GRADE 3

Building Blocks OF SCIENCE™ | 3D

Life in Ecosystems

Program Highlights and Lesson Sampler

Phenomenon-Based Investigations with Digital Support—in 30-Minute Lessons

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Inside this sampler, you will find:

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Life in Ecosystems

Teacher's Guide

3rd Edition

Building Blocks OF SCIENCE™ | 3D

Kit Materials

Material	Quantity Needed from Kit	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Bottle of red food coloring	1			■		
Butterfly habitat	1	■	■	■	■	■
Clothespin	8			■		
Collecting net	8			■		
Cotton wick	17	■		■		
Dry macaroni	2 C			■		
Fertilizer pellets	270	■		■		
Foam tray	8	■		■		
Graduated cylinder	8			■		
Group Animals Card Set	1	■		■		
Literacy Reader: *Life in Ecosystems* (below grade level)*	1	■	■	■	■	■
Literacy Reader: *Life in Ecosystems* (on grade level)*	1	■	■	■	■	■
Live Coupon for 2 butterfly larva cups	1	■				
Malachite Sunbird Card	8			■		
Measuring scoop, ¼ cup	8	■		■		
Pair of forceps	8			■		
Pipet	17	■		■		
Plastic container, 8 oz	17	■		■		
Plastic container, 16 oz	25	■		■	■	
Plastic cup, 1 oz	48	■		■		
Plastic tank	8	■		■		
Potting soil	4 L	■		■		
Sunflower seeds		■		■		
Transparent colored chips	500			■	■	
Variations Photo Card Set	1		■	■		
Wisconsin Fast Plants Seeds	153	■		■		

* The below-grade literacy reader is distinguished from the on-grade literacy reader by a yellow dot near the bottom left corner of the back cover.

Needed But Not Supplied Materials

Material	Quantity Needed	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Chart paper or whiteboard		■	■	■	■	■
Crayons, colored pencils, or markers		■		■	■	
Dark location in the classroom				■		
Different types of seeds	2	■				
Glue stick	30	Optional			■	
Light bank	1	■	■	■	■	■
Marker		■	■	■	■	■
Pair of scissors	31	■		■	■	■
Paper clip	8			■		
Paper towels		■		■		
Pencil	1	■		■		
Piece of construction paper	16			■		
Roll of clear tape	1	■		■		
Roll of masking tape	1	■		■		
Ruler, 30 cm	1	■		■		
Science notebook	30	■	■	■	■	■
Stapler	1			■		
Timer, wall clock, or stopwatch	1			■		
Utility knife or pair of sharp scissors		■		■		
Water	25 L	■		■		
World map	1			■		

NOTES

Unit Overview: *Life in Ecosystems*

Earth is a very special place and still the only planet that has been found to support life. As students travel to school, play on the playground, or participate in a school fire drill, they are observing and sharing space with a diverse group of organisms that live in the local ecosystem. We depend on organisms in our ecosystems for food, shelter, and the oxygen we breathe. In the five lessons in *Life in Ecosystems*, students will be introduced to life cycles, inherited and acquired traits, adaptations, and the fossil record and how all of those things impact the diversity of life on Earth. Students explore these concepts through investigation, discussion, and problem-solving. Students make observations and predictions, analyze and graph data, develop claims supported with evidence and reasoning, and evaluate problems and solutions.

Students begin by drawing upon previous knowledge to document what they know about the components of ecosystems. They are introduced to life cycles by setting up habitats for painted lady butterflies and Wisconsin Fast Plants® and beginning unit-long observations of these organisms. Students further explore growth and development by examining some of the inherited and acquired traits that they possess and evaluating trait variations in their plants, their butterflies, and other organisms.

Students discuss behavioral and physical adaptations, and they investigate physical adaptations by comparing model bird beaks to the types of food birds can obtain. Students build on their knowledge of adaptations to describe the benefits of camouflage in predator–prey relationships, and they observe how variations in adaptations can impact an organism's survival. Students investigate the effect of the environment on the life cycles of organisms by setting up a second plant growing system and withholding one important plant need. The experimental system is compared with students' original growing systems. Students analyze how environmental changes can impact various ecosystems, and use fossil structures and data to determine how organisms and the environments they lived in change over time.

In the last lesson, students are introduced to the engineering design process. After reviewing ecosystems and life cycles, students discuss how humans depend on and impact ecosystems. Students work in groups to analyze they ways that an environmental problem could affect the plants and animals in an ecosystem. They evaluate a proposed solution and determine whether the solution helps solve the environmental problem or harms the ecosystem by introducing additional changes with negative impacts.

Credit: SweetCrisis/Shutterstock.com

Next Generation Science Standards

The Building Blocks of Science unit *Life in Ecosytems* integrates process skills as defined by the Next Generation Science Standards (NGSS).

Performance Expectations

- **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.
- **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.
- **3-LS3-2:** Use evidence to support the explanation that traits can be influenced by the environment.
- **3-LS4-1:** Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
- **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.
- **3-LS4-3:** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
- **3-LS4-4:** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
- **3-5-ETS1-2:** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Disciplinary Core Ideas

- **LS1.B:** Growth and Development of Organisms
- **LS2.D:** Social Interactions and Group Behavior
- **LS2.C:** Ecosystem Dynamics, Functioning, and Resilience
- **LS3.A:** Inheritance of Traits
- **LS3.B:** Variation of Traits
- **LS4.A:** Evidence of Common Ancestry and Diversity
- **LS4.B:** Natural Selection
- **LS4.C:** Adaptation
- **LS4.D:** Biodiversity and Humans
- **ETS1.B:** Developing Possible Solutions

Science and Engineering Practices

- Developing and Using Models
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

Crosscutting Concepts

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Structure and Function

Important Terms Related to Science Instruction

Science and science instruction rely on specific terminology. Many scientific terms are likely to be new or unfamiliar to students. Below is a list of terms that are used throughout Building Blocks of Science units. Each is followed by a student-friendly definition to help students understand the meaning of the term in a scientific context. A brief description of how Building Blocks employs each of these scientific skills and tools is intended to help you help students model the behavior of scientists.

- **Analyze:** To examine. *Students are asked to examine (analyze) data they collect to help develop their understanding of core ideas and crosscutting concepts.*
- **Claim:** A statement. *To help students develop their understanding of concepts, they will make statements (claims) concerning various scenarios based on observations and data they have collected*.
- **Classify:** To arrange things in groups or categories. *As students investigate and collect data, they will arrange (classify) their data to look for patterns that may help to support claims that they make.*
- **Communicate:** To share information. *Students are continually asked to share experiences, questions, observations, data, and evidence (communicate) within their groups and with the class as a whole. Communication takes many forms, including discussions, the creation of models, designing solutions to problems, and formal presentations.*
- **Compare:** To note similarities and differences among things. *Like classifying, noting how things are alike and different (comparing) is another skill that students will use to analyze their data and look for patterns, cause and effect relationships, and other crosscutting concepts.*
- **Conclude:** To arrive at an opinion by reasoning. *The scientific practices of conducting investigations, collecting and analyzing evidence, and sharing and discussing information lead students to form opinions based on reasoning (to conclude). The conclusions that students develop during the unit will help you assess their understanding of the unit's core ideas.*
- **Evaluate:** To form an idea based on evidence. *Throughout each unit, students will look at (evaluate) the observations and data they collect and discuss their conclusions with classmates in order to form ideas about concepts based on evidence.*
- **Evidence:** Information to show whether something is true or valid. *Students will use the observations and data (evidence) they collect to support claims they make as being valid or true.*
- **Explain:** To describe in detail. *Throughout investigations, students will analyze the data they collect, make claims supported by evidence, and share their information with one another to make sense of (explain) core ideas and phenomena.*
- **Investigate:** To use a standard process to discover facts or information. *Students will carry out standard processes (investigate), sometimes developing those processes themselves, to discover facts or information related to scientific ideas.*
- **Model:** A representation of an object or idea. *Using a representation of an object or idea (a model) helps student scientists communicate and evaluate ideas regarding phenomena. Students will develop many types of models during a unit, including drawings, physical models, diagrams, graphs, and mathematical representations.*

- **Phenomena:** Occurrences or events that can be observed and cause one to wonder and ask questions. *Presenting occurrences or events (phenomena) related to the science concepts being studied engages students through real-world events and ensures common experiences for all students. Presenting phenomena also allows students to develop their own questions and take ownership of their learning.*

- **Predict:** To develop anticipated results of an event based on prior experience or knowledge. *Students are asked to anticipate (predict) the results of events based on experience and data from prior events.*

- **Reasoning:** Thinking about something in a logical way. *Students are asked to make claims, support them with evidence, and explain their claims in a logical fashion (with reasoning). Making claims supported with evidence and reasoning is scientific, or evidence-based, argumentation.*

- **Record:** To write down. *During investigations, students will keep track of their observations (record) by drawing or writing in their science notebooks or on student investigation sheets.*

- **Variable:** A factor that is able to be changed. *As students conduct investigations, they will consider which factors can be changed or manipulated (variables) to test something during the investigation.*

The 5E Instructional Model

Building Blocks of Science uses a constructivist approach to learning by encouraging students to build upon existing ideas using the 5Es. This instructional model cycles through five phases:

- **Engage:** Students draw upon prior knowledge to make connections to a new concept or topic.
- **Explore:** Students are provided with an activity related to a concept or topic and are encouraged to make claims and observations, collect evidence, and ask questions.
- **Explain:** Students use observations and discussion to construct an explanation for a concept or topic they are studying.
- **Elaborate:** Students must draw upon their experiences and apply their knowledge to a new situation in order to demonstrate understanding.
- **Evaluate:** Students assess their knowledge and review what they have learned.

In each Building Blocks of Science unit, students begin with an engaging pre-assessment activity, which allows the teacher to gauge levels of previous knowledge. The following lessons cycle through the explore, explain, and elaborate phases, and then in the final lesson, students are evaluated using project-based and summative assessments.

Incorporating Phenomena

Building Blocks of Science uses phenomena, or observable occurrences, to encourage students to develop questions that will lead to deeper understanding of the core ideas investigated in each unit and to support inquiry-based learning. Each unit includes both an anchoring phenomenon and lesson-specific investigative phenomena.

The unit's anchoring phenomenon, introduced to students in the first lesson, serves as the main focus of the unit. The anchoring phenomenon is introduced through a descriptive narrative in the Teacher's Guide and supported visually by a short online video. This visual teaser of the anchoring phenomenon piques students' interest and helps them to think more deeply and to develop questions. Viewing the video again at the end of the unit prompts students to make connections between the anchoring phenomenon and its applications beyond the scope of the unit's investigations.

An investigative phenomenon is presented to students at the beginning of each lesson to encourage them to develop additional questions. At the end of each lesson, the class revisits its questions and addresses them based on the evidence they collected during the lesson investigations, making connections to the lesson's investigative phenomenon.

As students begin to develop a deeper understanding of the unit's core ideas, they begin to make sense of the phenomena introduced throughout the unit. Students draw connections between what they have learned and how it applies to the world around them. In the last lesson, students engage in a performance task in which they are challenged to synthesize their knowledge to make connections to the unit's anchoring phenomenon. Students may be asked to build a model or design a solution to a problem. When communicating their designs and findings to their classmates, students explain their reasoning using evidence-based claims and answer questions during their presentation.

Each unit's literacy and digital components provide examples of connections between a concept and a phenomenon and ask students to make their own. Teachers are encouraged to support these connections by selecting related articles and videos or by engaging the class in discussion. Teacher Tips within the Teacher's Guide suggest other opportunities to identify related phenomena.

Anchoring phenomenon videos kick off each unit

The Engineering Cycle

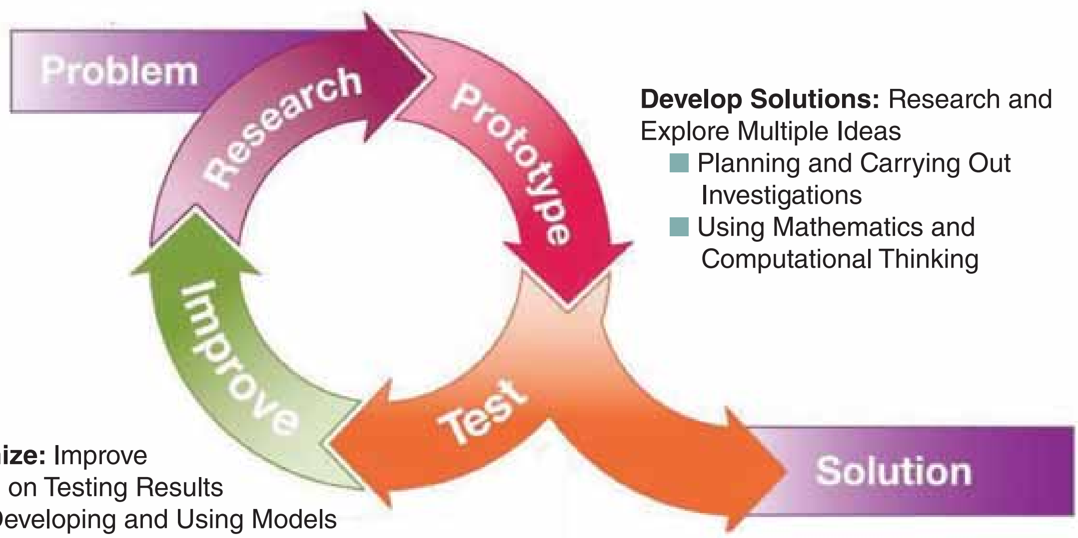
Building Blocks of Science incorporates an engineering design process to support the engineering, technology, and application of science (ETS) core idea outlined in the National Research Council's "A Framework for K–12 Science Education" (NRC, 2012, pp. 201–202). This ETS core idea has been brought into action through the NGSS ETS performance expectations, which allow students to practice systematic problem solving as they apply scientific knowledge they have acquired.

Through scientific engineering and design, students apply what they have learned to creatively solve real-world problems. This 21st-century skill encourages students to collaborate and exposes them to the idea that one problem can have multiple solutions.

