b>3. Inheritance and Variation of Traits: Life Cycles and Traits</b>		
Students who demonstrate understanding can:		
<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.]		
The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i> :		
<b>Science and Engineering Practices</b>	<b>Disciplinary Core Ideas</b>	<b>Crosscutting Concepts</b>
<p><b>Developing and Using Models</b> 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.</p> <ul style="list-style-type: none"> <li>▪ Develop models to describe phenomena. (3-LS1-1)</li> </ul> <p style="text-align: center;">-----</p> <p style="text-align: center;"><b>Connections to Nature of Science</b></p> <p><b>Scientific Knowledge is Based on Empirical Evidence</b></p> <ul style="list-style-type: none"> <li>▪ Science findings are based on recognizing patterns. (3-LS1-1)</li> </ul>	<p><b>LS1.B: Growth and Development of Organisms</b></p> <ul style="list-style-type: none"> <li>▪ Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)</li> </ul>	<p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>▪ Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)</li> <li>▪ Patterns of change can be used to make predictions. (3-LS1-1)</li> </ul>
Connections to other DCIs in third grade: N/A		
Articulation of DCIs across grade-levels: <b>MS.LS1.B</b> (3-LS1-1) <b>MS.LS3.A</b> (3-LS3-1); <b>MS.LS3.B</b> (3-LS3-1)		
Common Core State Standards Connections:		
ELA/Literacy –		
<b>RI.3.7</b> Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)		
<b>SL.3.5</b> Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)		
Mathematics –		
<b>MP.4</b> Model with mathematics. (3-LS1-1)		
<b>3.NBT</b> Number and Operations in Base Ten (3-LS1-1)		
<b>3.NF</b> Number and Operations—Fractions (3-LS1-1)		

<b>3. Inheritance and Variation of Traits: Life Cycles and Traits</b>		
Students who demonstrate understanding can:		
<b>3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.</b> [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]		
The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i> :		
<b>Science and Engineering Practices</b> <b>Constructing Explanations and Designing Solutions</b> 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. <ul style="list-style-type: none"> <li>Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)</li> </ul>	<b>Disciplinary Core Ideas</b> <b>LS4.B: Natural Selection</b> <ul style="list-style-type: none"> <li>Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)</li> </ul>	<b>Crosscutting Concepts</b> <b>Cause and Effect</b> <ul style="list-style-type: none"> <li>Cause and effect relationships are routinely identified and used to explain change. (3-LS4-2)</li> </ul>
Connections to other DCIs in third grade: <b>3.LS4.C</b> (3-LS4-2)		
Articulation of DCIs across grade-levels: <b>1.LS3.A</b> (3-LS4-2); <b>MS.LS2.A</b> (3-LS4-2); <b>MS.LS3.B</b> (3-LS4-2); <b>MS.LS4.B</b> (3-LS4-2)		
<b>Common Core State Standards Connections:</b> <b>ELA/Literacy –</b> <b>RI.3.1</b> Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-2) <b>RI.3.2</b> Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-2) <b>RI.3.3</b> Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS4-2) <b>W.3.2</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-2) <b>SL.3.4</b> Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-2) <b>Mathematics –</b> <b>MP.2</b> Reason abstractly and quantitatively. (3-LS4-2) <b>MP.4</b> Model with mathematics. (3-LS4-2) <b>3.MD.B.3</b> Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. (3-LS4-2)		

## Clarifying the standards

### *Prior learning*

The following disciplinary core ideas are prior learning for the concepts in this unit of study. By the end of Grade 1, students know that:

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

### *Progression of current learning*

#### **Driving question 1**

In what ways are the life cycles of organisms similar and different?

##### Concepts

- Science findings are based on recognizing patterns.
- Similarities and differences in patterns can be used to sort and classify natural phenomena.
- Patterns of change can be used to make predictions.
- Reproduction is essential to the continued existence of every kind of organism.
- Plants and animals have unique and diverse life cycles.

##### Practices

- Sort and classify natural phenomena (inherited traits) using similarities and differences in patterns.
- Make predictions using patterns of change.
- Develop models to describe phenomena.
- Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. (I.e., Changes organisms go through during their life form a pattern.) (Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.)

**Driving question 2**

How can variations in characteristics among individuals of the same species provide advantages in surviving, finding mates, and reproducing?

**Concepts**

- Cause-and-effect relationships are routinely identified and used to explain change.
- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

**Practices**

- Identify cause-and-effect relationships in order to explain change.
- Use evidence (e.g., observations, patterns) to construct an explanation.
- Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. Examples of cause-and-effect relationships could include:
  - Plants that have larger thorns than other plants may be less likely to be eaten by predators.
  - Animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.