An engineering design process can be thought of in three phases: defining a problem, developing solutions, and optimizing the design. Each phase can be correlated with NGSS Science and Engineering Practices as depicted in the graphic below.

Engineering Design Process

Define Problem: Identify Constraints and Criteria for Success
- Asking Questions and Defining Problems
- Obtaining and Evaluating Information



Develop Solutions: Research and Explore Multiple Ideas
- Planning and Carrying Out Investigations
- Using Mathematics and Computational Thinking

Optimize: Improve Based on Testing Results
- Developing and Using Models
- Analyzing and Interpreting Data

In each Building Blocks of Science unit, students employ this engineering cycle to assess their knowledge and build problem-solving skills. Depending on the activity, students may be creating a model, developing an experiment, or redesigning an existing product. To increase student engagement, relate the engineering process to a task, a phenomenon, or a career.

Sensemaking: Developing Claims Supported with Evidence and Reasoning

Scientific argumentation, or evidence-based argumentation, is defined as making scientific explanations (claims) using empirical data (evidence) to justify an argument (reasoning). Scientists use this type of argumentation to make sense of phenomena and refine their ideas, explanations, and experimental designs. In the classroom, students should be introduced to scientific argumentation to guide them in sensemaking, or building an understanding of phenomena based on evidence gained through observations, investigations, and data analysis. Through sensemaking, students refine and revise their understanding as new evidence is acquired and information is shared through class discussions.

Building Blocks of Science units offer multiple opportunities for students to make sense of scientific concepts by developing claims and supporting their claims with evidence and reasoning. At the start of an investigation, students are presented with a question related to a scientific concept. To make sense of a phenomenon or concept, students must draw upon their previous knowledge and experiences to develop a statement or conclusion that answers the question. To support that claim, students must provide relevant and specific data as evidence. This data may come from previous investigations, inference clues, texts, or class discussions. Students may even reference personal experience. Reasoning provides justification for why the selected evidence supports the claim. Relevant scientific principles should be incorporated into this reasoning. After the investigation, students should revisit their initial claims and determine if they are supported by newly gathered evidence. If the available evidence does not support students' initial claims, students should identify misunderstandings and present a claim that is supported.

To support students who struggle with scientific argumentation, ask them to use sentence frames such as "I think _____ because ______" to help with sensemaking. Explain that the first blank is the claim and the second blank is the evidence and reasoning.

Science Notebooks

Science notebooks are an integral part of the process of learning science because they provide a location for students to record their ideas, questions, predictions, observations, and data throughout the unit. The science notebook is used for notes, Tell Me More responses, diagrams, and outlines. Student investigation sheets can be glued, taped, or stapled into the science notebook as well.

Spiral notebooks are recommended and can be purchased inexpensively. If you choose to pre-assemble notebooks, consider including blank sheets of centimeter graph paper and plain paper for writing and drawing. It is recommended to create tabs for each lesson and to have students date each entry.

NOTE: Student investigation sheets use a specific numbering sequence to make it easier for students and teachers to identify them. The first number calls out the lesson, and the letter references the investigation. For example, Student Investigation Sheet 1A supports Investigation A of Lesson 1. If there are multiple student investigation sheets in one investigation, a second number will indicate the order of use (Student Investigation Sheet 2A.1, 2A.2, etc.).

Take-Home Science Activities

Take-Home Science activities are included in each unit and are called out within the related lesson. These activities reflect the science concepts and vocabulary that students are learning about and extend that learning to the home.

A reproducible letter explains how Take-Home Science activities work. Topic-specific activity sheets include directions for the parent, simple background information, and a space for the student to record observations or data. It is recommended that students share their findings and compare experiences as a class after completing the activity. Take-Home Science resources are found with the student investigation sheets at the end of the lesson in which they are assigned.

Assessment

Building Blocks of Science units provide assessment opportunities that correspond to specific lesson objectives, general science process skills, communication skills, and a student's ability to apply the concepts and ideas presented in the unit to new situations. The Teacher's Guide includes strategies for both formative and summative assessment. Each unit includes:

- **Pre-Unit Assessment and Post-Unit Assessment Opportunities:** The pre-unit assessment asks students to draw upon previous knowledge, allowing you to gauge their levels of understanding. The post-unit assessment touches upon the topics and concepts from the entire unit and evaluates students' learning. It is a beneficial practice to ask students to compare the pre-unit assessment and post-unit assessment activities to evaluate growth.

- **Formative Assessment Strategies:** At the end of each lesson, specific strategies are listed for each investigation. These include ways to utilize Student Investigation Sheets and Tell Me More questions as assessment tools. In lower grades, an Assessment Observation Sheet lists things to look for as you work with small groups of students.

- **Literacy and Digital Components:** These resources can be assigned to differentiate assignments and to assess student progress as needed.

- **General Rubric:** Appendix A includes a rubric that provides an expected progression of skills and understanding of science content. You can use these guidelines to assess students throughout the course of the unit.

- **Summative Assessment:** This unit-specific, cumulative assessment allows students to demonstrate their understanding of content presented by responding to questions in a variety of formats. Each question is aligned to performance expectations and provides insight on students' understanding of the concepts addressed. An answer key is provided, as well as a chart that indicates the performance expectation addressed by each question and lessons to revisit if remediation is required.

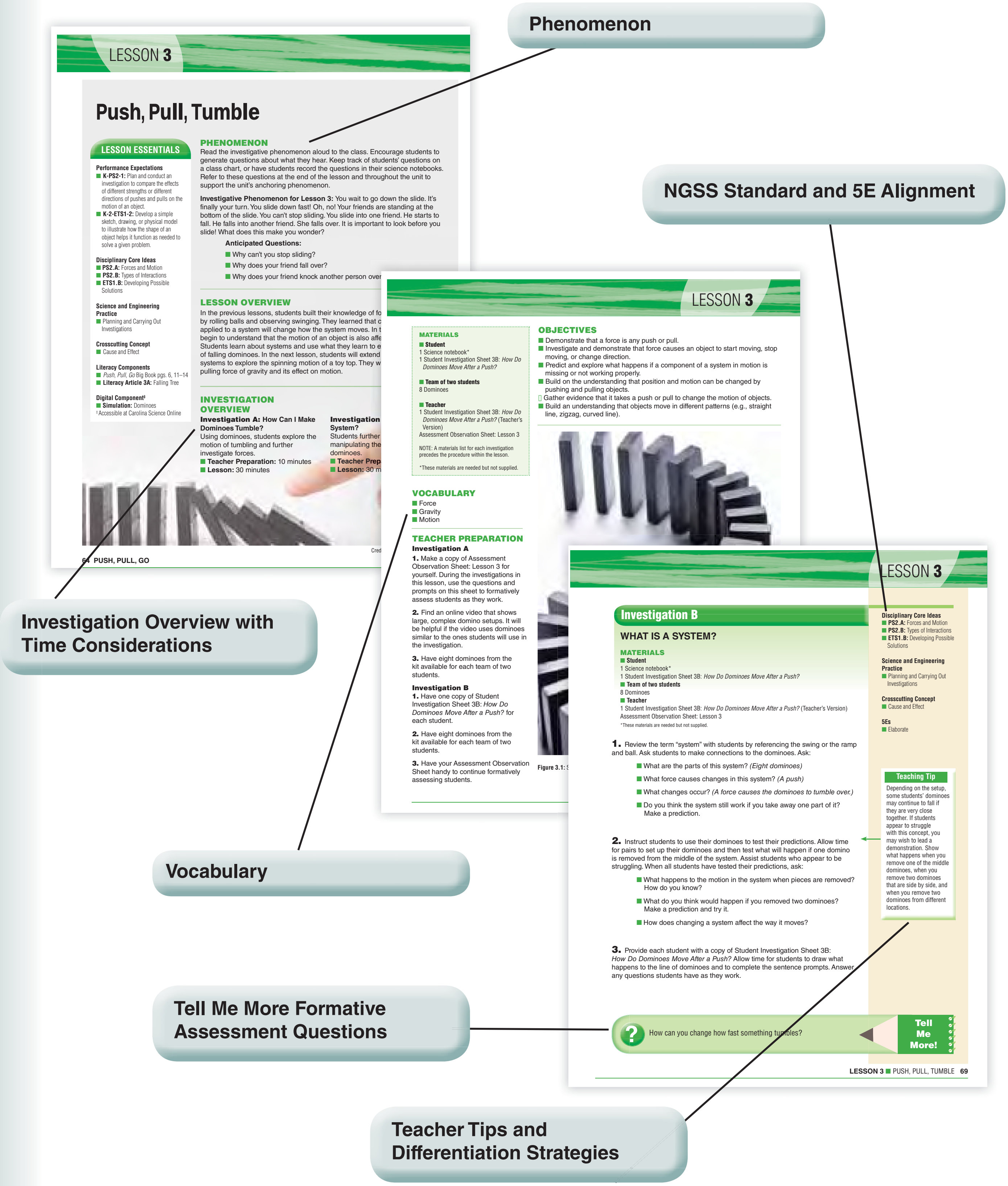
Additionally, there is a second end-of-unit assessment accessible only online. This digital summative assessment is **scenario-based** and touches upon all the standards from the unit. It includes both close-ended and open-ended questions.

Building Blocks of Science 3D—The Total Package

Phenomenon-Based Investigations with Digital Support—in 30-Minute Lessons

Hands-on materials are always included—not an extra purchase

Navigating the Teacher's Guide



Extensions

LESSON 3

EXTENSIONS

Action Attraction
Challenge students to explore what might make the dominoes fall more slowly or more quickly. You might prompt students by asking:

- Does spacing make a difference in how a line of dominoes topples over?
- How might you test this question?
- Make a prediction and then try your ideas.

Domino Rally Events
Do a quick Internet search for videos that show domino challenges that people have set up. Share these videos with students, and encourage them to work together in small groups with all 96 dominoes to see how many dominoes they can set up to tumble with one push.

Credit: Africa Studio/Shutterstock.com

Counting and Setting Up Sets
Challenge pairs of students in a learning center to set up a line of dominoes that not only will fall down with one push but also is set up in sets of two or five. Have students offset the line of dominoes so that before the line is sent tumbling, they can identify and count the sets of two, three, or five.

ASSESSMENT STRATEGIES

1. Investigation A

- Use students' responses to the Tell Me More question to assess their understanding of domino motion. If students do not seem to understand this concept, you may wish to provide supplemental examples of motion and force.

2. Investigation B

- Use Student Investigation Sheet 3B: *How Do Dominoes Move After a Push?* to determine how well students understand force and motion using dominoes. Look for use of appropriate vocabulary and drawings that demonstrate motion.
- Use students' responses to the Tell Me More question to evaluate their understanding of forces. Students should recognize that adding force will increase the speed at which an object tumbles.

3. Refer to the Assessment Observation Sheet where you recorded observations during this lesson to formatively assess your class, and adjust instruction as needed.

4. Refer to the General Rubric in Appendix A to assess individual progress as needed.

Additional Features

- Lesson Overview Charts
- Guide to Instructional Scaffolding
- Teacher Preparation
- Background Information
- NGSS Standards by Lesson
- Literacy and Digital Components
- Summative Assessment

Assessment Strategies

Literacy Article 3A

Name: ____________ Date: ________

Falling Tree

You saw a tree in the forest. It was tall. It was wide. It was huge!

It rained hard. The wind blew.

The tree tumbled over! The tree fell onto smaller trees.

They had thin trunks. The smaller trees tumbled, too. The smaller trees fell on bushes. The bushes tumbled.

The rain stops. The Sun comes out. Birds start to sing.

Credit: Patrycja I

Literacy Articles

Take-Home Science Activities

Student Investigation Sheet 3B: How Do Domino

Name: ____________ Da

This is a line that moves.

Dominoes ____________.

A push ____________.

© Carolina Biological Supply Company   Student Investigation Sheet 3B

Student Investigation Sheets

Take-Home Science

Dear Family,

Our class is beginning an inquiry science unit. Inquiry science is all about questions, active explorations, drawing, writing, and recording what you see and do to build an understanding of science. Young children are natural scientists. Scientists question everything. Once scientists answer one question, they move without blinking to the next question.

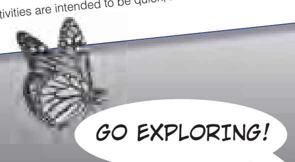
Take-Home Science is an exciting part of our program because it's one way we can better connect home and school. With everyone working together, we can reinforce the science concepts that your student is exploring in the classroom. Here's how Take-Home Science works.

Your student will bring home an investigation sheet that explains an activity related to the science unit the class is studying. The activity is designed so that everyone in the household—younger and older children alike—can work together to learn about science.

A section of the investigation sheet explains the science words and ideas that will be explored during the activity. These science words and ideas are not new to your student, because the activity follows a lesson in which those same concepts were explored.

The activities are simple and can be completed within 20 minutes using items normally found in the home. A section of the investigation sheet is for your student to complete and bring back to school. In class, your student will have the opportunity to share his or her experiences and results with other students.

The activities are intended to be quick, informal, and fun. Enjoy!



Credit: Cathy Keifer /Shutterstock

© Carolina Biological Supply Company   Lesson 5 Take-Home Science Letter

Every unit anchored in phenomena

Life in Ecosystems

Unit Overview

Earth is a very special place and still the only planet that has been found to support life. As students travel to school, play on the playground, or participate in a school fire drill, they are observing and sharing space with a diverse group of organisms that live in the local ecosystem. We depend on organisms in our ecosystems for food, shelter, and the oxygen we breathe. In the five lessons in *Life in Ecosystems*, students will be introduced to life cycles, inherited and acquired traits, adaptations, and the fossil record and how all of those things impact the diversity of life on Earth. Students explore these concepts through investigation, discussion, and problem-solving. Students make observations and predictions, analyze and graph data, develop claims supported with evidence and reasoning, and evaluate problems and solutions.

Unit Anchoring Phenomenon

Earth is a very special place and is the only planet that has been found to support life. Have you ever stopped to consider the sheer number of organisms that surround us in our daily interactions? As students travel to school, play on the playground, or participate in a school fire drill, they are observing and sharing space with many of the different organisms that live in the local ecosystem. The anchoring phenomenon for *Life in Ecosystems* is recognizing the amazing diversity of life in the ecosystems we live in.

	LESSON 1	LESSON 2
INVESTIGATIVE PHENOMENA	It is a nice day, so you head to a park after school with your friends. While there, you take note of your surroundings. You hear birds singing and a frog croaking. You see a squirrel grab some acorns from the ground and run up a nearby tree. You notice a line of ants moving toward a piece of bread someone has dropped. You think about all the different living things, including yourself, that are here in this small park. What does this make you wonder?	You are so excited to be able to finally meet your friend's German Shepherd puppies! You had to wait a month to play with them, until they had grown big enough to be handled. When you arrive at your friend's house, you notice that the mother had five puppies. Three puppies are the same brown color as the mother, one is all white, and one is black with a small white patch on its chest. What does this make you wonder?
OBJECTIVES	■ Distinguish between the different components that make up an ecosystem. ■ Recognize that different ecosystems are defined by their living and nonliving factors. ■ Provide examples of organisms and nonliving factors that can be found in ecosystems. ■ Analyze images to gather evidence to support a claim that some animals survive better in groups. ■ Compare plant and animal life cycles to identify patterns in birth, growth and development, reproduction, and death.	■ Distinguish between inherited traits and acquired traits in organisms. ■ Investigate various traits that an offspring can inherit from its parents. ■ Analyze variations of traits that occur among members of the same species. ■ Gather evidence to support a claim that humans are not the only organisms to pass traits on to offspring. ■ Develop models of the patterns in growth and development of an organism's life cycle by observing development of Wisconsin Fast Plants® and painted lady butterfly larvae. ■ Analyze data to describe the patterns of similarities in traits between organisms and their offspring to show evidence that traits are inherited.
SCAFFOLDING Students should know:	↓ Living things are called organisms. ↓ Many kinds of organisms live together as a community in an ecosystem. ↓ The main parts of an organism's life cycle are birth, growth and development, reproduction, and death. ↓ Living in a group can contribute to an animal's survival.	↓ Traits are characteristics that make organisms unique. Traits can be physical or behavioral. ↓ Inherited traits are passed on from parents to offspring. ↓ Acquired traits are developed over the course of an organism's lifetime and are not passed on to offspring. ↓ Variations can be found among members of the same species.

Concepts build from one lesson to the next

LESSON 3	LESSON 4	LESSON 5
Your neighbor has birdfeeders in her backyard. You notice that the birds that come to the feeders are all different colors and sizes. Some birds perch on the feeders to eat the seeds. Not all of these birds eat the same seeds. Other birds pull food from the ground—they are looking for bugs and worms! What does this make you wonder?	Another classroom in your school has a terrarium with pill bugs in it. One of the students from that class tells you that pill bugs have a unique adaptation to protect their soft insides: they roll up into a tight ball. This adaptation gives pill bugs the nickname "roly poly." The student also tells you that pill bugs are not actually insects, but isopods, which are more closely related to ocean animals like shrimp and crabs. What does this make you wonder?	You notice that there are drains in different locations along the curbs of the streets in your neighborhood. Some of the drains have a sign that says "No dumping. Drains to waterways." What does this make you wonder?
■ Compare behavioral and physical adaptations. ■ Use models to investigate the relationships between an animal's adaptations and the food it eats. ■ Describe predator–prey relationships. ■ Use evidence to explain the benefits of camouflage. ■ Distinguish between variations in adaptations that affect how an organism survives in its environment.	■ Identify the ways in which an organism's habitat supports its basic needs. ■ Conduct an investigation to gather evidence to support the idea that the environment plays a role in the patterns of growth and development of an organism. ■ Argue and defend the idea that some organisms survive well, others less well, and some not at all in an environment. ■ Predict the results of a problem caused by environmental changes and how these changes may affect the populations of organisms that live there. ■ Analyze fossil structures and infer which present-day organisms could have descended from them. ■ Analyze and interpret data to draw the conclusion that organisms and the environments they live in change over time.	■ Identify how humans depend on and impact an ecosystem. ■ Use evidence to explain how changes to an environment affect the plants and animals that live in that environment. ■ Predict the results of a problem caused by environmental changes and how these changes may affect the populations of organisms that live there. ■ Evaluate a solution to a problem caused by environmental changes and determine whether the proposed solution reduces the impact of the problem.
↓ Adaptations can help populations of organisms better survive in their environment. They can be physical or behavioral. ↓ Acclimation, the process of an individual organism making adjustments to survive in an environment, is not the same as adaptation. ↓ Camouflage is a physical adaptation of predators and prey that increases their chance of survival.	↓ Environmental factors can influence the development of inherited traits. ↓ When the environment changes, some organisms survive well, some less well, and others not at all. ↓ Fossil evidence is used to make connections between present-day organisms and their prehistoric ancestors. ↓ Fossils can provide clues about environmental changes over Earth's history. ↓ Fossils can be used to provide evidence of extinct organisms and the environments in which they lived.	↓ Humans depend on ecosystems and can impact them in positive and negative ways. ↓ An engineer is someone who uses science to solve problems or fulfill needs. ↓ When an environmental change occurs in an ecosystem, it affects the organisms that live there. ↓ The solutions proposed for problems facing an ecosystem have to be considered from many viewpoints, including social, economic, political, and environmental. ↓ Sometimes solutions to ecosystem problems can cause additional issues in the ecosystem.

NGSS correlations by lesson

Lesson 3: Adaptations

Investigation Overview

Investigation A: How Do Adaptations Help Organisms Survive?
5Es: Explore, Explain
Students discuss and compare physical and behavioral traits of organisms in an ecosystem.

- **Teacher Preparation:** 30 minutes
- **Lesson:** 45 minutes

Tell Me More! You take a trip to a desert ecosystem to observe the plants and animals that live there. What are some adaptations that you would expect desert plants and animals to have?

Investigation B: How Does the Structure of a Bird's Beak Help It Survive?
5Es: Explore, Explain
Students use model beaks to investigate how beak shape affects the ability to access various types of food.

- **Teacher Preparation:** 20 minutes
- **Lesson:** 60 minutes

Tell Me More! You just investigated bird beaks as an adaptation. Give an example of another adaptation that a bird living in a rain forest ecosystem might have.

Investigation C: How Can Camouflage Be Beneficial in a Predator–Prey Relationship?
5Es: Explore, Explain
Students participate in a predator–prey simulation to investigate the physical adaptation of camouflage.

- **Teacher Preparation:** 15 minutes
- **Lesson:** 30 minutes

Tell Me More! You have been asked to help a scientist collect data on bird behavior in a local forest ecosystem without disturbing the birds. What are some ways you could blend in with their environment?

30-minute investigations fit into your busy day

Integrated ELA and math

Standards

Next Generation Science Standards Performance Expectation

- **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.

Disciplinary Core Ideas

- **LS3.B:** Variations of Traits
- **LS4.B:** Natural Selection

Science and Engineering Practices

- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

Crosscutting Concepts

- Patterns
- Cause and Effect
- Structure and Function

Language Arts and Math Standards

Language Arts

- **L.3.4:** Vocabulary Acquisition and Use
- **RI.3.1:** Key Ideas and Details
- **RI.3.2:** Key Ideas and Details
- **RI.3.3:** Key Ideas and Details
- **RI.3.4:** Craft and Structure
- **RI.3.7:** Integration of Knowledge and Ideas
- **SL.3.1:** Comprehension and Collaboration
- **SL.3.2:** Comprehension and Collaboration
- **SL.3.3:** Comprehension and Collaboration
- **SL.3.4:** Presentation of Knowledge and Ideas
- **W.3.2:** Text Types and Purposes
- **W.3.10:** Range of Writing

Math

- **3.MD.A.2:** Solve problems involving measurement and estimations.
- **3.MD.B.3:** Represent and interpret data.

Resources

Student Investigation Sheets

- Student Investigation Sheet 3A: *How Can I Study the Environmental Factors that Affect Plant Growth?*
- Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?*
- Student Investigation Sheet 3C: *How Can Camouflage Be Beneficial in a Predator-Prey Relationship?*
- Take-Home Science Activity: *Observing Birds and Their Feeding Patterns*

Literacy Components

- *Life in Ecosystems* Literacy Reader, pgs. 4–14
- Literacy Article 3C: Two Sensational Sharks

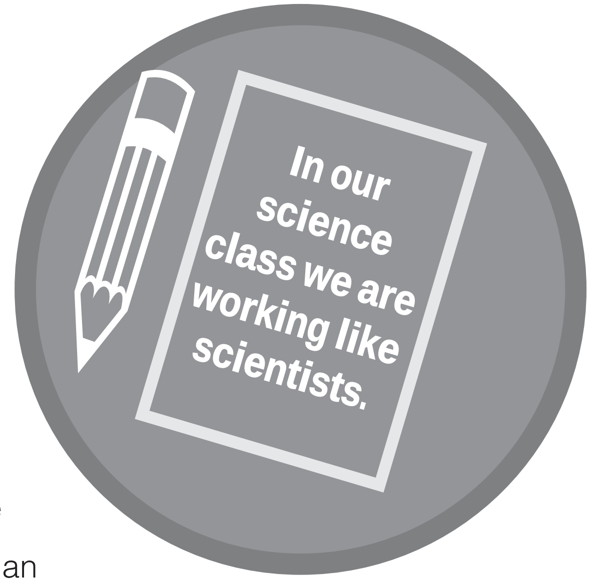
Digital Components

- Interactive Whiteboard: Adaptations
- Interactive Whiteboard: Environmental Factors and Plant Growth
- Interactive Whiteboard: Predator–Prey
- Simulation: Beak Simulation

Vocabulary

- Adaptation
- Behavioral adaptation
- Camouflage
- Physical adaptation
- Predator
- Prey

Safety Contract



In science class, I will:

- Listen to directions
- Complete each step of the experiment
- Look, feel, smell, and listen but never taste
- Wait to begin until my teacher tells me
- Wear safety goggles when my teacher tells me
- Ask my teacher to approve any experiment I plan on my own or with classmates
- Keep my hands away from my mouth and eyes as I work
- Tie back long hair
- Tuck in loose clothing
- Keep my workstation neat
- Put away materials after use
- Follow all safety rules

I have read this contract and will follow these safety rules in science class.

Student's signature ______________________________

Date ______________________________

I have read this safety contract and understand what is expected of my child during science class.

Parent/Guardian's signature ______________________________

Date ______________________________

Note to Parent/Guardian:
Science materials and activities are chosen for safety and age appropriateness.

All lessons are anchored in phenomena

Adaptations

LESSON ESSENTIALS

Performance Expectation
- **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.

Disciplinary Core Ideas
- **LS3.B:** Variations of Traits
- **LS4.B:** Natural Selection

Science and Engineering Practices
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

Crosscutting Concepts
- Patterns
- Cause and Effect
- Structure and Function

Literacy Components
- *Life in Ecosystems* Literacy Reader, pgs. 4–14
- **Literacy Article 3C:** Two Sensational Sharks

Digital Components‡
- **Interactive Whiteboard:** Adaptations
- **Interactive Whiteboard:** Environmental Factors and Plant Growth
- **Interactive Whiteboard:** Predator–Prey
- **Simulation:** Beak Simulation

‡ Accessible at Carolina Science Online

PHENOMENON

Read the investigative phenomenon aloud to the class. Encourage students to generate questions about what they hear. Keep track of students' questions on a class chart, or have students record the questions in their science notebooks. Refer to these questions at the end of the lesson and throughout the unit to support the unit's anchoring phenomenon.

Investigative Phenomenon for Lesson 3: Your neighbor has birdfeeders in her backyard. You notice that the birds that come to the feeders are all different colors and sizes. Some birds perch on the feeders to eat the seeds. Not all of these birds eat the same seeds. Other birds pull food from the ground—they are looking for bugs and worms! What does this make you wonder?

Anticipated Questions:
- Why do birds eat all sorts of different food?
- How many types of birds are there?
- What makes birds different colors?

LESSON OVERVIEW

In previous lessons, students explored how variations in traits contribute to diversity among organisms, including their Wisconsin Fast Plants®. In this lesson, students distinguish between behavioral and physical adaptations. They investigate beak adaptations in birds by using a variety of tools to model beaks. Students then apply what they have learned about adaptations by focusing on camouflage in a predator–prey relationship. They analyze how variations in an adaptation, such as camouflage, affect how an organism can survive in its environment. In the next lesson, students will explore how environmental factors can influence life cycles and how they impact an organism's survival.