**Integration of content, practices, and crosscutting concepts**

In third grade, students learn that the changes an organism goes through during its life form an observable pattern. Although different types of organisms have unique and diverse life cycles, they follow a pattern of birth, growth, reproduction, and death. While observing and studying life cycles, students should look closely for patterns of change and use these observed patterns to make predictions. They should also sort and classify a variety of organisms using the similarities and differences they observe. For example, flowering plants begin as seeds. With the right conditions, the seeds germinate and grow, from small seedlings to adult plants. Adult plants then produce flowers that, once pollinated, will produce seeds from which the next generation will grow.

Animals, likewise, go through observable patterns of change, which allow students to sort and classify them based on the stages of their life cycles. Some animals, for example, undergo complete metamorphosis; others go through incomplete metamorphosis; while others do not undergo metamorphosis at all. Some animals begin their life cycles with a live birth, while others hatch from eggs. Students should develop models to describe the unique and diverse life cycles of organisms. They can draw diagrams, build physical models, or create presentations to show the patterns of change that make up the life cycles of given organisms. As students become familiar with the stages in the life cycles of different types of plant and animals, they will come to understand that reproduction is essential to the continued existence of every kind of organism.

In the prior unit of study, students learned that organisms have traits that are inherited from their parents. This process occurs during reproduction. While observing and identifying traits of a specific species or type of organism, students also learned that there are differences in characteristics within the same species. In this unit, students learn that these differences in characteristics among individuals of the same species sometimes provide advantages in survival, finding mates, and reproducing. For example, when comparing plants from the

same species, those with larger or more abundant thorns may be less likely to be eaten by a predator. Likewise, animals with better camouflage coloration may be more likely to survive and therefore more likely to leave offspring. As students read about, observe, and discuss variations in organisms' characteristics, they should identify cause-and-effect relationships that help explain why any variation might give an advantage in surviving or reproducing to some members of a species over others.

### Integration of DCI from prior units within this grade level

In Unit 4, Traits, students used patterns and cause-and-effect relationships to understand that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops.

In Unit 6, Organisms and Environment, students use evidence to construct explanations for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. They also use cause-and-effect relationships to understand that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.

### Integration of English language arts and mathematics

#### *English language arts*

In order to integrate the CCSS for English language arts into this unit, students will need opportunities to read about the life cycles and inherited traits of organisms in a variety of texts and resources. During discussions, teachers might pose questions such as

- What are the stages of an organism's life cycle?
- How do the life cycles of organisms compare?
- What makes an organism's life cycle unique?
- How do organisms use their characteristics to survive, find mates, and reproduce?

Students need access to a variety of books, pictures, and maps. They should be able to refer to these resources specifically when answering questions, articulating the main idea, and describing the key ideas using supporting details in their explanations. Additionally, they should describe the relationship between scientific ideas or concepts and using language that pertains to time, sequence, and cause and effect.

During this unit, students also need opportunities to write informative/explanatory texts to convey ideas and information gathered through investigations and from other resources. For example, after reading texts about a given organism, students should be expected to use key details and appropriate facts about that organism to compose an informative piece of writing that lists some of the organism's traits that might give it an advantage in survival, growth, or reproduction over others of its kind. Students can also use Venn diagrams or T-charts to compare traits among individuals from a common species. These data can be used to explain how variations in characteristics can give an advantage to one or another individual in reproduction, growth, or survival. Students should also have the opportunity to report on how one or more traits of an organism give it an advantage in survival, growth, and/or reproduction in its environment. As students speak, they should share relevant facts, details, and information while speaking clearly and at an understandable pace.

#### *Mathematics*

There are multiple ways to integrate the CCSS for mathematics into this unit of study. Students can draw scaled picture graphs or bar graphs to represent a data set with several categories, such as the average length of the life span of a variety of organisms, which could range from days to hundreds of years, or the varying reproductive capacity of organisms, which could range from a single offspring to thousands. As students

analyze their data, they may observe similarities within a category of organisms (e.g., mammals, reptiles, or insects) or marked differences across these same categories. Analyzing data will help students understand that organisms have unique and diverse life cycles, but all have in common birth, growth, reproduction, and death. As students collect, organize, and analyze their data, they have opportunities to reason abstractly and model with mathematics.

### ***Future learning***

The following disciplinary core ideas are future learning related to the concepts in this unit of study.

By the end of middle school, students know that:

- Animals engage in characteristic behaviors that increase their odds of reproduction.
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.
- Genetic factors as well as local conditions affect the growth of the adult plant.
- Organisms reproduce either sexually or asexually and transfer their genetic information to their offspring.
- Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving factors.
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
- Growth of organisms and population increases are limited by access to resources.
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both its living and nonliving components, are shared.
- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.
- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others are harmful, and some are neutral to the organism.
- Natural selection leads to the predominance of certain traits in a population and the suppression of others.

- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring.

## Number of Instructional Days

*Recommended number of instructional days: 20 (1 day = approximately 45-60 minutes)*

**Note**—The recommended number of days is an estimate based on the information available at this time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.