INVESTIGATION OVERVIEW

Investigation A: How Do Adaptations Help Organisms Survive?
Students discuss and compare physical and behavioral traits of organisms in an ecosystem.
- **Teacher Preparation:** 30 minutes
- **Lesson:** 45 minutes

Investigation B: How Does the Structure of a Bird's Beak Help It Survive?
Students use model beaks to investigate how beak shape affects the ability to access various types of food.
- **Teacher Preparation:** 20 minutes
- **Lesson:** 60 minutes

Investigation C: How Can Camouflage Be Beneficial in a Predator–Prey Relationship?
Students participate in a predator–prey simulation to investigate the physical adaptation of camouflage.
- **Teacher Preparation:** 15 minutes
- **Lesson:** 30 minutes

VOCABULARY

- Adaptation
- Behavioral adaptation
- Camouflage
- Physical adaptation
- Predator
- Prey

MATERIALS

Student

1 Science notebook*
1 Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?*
1 Student Investigation Sheet 3C: *How Can Camouflage Be Beneficial in a Predator-Prey Relationship?*
1 Take-Home Science Activity: *Observing Birds and Their Feeding Patterns*
1 Take-Home Science Letter

Team of four students

1 Student Investigation Sheet 3A: *How Can I Study the Environmental Factors that Affect Plant Growth?*
1 Clothespin
1 Collecting net
1 Construction-paper environment*
1 Foam tray
1 Malachite Sunbird Card
1 Measuring scoop, ¼ cup
1 Pair of forceps
1 Pipet
4 Plastic cups, 1 oz
2 Plastic cups (1 oz) of sunflower seeds
2 Plastic containers, 16 oz
1 Plastic container (16 oz) of transparent colored chips
1 Prepared graduated cylinder
1 Prepared plastic container, 8 oz
1 Prepared tank
1 Set of Bird Beak Cards (from Teacher Sheet 3B.2)
1 Strip of fertilizer pellets (for all but 2 groups)
1 Strip of masking tape*
1 Strip of seeds*

Class

Dark location in the classroom*
Light bank*

Teacher

8 Teacher Sheet 3B.1: *Bird Beak Cards*
1 Teacher Sheet 3B.2: *Color Images of the Birds on the Bird Beak Cards*
1 Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?* (Teacher's Version)
1 Student Investigation Sheet 3C: *How Can Camouflage Be Beneficial In a Predator–Prey Relationship?* (Teacher's Version)
1 Bottle of red food coloring
8 Cotton wicks
2 C Dry macaroni
108 Fertilizer pellets
8 Graduated cylinders
1 Group Animals Photo Card Set
1 Measuring scoop, ¼ cup
1 Pair of scissors*
8 Paper clips*
1 Pencil*
16 Pieces of construction paper*
8 Plastic containers, 8 oz
8 Plastic containers, 16 oz
8 Plastic tanks
2 L Potting soil
1 Roll of clear tape*
1 Roll of masking tape*
1 Ruler, 30 cm*
1 Timer, wall clock, or stopwatch*
500 Transparent colored chips
1 Utility knife or pair of sharp scissors*
1 Variations Photo Card Set
23 L Water*
72 Wisconsin Fast Plants seeds
Chart paper or whiteboard*
Markers*
Paper towels*
Stapler*

NOTE: A materials list for each investigation precedes the procedure within the lesson.

*These materials are needed but not supplied.

Credit: Super Prin/Shutterstock.com

OBJECTIVES

- Compare behavioral and physical adaptations.
- Use models to investigate the relationships between an animal's adaptations and the food it eats.
- Describe predator–prey relationships.
- Use evidence to describe the benefits of camouflage.
- Distinguish between variations in adaptations that affect how an organism survives in its environment.

TEACHER PREPARATION

Investigation A

1. Title a sheet of chart paper "Environmental Factors that Affect Plant Growth." Have this and a marker available so you can record students' ideas during the discussion. Alternatively, you may use Interactive Whiteboard: Environmental Factors and Plant Growth.

2. Create a two-column chart titled "Adaptations." Label one column "Physical" and the other column "Behavioral." Alternatively, you can use the Interactive Whiteboard: Adaptations.

3. Decide which groups will investigate each environmental factor (no light, no fertilizer, no water, no soil). It is recommended that two groups explore each factor. Identify locations in the classroom where the "No Light" groups can place their growing systems (e.g., a cabinet, a drawer, or under a box).

4. Make enough copies of Student Investigation Sheet 3A: *How Can I Study the Environmental Factors that Affect Plant Growth?* for each team of four students to have a copy of the correct growing system setup for the variable they will investigate.

5. Prepare an 8-oz plastic container for each group of four students. Begin by placing eight cotton wicks in a container of water and allowing them to soak until they are saturated. Meanwhile, use a marker to draw a 3-cm X on the bottom of each container. Cut the X with a utility knife or a pair of sharp scissors. Insert one of the pre-soaked wicks into this hole. if it is difficult to insert the wick, use a pencil to enlarge the opening, and then push the wick through.

6. Place 2 L of the potting soil provided in the kit in a large container (or you can divide the soil between two of the plastic tanks provided in the kit). Moisten the soil until it is wet and clumpy but not so saturated that it becomes mud.

7. Fill a second large container or a plastic tank from the kit with water. Students will obtain water themselves during the investigation.

8. Count out nine Wisconsin Fast Plants seeds for each group. Place each group's seeds on a piece of clear tape.

9. Count out 18 fertilizer pellets for all but two groups of four students. Place each group's fertilizer pellets on a piece of clear tape.

10. Prepare a foam tray of materials for each group of four students. On each tray, place a strip of masking tape, a strip of fertilizer pellets (for all but two groups), a strip of seeds, two 16-oz plastic containers, one prepared 8-oz plastic container, a pipet, and a ¼-cup measuring scoop.

11. Have paper towels available to clean up any spills.

12. Have the elephant card from the Group Animals Photo Card Set available. Have the African cichlids and tulips cards from the Variations Photo Card Set available.

Investigation B

1. Make one copy of Teacher Sheet 3B.1: *Bird Beak Cards* for each group of four students. Cut out the four cards from each sheet and paper clip them together.

2. You may wish to share Teacher Sheet 3B.2: *Color Images of the Birds on the Bird Beak Cards* with students during this investigation. The photographs on this sheet correlate to the sketches of the beak shapes on the Bird Beak Cards. Sharing this sheet with students may help them with their observations.

3. For each student, make one copy of each of the following: Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?*; the Take-Home Science Letter; and the Take-Home Science Activity: *Observing Birds and Their Feeding Patterns*.

4. For each team of four students, fill a graduated cylinder halfway with water and add two drops of red food coloring.

5. Fill 16 1-oz cups with sunflower seeds. Secure the lids.

6. Fill eight plastic tanks from the kit halfway with water. Add one-quarter cup dry macaroni to each tank.

7. Prepare a foam tray for each group of four students. On each tray, place a collecting net, a pipet, a clothespin, and a pair of forceps.

8. Have a stopwatch or other device available so that you can keep time in seconds. You might find an online timer.

9. Have paper towels available to clean up any spills.

10. Have one Malachite Sunbird Card available for each group of four students.

11. You may wish to divide the leftover sunflower seeds into plastic bags for students who will not have access to sunflower seeds for the Take-Home Science Activity.

12. Move your Wisconsin Fast Plants® growing system from Lesson 1 about 15 cm away from the light source to promote phototropism.

Investigation C

1. Make one copy of Student Investigation Sheet 3C: *How Can Camouflage Be Beneficial in a Predator–Prey Relationship?* for each student.

2. Create a Venn diagram on chart paper or on the board. Label one side "Predators" and the other side "Prey." Alternatively, you can use the Interactive Whiteboard: Predator–Prey.

3. Divide the transparent colored chips from the kit equally among eight 16-oz plastic containers. Each group's container should have a mix of all the colors of chips provided in the kit.

4. Choose a color of construction paper that will "camouflage" at least one color chip. Obtain at least two sheets of paper in this color for each group. Staple or tape pieces together to create a model environment. Each group's environment should be the same color and size.

5. Have the lion, fur seal, and flamingo cards from the Group Animals Photo Card Set available.

Just-in-time background information

BACKGROUND INFORMATION

To survive, a living thing must gather enough food or energy for growth, protect itself from harm, and reproduce. Adaptations are specialized to help plants and animals accomplish these tasks within their specific environments. An **adaptation** is an inherited trait that is common within a species and that allows a population of organisms to better survive in their environment. These traits generally take many generations to develop. Variations in traits among individuals of the same species can provide advantages for those organisms to survive, find mates, and reproduce. These variations can lead to the ability of some organisms to survive well, less well, or not at all. If an organism can survive, it has a better chance of reproducing; the offspring are likely to inherit the adaptation as well. Adaptations are of two types: behavioral and physical.

Behavioral adaptations are things that species do that improve their chance of survival. Examples include an opossum playing dead, birds migrating, a lion stalking its prey, a sunflower bending toward light, a herd of elephants circling around their young for protection, and a desert plant turning its leaves away from the Sun to conserve water.

Physical adaptations are changes in body structure that increase the chance of survival in a particular habitat. Examples of physical adaptations include fangs, antlers, whiskers, fur with spots or stripes, scales, claws, venom, beaks, wings, antenna, roots, stems, thorns, leaves, and flowers.

Camouflage is a common physical adaptation in both **predator** and **prey** species that allows organisms to blend in with their environment. This adaptation helps predators hunt prey, and it helps prey survive by hiding them from potential predators.

It is important for students to understand that adapting and acclimating to an environment are not the same thing. Adjustments that an individual organism might make to survive in its environment are not adaptations.

3-dimensional learning

Disciplinary Core Idea
- **LS4.B:** Natural Selection

Science and Engineering Practice
- Constructing Explanations and Designing Solutions

Crosscutting Concept
- Cause and Effect

5Es
- Explore
- Explain

Digital Component
- **Interactive Whiteboard:** Adaptations

ELA connection W.3.10

Investigation A

HOW DO ADAPTATIONS HELP ORGANISMS SURVIVE?

MATERIALS

Student

1 Science notebook*

Team of four students

1 Student Investigation Sheet 3A: *How Can I Study the Environmental Factors that Affect Plant Growth?*
1 Foam tray
1 Measuring scoop, ¼ cup
1 Pipet
2 Plastic containers, 16 oz
1 Prepared plastic container, 8 oz
1 Strip of fertilizer pellets* (for all but 2 groups)
1 Strip of masking tape*
1 Strip of seeds*

Class

Dark location in the classroom*
Light bank*

Teacher

8 Cotton wicks
108 Fertilizer pellets
1 Group Animals Photo Card Set
1 Pencil*
8 Plastic containers, 8 oz
3 Plastic tanks
2 L Potting soil
1 Roll of clear tape
1 Roll of masking tape*
1 Ruler, 30 cm*
1 Utility knife or pair of sharp scissors*
1 Variations Photo Card Set
2 L Water*
72 Wisconsin Fast Plants seeds
Chart paper or whiteboard*
Markers*
Paper towels*

*These materials are needed but not supplied.

Our Plant and Butterfly Study

Materials

Student

1 Science notebook or Student Investigation Sheet 1B.2: *Can I Observe Changes in Plants and Butterflies?*

Team of four students

1 Wisconsin Fast Plants Growing System (from Lesson 1)

Class

1 Butterfly habitat
2 Butterfly larva cups
"Life Cycle of a Painted Lady Butterfly" class chart* (from Lesson 1)
"Life Cycle of a Wisconsin Fast Plant" class chart* (from Lesson 1)
"Predictions About Our Plants and Butterflies" class chart* (from Lesson 1)
Light bank*
Markers*

Allow time at the beginning or end of this investigation for students to check on their plants and the butterfly larvae and to record their observations in their science notebooks or on Student Investigation Sheet 1B.2: *Can I Observe Changes in Plants and Butterflies?* Encourage students to make qualitative (color, shape, texture) as well as quantitative (size, number, width) observations of their organisms. Revisit students' predictions about each organism's life cycle from Lesson 1. Allow time for students to share their observations with the class, and discuss any new questions students have about the organisms. Add new questions to the life cycle and prediction class charts from Lesson 1.

1. Tell students that they will set up a second Wisconsin Fast Plants® growing system for a future lesson, in which they will explore how environmental factors can affect inherited traits. Ask students to brainstorm with a partner what environmental factors could affect plants' traits. Accept all ideas, and record them on the chart you prepared called "Environmental Factors that Affect Plant Growth." Guide students to recognize that their second growing system will provide all but one factor for successful plant growth (light, water, fertilizer, or soil). Assign each group a factor to omit from their second growing system.

2. Point out the soil and water stations and the light bank. Distribute one tray of materials and one copy of Student Investigation Sheet 3A: *How Can I Study the Environmental Factors that Affect Plant Growth?* to each team of four students. Have a roll of paper towels on hand to clean up any spills.

3. Allow ample time for groups to put together their growing systems. Remind teams to write their group number and the environmental factor they are omitting on a piece of masking tape and stick it to the side of their growing system. Show the "No Light" groups in the dark location you chose for them to store their plants. Have all other groups place their systems under the light bank. Direct students to return all materials to the materials station, clean up their workstations, and wash their hands.

Teaching Tip

Each group should return a 16-oz plastic container to the materials station for reuse in Investigation C.

4. Gather together as a class. Ask students to predict how leaving out the different environmental factors might affect their plants' growth. Record students' predictions on the chart, and save the chart to refer to in Lesson 4.

Teaching Tip

If you need to teach this lesson over multiple class sessions, a good stopping point is after Step 4. Students can discuss adaptations in the next class session.

5. Display the elephant card from the Group Animals Photo Card Set and use it to review ecosystems with the class. Ask the following the questions to help guide the discussion:

- What living things do you notice in the picture? *(Elephants, trees, grass)*
- What living things could be in this ecosystem even though they are not in the picture? *(Students may mention lions, zebras, birds, or insects.)*
- What things might affect this ecosystem? *(Students might suggest factors such as water, sunlight, soil, temperature, rainfall, or humans.)*

Tips for teaching in every lesson

6. Display the class chart titled "Adaptations." Ask the following questions, and record students' responses under the appropriate columns on the chart:

- What traits do you think the African elephants may have inherited from their parents? *(Students may suggest tusks, size, amount of hair, ear shape, color patterns, or trunk size.)*
- What traits do you think the plants may have inherited from their parents? *(Students may suggest height, leaf shape, color, whether the plant has thorns, size of trunk, or size of roots.)*
- Choose one trait we listed for elephants. Explain how that trait might help the elephant survive. *(Answers will vary but may include a trunk to get water, tusks for protection, size of elephant, living in groups, coloration to blend in to the environment, etc.)*

ELA connection L.3.4, RI.3,7, SL.3.1, SL.3.2

ELA connection L.3.4, RI.3.1

Literacy Tip

Pages 4–7 of the *Life in Ecosystems* Literacy Reader address behavioral and physical adaptations. Consider reading these pages to the class or letting students read them individually or in small groups.

Literacy integration

ELA connection SL.3.2, SL.3.4, RI.3.7

- Choose one trait we listed for plants. Explain how that trait might help the plant survive. *(Answers will vary, but students may say that leaves collect sunlight, that roots absorb water, or that size may help a plant avoid being eaten or stepped on or obtain more sunlight.)*

7. Write the word "adaptation" and the following definition on the chart. Instruct students to copy this and the two-column chart in their science notebooks. Explain that adaptations can also help organisms find mates and reproduce to have offspring.

- Adaptation: Something that allows organisms to better survive in their environment.

8. Ask students to list in their science notebooks three animals or plants they have seen in their local ecosystem. Ask students to talk to a partner about how those plants and animals find ways to survive. After some time, invite students to share some of their ideas with the class. As they share their ideas, record them under the "Behavioral" and "Physical" columns of the class chart as appropriate. Encourage students to list a few examples of each type of adaptation in the chart in their science notebooks. Students' suggestions may include:

- Behavioral Adaptations: Hibernate, migrate, hide when a predator is nearby, build a nest for young, hunt, bird calls, play dead, be nocturnal, lose leaves in winter, flowers that bloom only at night, roots that grow deep into the soil, vines that climb up to the catch the sunlight
- Physical Adaptations: Teeth, fur, poison, sticky tongue, eyes, webbed feet, beak, claws, feathers, bright colors, petals, big leaves, roots, thorns

9. Display the African cichlids card and tulip card from the Variations Photo Card Set. Allow time for students to discuss with a partner the variations on the cards. Then bring the class together and ask the following questions to facilitate the discussion:

- Do you think individuals in a population can have variations, or differences, in their adaptations? *(Yes)*
- What are variations that you see on these cards? *(Different colors, different sizes, different stages of life cycle.)*
- Do you think variations are always good for an organism? *(Answers will vary, but students should recognize that variations might not always be good for an organism.)*
- When would a variation not be helpful to an organism? *(Students should recognize that an adaptation will not be beneficial in all habitats. For example, shorter tulips might not be pollinated as easily as taller tulips, or yellow fish might be more easily spotted by preadators in their environment.)*

- If a variation is not helpful to an organism, how could that affect the overall population? *(Students should be able to identify that the organism might die before it is able to produce offspring, which could reduce the overall population.)*

Tell Me More!

You take a trip to a desert ecosystem to observe the plants and animals that live there. What are some adaptations that you would expect desert plants and animals to have?

NOTES

Disciplinary Core Ideas
- **LS3.B:** Variation of Traits
- **LS4.B:** Natural Selection

Science and Engineering Practices
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

Crosscutting Concepts
- Patterns
- Cause and Effect
- Structure and Function

5Es
- Explore
- Explain

Literacy Component
- *Life in Ecosystems* Literacy Reader, pgs. 4–14

Digital Component
- **Simulation:** Beak Simulation

ELA connection W.3.10

Investigation B

HOW DOES THE STRUCTURE OF A BIRD'S BEAK HELP IT SURVIVE?

MATERIALS

Student
- 1 Science notebook*
- 1 Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?*
- 1 Take-Home Science Activity: *Observing Birds and Their Feeding Patterns*
- 1 Take-Home Science Letter

Team of four students
- 1 Clothespin
- 1 Collecting net
- 1 Foam tray
- 1 Malachite Sunbird Card
- 1 Pair of forceps
- 1 Pipet
- 4 Plastic cups, 1 oz
- 2 Plastic cups (1 oz) of sunflower seeds
- 1 Prepared graduated cylinder
- 1 Prepared tank
- 1 Set of Bird Beak Cards (from Teacher Sheet 3B.1)

Teacher
- 1 Teacher Sheet 3B.1: *Bird Beak Cards*
- 1 Teacher Sheet 3B.2: *Color Images of the Birds on the Bird Beak Cards*
- 1 Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?* (Teacher's Version)
- 1 Bottle of food coloring
- 2 C Dry macaroni
- 8 Graduated cylinders
- 1 Measuring scoop, 1/4 cup
- 1 Pair of scissors*
- 8 Paper clips*
- 8 Plastic tanks
- 1 Timer, wall clock, or stopwatch*
- 19 L Water*
- Chart paper or whiteboard*
- Markers*
- Paper towels*

*These materials are needed but not supplied.

Our Plant and Butterfly Study

Materials

Student
- 1 Science notebook or Student Investigation Sheet 1B.2: *Can I Observe Changes in Plants and Butterflies?*

Team of four students
- 1 Wisconsin Fast Plants Growing System (from Lesson 1)

Class
- 1 Butterfly habitat
- 2 Butterfly larva cups
- "Life Cycle of a Painted Lady Butterfly" class chart* (from Lesson 1)
- "Life Cycle of a Wisconsin Fast Plant" class chart* (from Lesson 1)
- "Predictions About Our Plants and Butterflies" class chart* (from Lesson 1)
- Light bank*
- Markers*

Allow time at the beginning or end of this investigation for students to check on their plants and the butterfly larvae and to record their observations in their science notebooks or on Student Investigation Sheet 1B.2: *Can I Observe Changes in Plants and Butterflies?* Encourage students to make qualitative (color, shape, texture) as well as quantitative (size, number, width) observations of their organisms. Revisit students' predictions about each organism's life cycle from Lesson 1. Allow time for students to share their observations with the class, and discuss any new questions students have about the organisms. Add new questions to the life cycle and prediction class charts from Lesson 1.

ELA connection
RI.3.7, SL.3.1, SL.3.2,SL.3.3

1. Distribute a set of Bird Beak Cards to each group of four students. Encourage students to look over each card carefully and discuss within their groups the various physical and behavioral adaptations each bird has. You may want to reference Teacher Sheet 3B.1: *Color Images of Birds on the Bird Beak Cards* with students during the discussion. Ask:

- What are some behavioral adaptations these birds might have? *(Answers will vary. Students may mention migration, flying in groups, bird calls, or building nests.)*
- What is a physical adaptation the birds could have? *(Answers will vary. Students may mention feather colors, webbed feet, small wings, or beaks.)*

2. Focus the discussion on beaks by asking the following questions:

- What do you notice about each of the birds' beaks? *(Answers will vary. Students should point out differences in shape.)*
- What kind of adaptation is the beak? Why? *(Students should realize that beaks are physical adaptations, though their explanations may vary.)*
- Did you ever wonder why there are so many types of beaks? Why do you think beaks are different? *(Accept all students' ideas, and then guide them to the understanding that the beak is a physical adaptation for the function of obtaining food.)*

3. Distribute a Malachite Sunbird Card to each team of four students. Explain that this bird escaped from a bird sanctuary and has been spotted by local bird watchers just outside of the school. Ask students to study the picture and then write a claim in their science notebooks to answer the following question:

- How would a change in the malachite sunbird's habitat affect its ability to survive?

4. Have students use their background knowledge about ecosystems, their experiences observing birds, and what they have discussed about physical adaptations to provide evidence and reasoning for their claim. Allow ample time for students to record their evidence and reasoning beneath their claim in their science notebooks.

5. Ask a few volunteers to share their claims about the malachite sunbird's ability to survive in a different habitat. Remind these volunteers to use evidence and reasoning to support their claims. Encourage other students to ask questions about the claim. Remind students that they need to listen quietly to other students' answers and ask appropriate questions. Collect the Malachite Sunbird Cards for use at the end of the investigation.

Teaching Tip

If you need to split this investigation into multiple sessions, this is a good stopping point. Students can model birds' beaks in the next class session.

6. Tell students that they will gather additional evidence about how birds' beaks contribute to a bird's ability to gather food. Explain that each student will pretend to be one of the birds using a tool to model that bird's beak. Distribute a copy of Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?* to each student and instruct each member of the group to choose one of the four Bird Cards. On the board, write "red water (nectar)," "sunflower seeds," and "macaroni (fish)." Explain that these are the food types that will be available for the "birds" to eat.

Teaching Tip

Students may think that their models look just like the birds' actual beaks. Remind students that a model uses something that we are familiar with to represent a scientific object, process, or idea that we cannot experience directly.

7. Distribute a foam tray of materials to each team of four students, and allow groups time to compare each model beak to the bird beaks on the cards, and to discuss which food type each model beak might be best suited to collect. Each member of the group should choose the model beak they believe best represents the beak of the bird on their card. Direct students to record a prediction in Part A of Student Investigation Sheet 3B: *How Does the Structure of a Bird's Beak Help It Survive?* that explains why they selected the beak model they did.

8. Review the procedure in Part B of the investigation sheet. Make sure students understand the following:

- They must wait for your signal to begin.
- All food must be placed in the small cup in order for it to count.
- Students should try to collect each type of food even if their model beak may not be well-suited for the food.

9. Have students carefully remove all the items from their tray. Direct them to empty both cups of sunflower seeds onto the tray and spread the seeds out. Give students the signal to start collecting food, and start the timer.

10. After 10 seconds have passed, signal for students to stop. Instruct students to count the number of seeds in their cup and record their individual data in Part C of Student Investigation Sheet 3B. Groups should return all the sunflower seeds to the two small cups and set them aside.

11. Distribute a tank of water and macaroni "fish" to each team of four students. Instruct students to place the tank within reach of all group members. Give students the signal to start collecting, and keep time for 10 seconds. When you call time, instruct students to total the number of "fish" they have collected, record that number in the data table on their investigation sheet, and then return the "fish" to the tank. Collect the tanks.

12. Distribute a graduated cylinder of red “nectar” to each group. Explain that, due to the size of the graduated cylinder, each student will get 10 seconds to collect food. Tell students that the cylinder cannot be picked up, but must remain on the desktop during the entire 10 seconds. Call the start and stop time for each student, and instruct them to shade in the amount of nectar on their data table in Part C of the investigation sheet. Allow time for students to discuss their results with their group members.

13. Direct groups to clean up their materials. Collect the graduated cylinders.

14. Gather the class for a discussion using the investigation sheet and the following questions as a guide:

- Which model beak was the best for collecting nectar? Which bird has this type of beak? *(The pipet was best at collecting nectar because it is long and skinny and fit inside the graduated cylinder. A hummingbird has this type of beak.)*
- Which model beak functioned the best to collect seeds? Which bird has this type of beak? *(The forceps were best at collecting seeds, although some students may mention that the clothespin was successful. In this investigation, the forceps best modeled the finch’s beak.)*
- What model beak’s structure was the best for collecting fish? Which bird has this type of beak? *(The collecting net and clothespin are both good at collecting fish. There may be differences among groups regarding which beak was most successful at catching fish. The net best represents a pelican’s beak, and the clothespin best represents a penguin’s beak.)*
- What patterns did you notice among your group’s data? *(Answers will vary. Students may describe that some beaks were better at collecting some foods than other beaks.)*

15. Ask students to complete Parts D and E of Investigation Sheet 3B. After some time, review students’ responses as a class.

16. Direct students to return to the claims, evidence and reasoning, in their science notebooks about how a change in the malachite sunbird’s habitat would affect its ability to survive. Allow time for students to refine their claim and reasoning based on the evidence they collected from the bird beak simulation. Ask students to share their refined claims and reasoning in small groups or as a class. Encourage students to listen quietly to other students’ answers, ask appropriate questions, and use evidence when supporting their own claims.

Digital integration

Digital Tip

Use the Bird Beak simulation to allow students to further investigate bird beaks as an adaptation.

17. Provide each student with the Take-Home Science Letter and Take-Home Science Activity: *Observing Birds and Their Feeding Patterns*. Explain that students will make bird feeders at home with their families to observe patterns in the types of birds they see and the foods the birds eat. Students should collect data on their observations for one week and then bring back the completed data table to share with the class.

Formative assessment

Tell Me More!

You just investigated bird beaks as an adaptation. Give an example of another adaptation that a bird living in a rain forest ecosystem might have.

Take-Home Science

Observing Birds and Their Feeding Patterns
Students will make two feeders out of empty plastic bottles. They should fill each feeder with a different type of birdseed, such as sunflower seeds or a birdseed mix, and hang the feeders near a tree. Students should observe the types of birds that visit the feeders and the type of seed each bird eats. They should record their observations on the data table of their investigation sheet for seven days. They should bring the completed chart back to the class for discussion after one week.

Credit: Alexander Sviridov/Shutterstock.com

Investigation C

HOW CAN CAMOUFLAGE BE BENEFICIAL IN A PREDATOR–PREY RELATIONSHIP?

MATERIALS

■ **Student**
1 Science notebook*
1 Student Investigation Sheet 3C: *How Can Camouflage Be Beneficial In a Predator–Prey Relationship?*

■ **Team of four students**
1 Construction-paper environment*
1 Plastic container (16 oz) of transparent colored chips

■ **Teacher**
1 Student Investigation Sheet 3C: *How Can Camouflage Be Beneficial in a Predator–Prey Relationship?* (Teacher's Version)
1 Group Animals Photo Card Set
16 Pieces of construction paper*
8 Plastic containers, 16 oz
1 Timer, wall clock, or stopwatch*
500 Transparent colored chips
Chart paper or whiteboard*
Markers*
Stapler*

*These materials are needed but not supplied.

Our Plant and Butterfly Study

Materials

■ **Student**
1 Science notebook or Student Investigation Sheet 1B.2: *Can I Observe Changes in Plants and Butterflies?*

■ **Team of four students**
1 Wisconsin Fast Plants Growing System (from Lesson 1)

■ **Class**
1 Butterfly habitat
2 Butterfly larva cups
"Life Cycle of a Painted Lady Butterfly" class chart* (from Lesson 1)
"Life Cycle of a Wisconsin Fast Plant" class chart* (from Lesson 1)
"Predictions About Our Plants and Butterflies" class chart* (from Lesson 1)
Light bank*
Markers*

Allow time at the beginning or end of this investigation for students to check on their plants and the butterfly larvae and to record their observations in their science notebooks or on Student Investigation Sheet 1B.2: *Can I Observe Changes in Plants and Butterflies?* Encourage students to make qualitative (color, shape, texture) as well as quantitative (size, number, width) observations of their organisms. Revisit students' predictions about each organism's life cycle from Lesson 1. Allow time for students to share their observations with the class, and discuss any new questions students have about the organisms. Add new questions to the life cycle and prediction class charts from Lesson 1.

1. Introduce the terms "predator" and "prey." Access students' prior knowledge by asking students to identify the predator and the prey in each of the following pairings:

- Owl and mouse
- Seal and shark
- Fox and rabbit

Disciplinary Core Ideas
- **LS3.B:** Variation of Traits
- **LS4.B:** Natural Selection

Science and Engineering Practices
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions

Crosscutting Concepts
- Patterns
- Cause and Effect

5Es
- Explore
- Explain

Literacy Components
- *Life in Ecosystems* Literacy Reader, pgs. 4–14
- **Literacy Article 3C:** Two Sensational Sharks

Digital Component
- **Interactive Whiteboard:** Predator–Prey

ELA connection W.3.10

2. Explain that a predator is something that hunts and eats other organisms, and that prey are the organisms that gets eaten. Display the "Predator–Prey" class chart, and have students copy the Venn diagram into their science notebooks. Allow time for students to list in the diagram any adaptations that predators or prey might have.

Teaching Tip

List plant adaptations on the chart using a green marker to differentiate between the adaptations.

3. As a class, discuss students' ideas, and add the adaptations to the correct side of the Venn diagram. If the adaptation is something that both predator and prey have, list those adaptations in the center of the diagram.

Differentiation

4. Ask the following questions to guide the discussion:

- What are some adaptations that predators have to help them catch prey? *(Answers will vary. Students may suggest claws, speed, sharp teeth, or size.)*
- What are some adaptations that prey might have to avoid being eaten by a predator? *(Answers will vary. Students may say living in large numbers, size, or the ability to hide.)*
- What are some specific adaptations that plants have to protect them from becoming prey? *(Students may suggest thorns or spikes, poison, bad odors or tastes, or causing the predator to be itchy.)*

Differentiation Strategy

For high-level thinking, challenge students to come up with examples of plants that could be considered predators and what adaptations they would need. You may wish to follow up with a discussion and video clip on carnivorous plants, such as the Venus flytrap.

Encourage students to think of additional examples of predator and prey adaptations and allow students time to add the examples to the charts in the their science notebooks.

5. Display the lion, fur seal, and flamingo cards from the Group Animals Photo Card Set. Ask:

- Which of these animals do you think can hide easily? *(The lion and the fur seal)*
- Why is it easy for these animals to hide? *(Students should recognize that the lion and the fur seal can blend in with their environments.)*
- Which of these animals do you think would have a hard time hiding? Why? *(Students should suggest that the bright pink color of the flamingos would make it difficult for them to hide.)*
- What adaptations do flamingos have to help them avoid predators? *(Answers will vary. Students may suggest flying, long legs, or living in areas that are harder for predators to get to.)*

ELA connection L.3.4, RI.3.7

6. When we say an animal can hide easily, what adaptations might they have to help them hide? *(Students may mention color or markings on the animal to help them blend in with the environment.)*

7. Introduce the term "camouflage," and emphasize that camouflage is important to both predators and prey. Ask:

- How might a predator use camouflage? *(Most students will say that predators need camouflage to sneak up on prey.)*
- How might prey use camouflage? *(Most students will say that prey use camouflage to hide from predators.)*

8. Distribute a copy of Student Investigation Sheet 3C: *How Can Camouflage Be Beneficial in a Predator–Prey Relationship?* to each student. Read the scenario aloud to the class. Hold up a container of chips so that students can see the variations or different colors.

9. Allow time for students to get back in their groups. Distribute a construction-paper environment and a container of transparent chips to each group. Have students observe the chips without touching the container. Ask them to predict which variation of the "chipimals" will survive the best in the construction-paper environment. Instruct students to record their prediction on Student Investigation Sheet 3C.

10. Review the procedure in Part B of the investigation sheet with students. Emphasize that each student will be the timer for one trial and will not collect data during the trial they time. Remind the timers that their job is to give other students the signal for when to start and stop hunting.

11. Once groups have collected all their data, allow ample time for students to analyze their data and answer the questions in Part D of the investigation sheet. Discuss students' responses to the questions as a class. Ask:

- If a specific color of chipimal is unable to survive in this environment, what do you predict will happen to the chipimal population? *(Students might suggest that if any color chipimal could not survive, the overall chipimal population would decline.)*
- What do you think would happen if you repeated this investigation using a different-colored environment? *(Students should conclude that a different color of chipimal would be easier to spot on the different-colored environment, but that the overall effect would be the same: a decrease in the overall population.)*

12. Allow time for students to answer the questions in Part E of the investigation sheet. Then gather together and invite students to share their answers with the class.

Identify Phenomena

You may want to show examples of camouflage on military uniforms and ask students to discuss how this helps soldiers.

Connect to phenomena

Teaching Tip

The timer will need to keep a 5 second time for each hunt. If a stopwatch is not available, have students count out the seconds.

Literacy integration

Literacy Tip

To help students make real-world connections to adaptations and camouflage, have them to read Literacy Article 3C: Two Sensational Sharks.

Differentiation Strategy

For high-level thinking, encourage students to think about a reason that certain organisms are brightly colored and whether this bright color is a disadvantage in a predator–prey relationship.

LESSON 3

Tell Me More!

You have been asked to help a scientist collect data on bird behavior in a local forest ecosystem without disturbing the birds. What are some ways you could blend in with their environment?

Phenomenon

Review students' questions about the investigative phenomenon from the beginning of this lesson. Guide students in applying the concepts explored in this lesson and connecting them to the anchoring phenomenon: the diversity of life in Earth's ecosystems. By the end of the lesson, students should be able to explain that:

- Organisms have behavioral and physical adaptations that can affect their survival in an ecosystem.
- Camouflage is a physical adaptation that can be beneficial to both predators and prey.
- Adaptations may have variations within species. These variations can help an organism survive well, less well, or not at all in its ecosystem.

Connecting ideas about phenomena to evidence

NOTES

EXTENSIONS

Arctic Adaptations
Take students on a digital field trip to the Arctic. Have them research different Arctic animals and some of the adaptations they have for living in the Arctic. You may wish to set up stations to explore adaptations such as camouflage, insulation, webbed feet, fins, or large paws. Challenge students to compare the animals in the Arctic to animals in their local ecosystem.

Amazing Adaptations
Locate some videos on amazing adaptations, such as those of the pistol shrimp, African bullfrogs, Australian grass trees, camels, giant kelp, addax antelopes, hummingbirds, and great white sharks. Challenge students to think about how the amazing adaptations allow the organisms to survive in their ecosystems. Encourage students to research additional amazing adaptations and create a classroom display of their research.

Credit: Butterfly Hunter/Shutterstock.com

Winged Camouflage
Have students research different butterflies and moths that have wing patterns and coloration for camouflage. The atlas moth, owl butterfly, lichen moth, and brimstone butterfly are just a few examples of these masters of camouflage.

The Savage Beak
Ask pairs of students to experiment with different tools to design a beak adapted to eating small rodents, such as mice. Pairs should apply what they have learned about beak adaptations from Investigation B of this lesson.

NOTES

NOTES

Student Investigation Sheet 3A

Name ____________

Date ____________

Math connection 3.MD.A.2

How Can I Study the Environmental Factors that Affect Plant Growth?

Variable: No Light

Equipment:
1 Foam tray
2 Large plastic containers
1 Measuring scoop
1 Pipet
1 Small plastic container with wick
1 Strip of fertilizer pellets
1 Strip of masking tape
1 Strip of seeds
Dark location to store growing system
Paper towels
Soil
Water

A. Set Up

1. One member of your group will take one large plastic container and the measuring scoop to the soil station and bring back five scoops of soil.

2. One member of your group will take the other large plastic container and the measuring scoop to the water station and bring back four scoops of water.

B. Build a Growing System

1. Add two scoops of soil to the small plastic container with the wick.

2. Spread 18 pellets of fertilizer on top of the soil in your small container.

3. Pour another two scoops of soil into the small container.

4. Hold your small container over a paper towel. Use the pipet to water the top of the soil until you see water drip from the wick.

5. Carefully place nine Wisconsin Fast Plants® seeds in a circle on top of the soil.

6. Lightly cover the seeds with no more than one scoop of soil.

7. The water remaining in your large container will become your reservoir. Put the small container with the soil and seeds into the large container of water to complete your growing system.

8. Lightly water the top layer of soil using the pipet.

9. Write your group number and your variable on the strip of masking tape and attach it to your completed growing system.

10. Place your growing system in a dark location as directed by your teacher.

Variable: No Fertilizer

Equipment:

- 1 Foam tray
- 2 Large plastic containers
- 1 Measuring scoop
- 1 Pipet
- 1 Small plastic container with wick
- 1 Strip of masking tape
- 1 Strip of seeds
- Light bank
- Paper towels
- Soil
- Water

A. Set Up

1. One member of your group will take one large plastic container and the measuring scoop to the soil station and bring back five scoops of soil.

2. One member of your group will take the other large plastic container and the measuring scoop to the water station and bring back four scoops of water.

B. Build a Growing System

1. Add two scoops of soil to the small plastic container with the wick.

2. Pour another two scoops of soil into the small container.

3. Hold your small container over a paper towel. Use the pipet to water the top of the soil until you see water drip from the wick.

4. Carefully place nine Wisconsin Fast Plants® seeds in a circle on top of the soil.

5. Lightly cover the seeds with no more than one scoop of soil.

6. The water remaining in your large container will become your reservoir. Put the small container with the soil and seeds into the large container of water to complete your growing system.

7. Lightly water the top layer of soil using the pipet.

8. Write your group number and your variable on the strip of masking tape and attach it to your completed growing system.

9. Place your growing system under the light bank as directed by your teacher.

Variable: No Soil

Equipment:

- 1 Foam tray
- 2 Large plastic containers
- 1 Measuring scoop
- 1 Pipet
- 1 Small plastic container with wick
- 1 Strip of fertilizer pellets
- 1 Strip of masking tape
- 1 Strip of seeds
- Light bank
- Paper towels
- Water

A. Set Up

One member of your group will take the other large plastic container and the measuring scoop to the water station and bring back four scoops of water.

B. Build a Growing System

1. Cover the bottom of the small plastic container with the wick with a paper towel.

2. Spread 18 pellets of fertilizer on top of the paper towel in your small container.

3. Hold your small container over a second paper towel. Use the pipet to water the top of the paper towel in your container until you see water drip from the wick.

5. Put another paper towel on top of the fertilizer pellets. Carefully place nine Wisconsin Fast Plants® seeds in a circle on top of this paper towel.

6. The water remaining in your large container will become your reservoir. Put the small container with the paper towels and seeds into the large container of water to complete your growing system.

7. Write your group number and your variable on the strip of masking tape and attach it to your completed growing system.

8. Place your growing system under the light bank as directed by your teacher.

Variable: No Water

Equipment:
- 1 Foam tray
- 2 Large plastic containers
- 1 Measuring scoop
- 1 Pipet
- 1 Small plastic container with wick
- 1 Strip of fertilizer pellets
- 1 Strip of masking tape
- 1 Strip of seeds
- Light bank
- Paper towels
- Soil

A. Set Up

One member of your group will take one large plastic container and the measuring scoop to the soil station and bring back five scoops of soil.

B. Build a Growing System

1. Add two scoops of soil to the small plastic container with the wick.

2. Spread 18 pellets of fertilizer on top of the soil in your small container.

3. Pour another two scoops of soil into the small container.

4. Carefully place nine Wisconsin Fast Plants® seeds in a circle on top of the soil.

5. Lightly cover the seeds with no more than one scoop of soil.

6. Put the small container with the soil and seeds into the large container to complete your growing system.

7. Write your group number and your variable on the strip of masking tape and attach it to your completed growing system.

8. Place your growing system in under the light bank as directed by your teacher.

Student Investigation Sheet 3B

Name ______________________

Date ______________________

ELA connection
W.3.2, SL.3.1
Math connection
3.MD.B.3

How Does the Structure of a Bird's Beak Help It Survive?

Equipment:

1 Clothespin
1 Collecting net
2 Cups of sunflower seeds
1 Graduated cylinder containing red water (nectar)
1 Pair of tweezers
1 Pipet
1 Plastic tank containing water and macaroni (fish)
1 Set of Bird Beak Cards
4 Small cups
Paper towels

A. Predict

Select a model beak with a shape similar to the shape of the beak of the bird on the card you chose. Record your prediction and the reasoning that supports it.

The beak of ______________ (my bird) seems to be adapted to eat ______________________________.

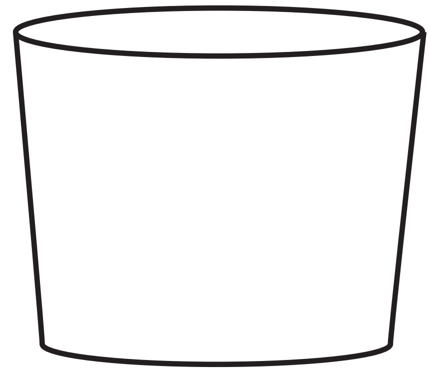
I think this because ____

____.

B. Procedure

- You will have 10 seconds to collect food from three food sources: red water (to represent nectar), sunflower seeds, and macaroni (to represent fish).
- Your teacher will keep time. Listen for the start and stop signals your teacher gives the class. Remember that you will collect all the food types, but that you will use only the model beak you selected.
- Use only the model beak you selected to collect food and place it in your cup.
- Count the amount of food you have collected after each trial and record the total in the data table in Part C of this investigation sheet.

C. Observe and Record

Number of Seeds Collected	**Number of Fish Collected**	**Estimate of Nectar Collected**
		 Shade the cup to show how much nectar you collected. If you were not able to collect any nectar, leave the cup blank.

D. Explain

1. What type of food was easiest for you to collect with the beak model you used? Hardest? Explain. ______________________________

____

2. If your bird was born with a different-sized beak, how would it affect its survival? ______________________________

____

____

3. If you were observing a pelican population, what types of ecosystems would they do well in?

____

____

____

4. What ecosystems would pelicans have trouble surviving in? ______________________________

____

____

E. Conclude

1. Did your data match your prediction? Explain.

2. What type of adaptation is a bird beak, and how does it help a bird survive?

Take-Home Science

Connecting science with families

Dear Family,

Our class is beginning an inquiry science unit. Inquiry science is all about questions, active explorations, drawing, writing, and recording what you see and do to build an understanding of science. Young children are natural scientists. Scientists question everything. Once scientists answer one question, they move without blinking to the next question.

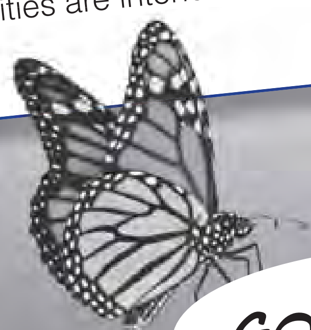
Take-Home Science is an exciting part of our program because it's one way we can better connect home and school. With everyone working together, we can reinforce the science concepts that your student is exploring in the classroom. Here's how Take-Home Science works.

Your student will bring home an investigation sheet that explains an activity related to the science unit the class is studying. The activity is designed so that everyone in the household—younger and older children alike—can work together to learn about science.

A section of the investigation sheet explains the science words and ideas that will be explored during the activity. These science words and ideas are not new to your student because the activity follows a lesson in which those same concepts were explored.

The activities are simple and can be completed within 20 minutes using items normally found in the home. A section of the investigation sheet is for your student to complete and bring back to school. In class, students will have the opportunity to share their experiences and results with one another.

The activities are intended to be quick, informal, and fun. Enjoy!



GO EXPLORING!

Credit: Cathy Keifer/Shutterstock.com

Take-Home Science

Observing Birds and Their Feeding Patterns

Make two bird feeders out of repurposed plastic bottles and hang them on a tree near your home. Observe the kinds of birds and the type of seed they eat. Record your observations on the chart on the next page. Observe the birds for one week, taking special note of the shapes of their beaks and how they use their beaks to eat the seeds.

Bird Buffet

Challenge: Observe the types of birds that are attracted to the two different types of seeds, and determine how the shapes of their beaks help them eat their food of choice.
Who: You and any person who will help (like brothers, sisters, parents, or friends).
1. What to look for: Which birds eat each type of seed you selected.

2. What to record: Complete the chart on the next page. Record the types of birds you see at the feeders for one week. Note how the shapes of their beaks help them eat their food.

3. What to report: After one week, bring your completed chart to class. Be prepared to share what you have found.

Equipment:

- 2 Plastic bottles of the same size, with caps (any size from 20 oz to 2 L)
- 1 Pair of sharp scissors or a utility knife
- 1 Marker
- Strong string
- Two different kinds of birdseed
- 1 Ruler or tape measure

How to make a bird feeder out of a plastic bottle:

Step 1: Halfway down from the top of your bottle, use a marker to draw a window. On the opposite side of the bottle, draw another window. Try to make both the windows the same size. You may use a ruler or tape measure to help create straight lines.

Step 2: Have an adult help you cut the left, top, and right side of each window. Fold the flap down to provide a landing spot for the birds to perch on while they eat. If the plastic is too stiff, use the flat end of your scissors to help crease the plastic.

Step 3: Put the cap on the bottle.

Step 4: Cut two pieces of string, each about 25 cm long. Tie one end of each string securely around the mouth of the bottle. Make sure the loose ends of the strings are on opposite sides. Tie the loose ends of the strings together in a tight knot to create a loop. You will hang the feeder from this string.

Step 5: Choose two types of bird seed. Label each feeder with the type of seed you will fill it with.

Step 6: Fill the bottom of each feeder with one of the two types of seed you chose. Be careful not to mix seeds!

Step 7: Hang the two bird feeders on tree branches near your home, and observe the different kinds of birds that eat each type of seed for one week.

Take-Home Science

Name ______________________

Date ______________________

ELA connection
W.3.2, W.3.10

Observing Birds and Their Feeding Patterns

A. Observe and Record

Draw and describe each type of bird you observe.	Draw and describe the beak shape and how the bird uses its beak.	Which type of seed did this bird mostly eat?

B. Analyze

How did the type of beak affect what type of seed you observed each bird eat? ______________________

Name ______________________________

Date ______________________________

ELA connection
RI.3.1, RI.3.2, RI.3.3, RI.3.4, RI.3.7, W.3.2

Two Sensational Sharks

The whale shark is the biggest fish in the world. It can grow to be the size of a school bus! Despite its name, the whale shark is not a whale at all. Unlike a whale, it uses gills to take in oxygen from the water. It has a skeleton made of cartilage. It is a fish, like other sharks.

The whale shark is a gentle giant—unless you are plankton, that is. “Plankton” is a general name for tiny organisms that float with water currents. The whale shark vacuums up plankton with its giant mouth by the tens of thousands. It uses its teeth and filter pads to separate food from water and nonfood items. Whale sharks can have over 300 rows of tiny teeth!

Most sharks have razor-sharp teeth. They thrash their prey from side to side, tearing and sawing the prey’s flesh. The great white shark has fewer rows of teeth than the whale shark, but the great white shark’s teeth are larger and sharper. Scientists have been studying great white sharks and have found that when they hunt prey such as seals, great whites can get up to speeds of 10 meters (33 feet) per second! This fish also has a keen sense of smell that can detect prey at great distances. The great white shark has a two-tone color scheme. It is light on the underside and dark on top. The light side makes it less visible to prey from underneath, when sunlight shines from above.

Most species of shark are solitary, which means they prefer to live alone. Sharks sometimes travel long distances in search of food. Sometimes there is a lot of food in a small area. At these times, the sharks gather in one place.

Questions:

1. What adaptation causes a whale shark to be classified as a fish?

2. Compare and contrast the teeth of a whale shark with the teeth of a great white shark.

3. How is a great white shark’s coloration an adaptation that helps it catch prey?

Credit: David Evison/Shutterstock.com

Credit: Tomas Kotouc/Shutterstock.com

Student Investigation Sheet 3C

How Can Camouflage Be Beneficial in a Predator–Prey Relationship?

Name ____________________

Date ____________________

Math connection
3.MD.B.3

Equipment: 1 Construction-paper environment
1 Container of transparent colored chips
1 Stopwatch (or count out the seconds)

A. Predict

I think that the ____________________ (choose a color) "chipimal" will have the best chance of surviving in its environment. I think this because ____

____

____.

B. Procedure

1. Select one group member to be the first timer. The timer will not collect data during the trial that s/he times.

2. The group members who will be hunting need to turn around while the timer spreads all the chips out on the construction-paper environment.

3. When the timer is ready, s/he will tell you to turn around, and you will have 5 seconds to collect as many chips as possible.

4. After 5 seconds, the timer will tell you that your time is up.

5. Count how many chips of each color you caught and record those totals in the table in Part C of this sheet.

6. Once you have recorded your data, return the chips to the container.

7. Select a new timer and repeat Steps 2–5. Do this until everyone in the group has had a chance to be the timer.

C. Observe and Record

After each trial, count how many of each color chip you collected and record it in the table below.

	Red	**Green**	**Blue**	**Yellow**	**Orange**	**Purple**
Trial 1						
Trial 2						
Trial 3						

D. Analyze

1. Which chipimal(s) had the worst survival rate? Explain.

2. What color chipimal had the best chance of survival and should have a better chance at finding a mate and having offspring? Explain.

3. How would the results change if the environment were a different color?

E. Conclude

1. Did your results support your prediction? Explain.

2. Give an example of how camouflage can help prey survive better in an ecosystem.

3. Give an example of how camouflage can help predators in an ecosystem.

4. How did this investigation simulate camouflage as an adaptation?

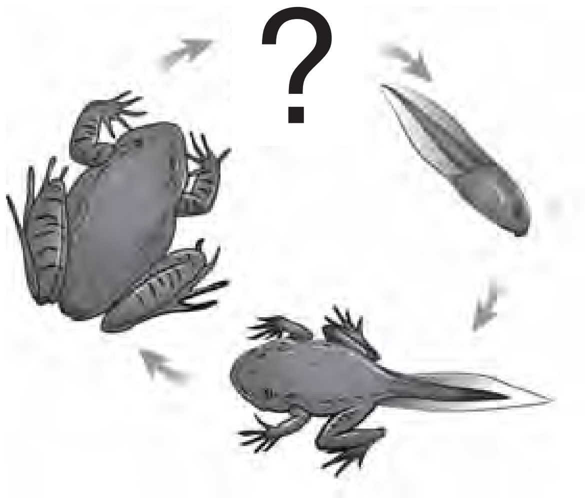
Summative Assessment

Name

Date

What have they learned?

1. Observe the diagram below.



What part of the frog's life cycle is missing?

a. Adult
b. Eggs
c. Tadpole
d. Tadpole with legs

2. Elephants live in herds. The oldest female leads the herd. How does living in a herd help elephants survive? Circle all that apply.

a. The elephants can more easily pass diseases to one another.
b. The young can learn how to defend themselves.
c. The young can learn migration routes.
d. Adult elephants can feed the very old or very young members of the herd.
e. It is easier to feed a large group when food is scarce.

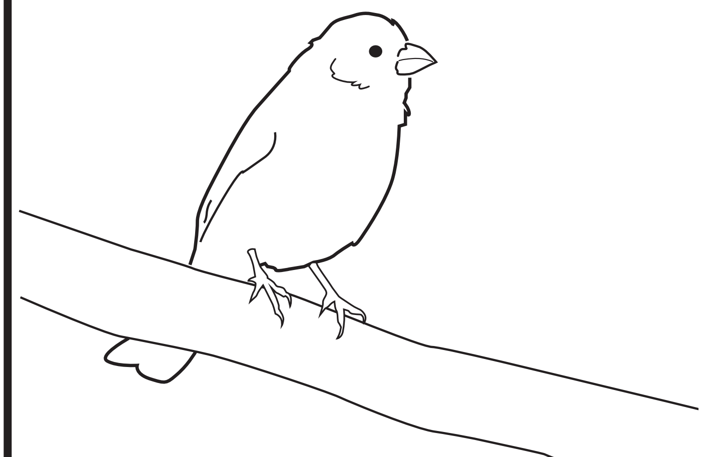
3. The northern mockingbird is common throughout the United States. Pairs of mockingbirds build nests together. Females lay three to five eggs. Which behavioral adaptation would you most likely expect from mockingbird parents to protect their offspring?

a. Attacking predators while hunting for food.
b. Copying the songs of other birds.
c. Attacking animals that go near their nests.
d. Laying each egg in a different nest.

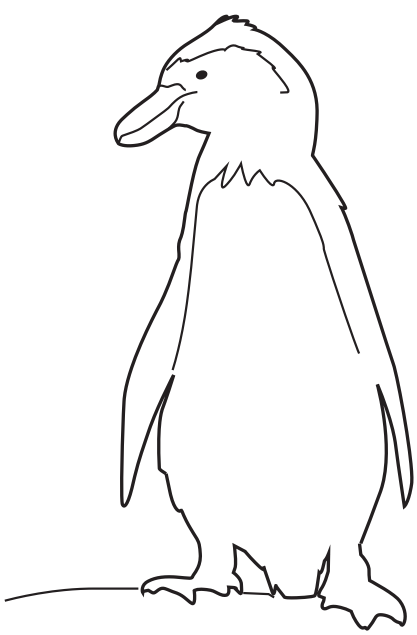
Teacher Sheet 3B.1

Bird Beak Cards

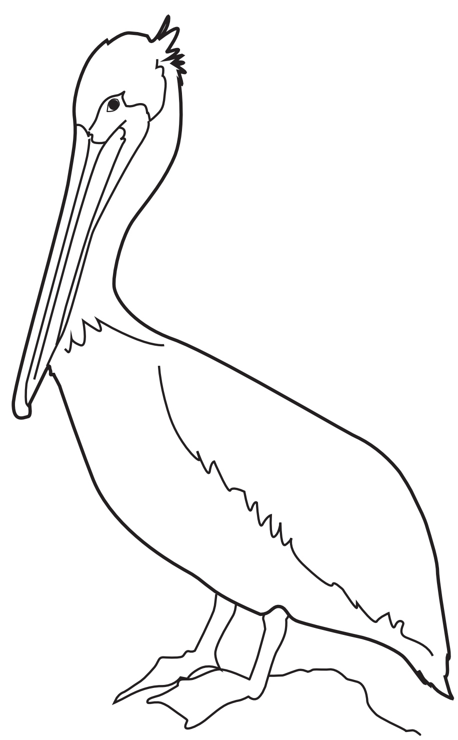
Hummingbird



House Finch



Penguin



Brown Pelican

Teacher Sheet 3B.2

Color Images of Birds on the Bird Beak Cards

Credits: (top left) Steve Byland/Shutterstock.com (top right) Steve Brigman/Shutterstock.com (bottom left) Angel R Martinez/Shutterstock.com (bottom right) Arto Hakola/Shutterstock.com

Student Investigation Sheet 3B: Teacher's Version

How Does the Structure of a Bird's Beak Help It Survive?

A. Predict

Select a model beak with a shape similar to the shape of the beak of the bird on the card you chose. Record your prediction and the reasoning that supports it.

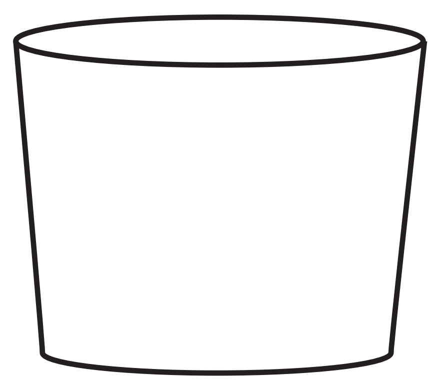
The beak of ________________ (my bird) seems to be adapted to eat ______________________________ .

I think this because ____________. *(Predictions will vary.)*

B. Procedure

- You will have 10 seconds to collect food from three food sources: red water (to represent nectar), sunflower seeds, and macaroni (to represent fish).
- Your teacher will keep time. Listen for the start and stop signals your teacher gives the class. Remember that you will collect all the food types, but that you will use only the model beak you selected.
- Use only the model beak you selected to collect food and place it in your cup.
- Count the amount of food you have collected after each trial and record the total in the data table in Part C of this investigation sheet.

C. Observe and Record

Number of Seeds Collected	**Number of Fish Collected**	**Estimate of Nectar Collected**
(Students' data will vary. The forceps will be able to pick up more seeds, the pipet will be best for collecting liquid, and the collecting net or clothespin will gather the most macaroni from the tank.)		 Shade the cup to show how much nectar you collected. If you were not able to collect any nectar, leave the cup blank.

D. Explain

1. What type of food was easiest for you to collect with the beak model you used? Hardest? Explain. *(Answers will vary.)*

2. If your bird was born with a different-sized beak, how would affect its survival? *(Students are likely to point out that the bird would do well if it could catch more food, but that it would do less well or possibly die if it could not catch food.)*

3. If you were observing a pelican population, what types of ecosystems would they do well in? *(Students' responses should connect the beak adaptations with other adaptations and with the ecosystem. For example, a pelican would do well in a coastal wetland because there is open water and plenty of fish. Students might also mention that webbed feet allow the pelican to paddle on top of the water or walk along marshy areas.)*

4. What ecosystems would pelicans have trouble surviving in? *(Students should be able to use their understanding of beak adaptations and other adaptations to identify ecosystems that would not be appropriate for pelicans. For example, a pelican would not do well in the desert because there is very little open water; a pelican's beak would not be able to access the available food sources in the desert.)*

E. Conclude

1. Did your data match your prediction? Explain. *(Answers will vary based on students' initial predictions in Part A of the investigation sheet. Students should use data from the investigation as evidence to explain whether their prediction was supported.)*

2. What type of adaptation is a bird beak, and how does it help a bird survive? *(Students should identify beaks as physical adaptations. They should also recognize that a bird's beak helps it eat, and that the type of beak affects the kind of food the bird can eat, which impacts the bird's survival.)*

Two Sensational Sharks

The whale shark is the biggest fish in the world. It can grow to be the size of a school bus! Despite its name, the whale shark is not a whale at all. Unlike a whale, it uses gills to take in oxygen from the water. It has a skeleton made of cartilage. It is a fish, like other sharks.

The whale shark is a gentle giant—unless you are plankton, that is. "Plankton" is a general name for tiny organisms that float with water currents. The whale shark vacuums up plankton with its giant mouth by the tens of thousands. It uses its teeth and filter pads to separate food from water and nonfood items. Whale sharks can have over 300 rows of tiny teeth!

Most sharks have razor-sharp teeth. They thrash their prey from side to side, tearing and sawing the prey's flesh. The great white shark has fewer rows of teeth than the whale shark, but the great white shark's teeth are larger and sharper. Scientists have been studying great white sharks and have found that when they hunt prey such as seals, great whites can get up to speeds of 10 meters (33 feet) per second! This fish also has a keen sense of smell that can detect prey at great distances. The great white shark has a two-tone color scheme. It is light on the underside and dark on top. The light side makes it less visible to prey from underneath, when sunlight shines from above.

Most species of shark are solitary, which means they prefer to live alone. Sharks sometimes travel long distances in search of food. move. Sometimes there is a lot of food in a small area. At these times, the sharks gather in one place.

Questions:

1. What adaptation causes a whale shark to be classified as a fish? *(A whale shark takes in oxygen from the water through gills, like fish do.)*

2. Compare and contrast the teeth of a whale shark with the teeth of a great white shark. *(Both species of shark have rows of teeth. The whale shark's teeth are modified to filter tiny organisms. The great white shark has fewer rows of teeth, but their teeth are larger and sharper than those of a whale shark.)*

3. How is a great white shark's coloration an adaptation that helps it catch prey? *(A great white's light underside makes it hard to see from below against the backdrop of the sunlight coming through the surface of the water.)*

Credit: David Evison/Shutterstock.com

Credit: Tomas Kotouc/Shutterstock.com

Student Investigation Sheet 3C: Teacher's Version

How Can Camouflage Be Beneficial in a Predator–Prey Relationship?

A. Predict

I think that the ________________________ (choose a color) "chipimal" will have the best chance of surviving in its environment. I think this because ________________. *(Predictions will vary.)*

B. Procedure

1. Select one group member to be the first timer. The timer will not collect data during the trial that s/he times.

2. The group members who will be hunting need to turn around while the timer spreads all the chips out on the construction-paper environment.

3. When the timer is ready, s/he will tell you to turn around, and you will have 5 seconds to collect as many chips as possible.

4. After 5 seconds, the timer will tell you that your time is up.

5. Count how many chips of each color you caught and record those totals in the table in Part C of this sheet.

6. Once you have recorded your data, return the chips to the container.

7. Select a new timer and repeat Steps 2–5. Do this until everyone in the group has had a chance to be the timer.

C. Observe and Record

After each trial, count how many of each color chip you collected and record it in the table below.

	Red	Green	Blue	Yellow	Orange	Purple
Trial 1						
Trial 2						
Trial 3						

D. Analyze

1. Which chipimal(s) had the worst survival rate? Explain. *(Students should identify the chipimals that did not blend in with the environment as having the worst survival rate. These chipimals were more likely to be caught and eaten.)*

2. What color chipimal had the best chance of survival and should have a better chance at finding a mate and having offspring? Explain. *(Students should identify the chipimal that blended in with the environment as having the best chance of surviving and having offspring.)*

3. How would the results change if the environment were a different color? *(Students should recognize that changing the color of the environment would change the color chipimals that could be easily caught.)*

E. Conclude

1. Did your results support your prediction? Explain. *(Answers will vary based on their initial predictions, but all students should use evidence from the investigation as support in their explanations.)*

2. Give an example of how camouflage can help prey survive better in an ecosystem. *(Answers will vary.)*

3. Give an example of how camouflage can help predators in an ecosystem. *(Answers will vary.)*

4. How did this activity simulate camouflage as an adaptation? *(Answers will vary, but students should use their data to explain how camouflage can be used to help a population survive.)*

Building Blocks of Science Student Literacy

Build students' literacy skills with literacy components found within lessons and Literacy Readers.

Building Blocks of Science Literacy Components can be used to:

- Introduce a new lesson
- Support an investigation
- Differentiate instruction
- Review previously learned concepts
- Incorporate science connections into your language arts sessions

Literacy Readers—**on-level and below-level** readers in **English and Spanish** and available in **print or digital format**—provide informational text that:

- Incorporates English language arts and literacy standards
- Uses supporting text with graphs, vocabulary, charts, data, illustrations, and photographs to address **science concepts** related to lessons
- Provides opportunities to practice skills such as analysis and reasoning, and communication of ideas through **crosscutting concept** questions
- Challenges students to exercise and apply knowledge to a **science and engineering practice** activity
- Features a career that provides real-world insight into related science content


Ecosystems and Habitats

An **ecosystem** is made up of all the living and nonliving things in an area. Remember that living things are plants and animals, including people. Nonliving things include water, air, and soil. Weather and light are also nonliving things.

All these things work together in an ecosystem. They depend on each other. Plants need the Sun for energy. Energy gives them the ability to grow and change. Some animals could not live without plants. Some animals could not live without other animals to eat. Both animals and plants need water to live.

The ecosystem where an animal lives is its **habitat**. A habitat gives animals the things they need to stay alive, or **survive**. Animals need air and water. They need energy to be active. Energy comes from the food that animals eat.

Animals also need **shelter**, a place to live. A shelter helps keep an animal safe from the weather and from other animals. Birds build nests for shelter. Bats find shelter in caves. Many animals dig burrows for shelter. They live underground for much of the time. Chipmunks, groundhogs, and rabbits live in burrows.

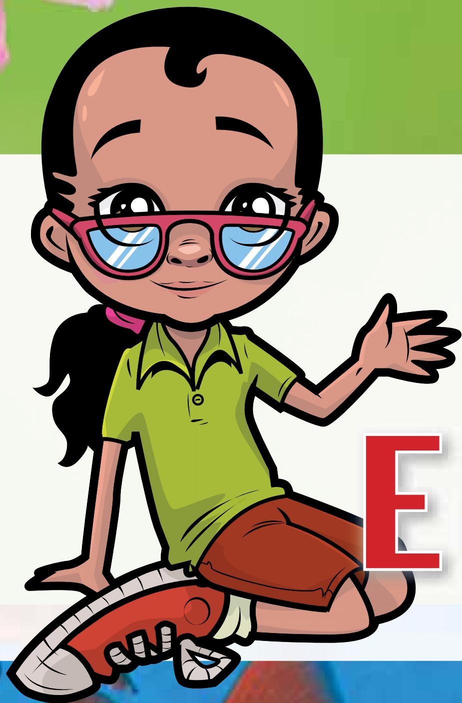
Rabbits use their strong claws to dig a burrow for shelter.

What else to look for?

Literacy Articles—These encourage students to elaborate upon unit topics, discuss real-world applications and phenomena, and ask students to connect this to concepts in the unit. Corresponding questions ask students to access high-level thinking and draw upon previous knowledge. (See page 33 of this sampler for an example.)

Science in the News Article Report—Students analyze a content-relevant reading or current event article, developing literacy skills as students identify important information, apply vocabulary, and draw connections to science content.

Building Blocks OF SCIENCE™ 3D



Life in Ecosystems

Student literacy—available in digital and print

Adaptations: Behavior

There are many ecosystems on Earth. Each kind has different living and nonliving things. Each kind can have hard conditions that make it difficult for living things to survive. An example of a hard condition is the lack of water in the desert. Animals have certain traits, or features, that help them survive in these conditions. These traits make it easier for them to get shelter or meet other needs. An **adaptation** is a trait that helps an animal survive.

Some adaptations are behaviors. One important adaptation is living in a group.

Elephants take care of their young as a group.

Animals in a group help each other find food. They help protect each other from other animals. They help each other care for their young.

Some animals adapt by migrating. They move from one area to another during different times of the year. Gray whales migrate many miles in the winter. They swim from the cold Arctic Ocean to warmer waters. They have their young in warmer waters. Then they swim back to the Arctic Ocean, where there is plenty of food for them. Some birds, fish, and insects also migrate.

Some birds migrate when the weather changes.

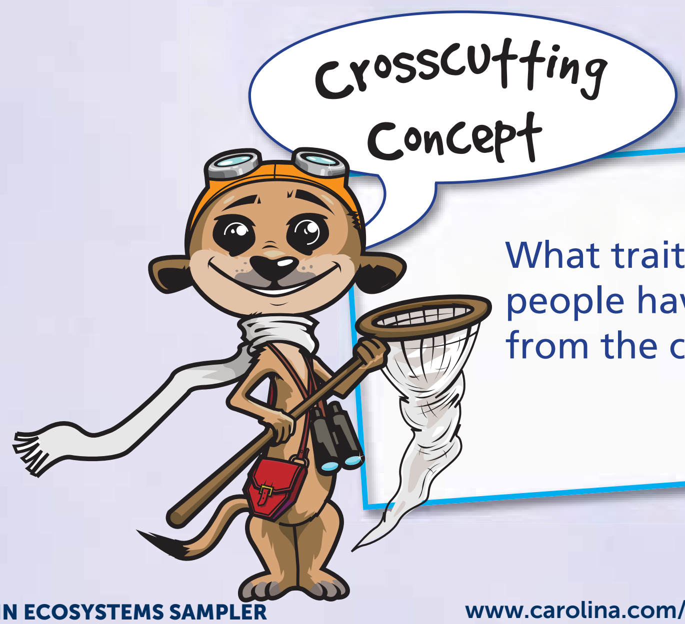
Adaptations: Physical

Body Systems of Animals in the Arctic

An adaptation can also be a physical trait. Animals that live in the Arctic have adapted to survive in a very cold climate. Temperatures there are below freezing for much of the time.

Snowy owls live in the Arctic year round. These owls have thick outer feathers from head to toe. They even have feathers on their feet. Snowy owls also have thick inner layers of down feathers. Down feathers trap air close to their bodies. The trapped air **insulates** them, or keeps the heat close to their bodies.

Snowy owls have two layers of thick feathers that insulate them.



ELA connection
L.3.4, RI.3.1, RI.3.7

What traits or adaptations do people have to protect themselves from the cold?

Blubber is an adaptation of Arctic animals that go in the water. **Blubber** is a layer of fat under their skin. This layer helps insulate them from the icy water. Whales, walruses, and seals have blubber. These animals dive into the water to find food.

Polar bears also have blubber, along with thick, waterproof fur. This fur comes in handy when they are diving for food. Polar bears are especially good swimmers because of their strong muscles. Their front paws have webbing that also helps them swim. These large paws act as snowshoes as well. Polar bears can walk over ice easily. Fur on their feet acts as socks. The bottoms of their paws have thick pads with small bumps. These prevent them from slipping on ice.

Polar bears are adapted to Arctic ice and cold temperatures.

Body Systems of Birds in the Woodlands

Many birds live in woodlands where there are plenty of trees and water. Birds have body systems that help them survive. They are the only animals that have feathers. Strong muscles attach their feathered wings to their bones. These adaptations allow birds to fly. They fly to find food and escape predators.

The shape of a bird's feet also helps it survive. Ducks paddle about with webbed feet. An eagle's talons are adapted to catch small animals. Woodpeckers have claws that help them climb trees. They eat ants, grubs, and insect eggs in the wood and bark of trees.

Eagle talons have muscles to grab and hold onto fish they catch.

Duck feet are webbed for swimming.

The shape and size of bird beaks are adapted to the different foods birds eat. Cardinals have a strong, thick beak. It is shaped for cracking seeds. Robins have longer, more slender beaks. They pick up earthworms from the soil. Hummingbirds have even longer beaks. They sip nectar from flowers. Parrots crack large nuts and peel fruit with their hooked beaks. They also use their powerful beaks to fight off predators.

Birds have many adaptations that allow them to live in many different ecosystems. Some live in rain forests or savannas. Some live in grasslands. Some live in the Arctic.

Parrots crack large nuts and peel fruit with their beaks.

The hummingbird's long beak fits inside flowers.

Careers

Science in the world

Animal Ecologist

Animal ecologists study how animals live in their habitats. They study what animals eat. They study how they behave. They study how things in the habitat affect animals, like climate and other animals.

Would I like this career?	You might like this career if • you like to do research. • you like animals and nature.
What would I do?	• You would study animal habitats. • You would research animal patterns.
How can I prepare for this career?	• Study science and nature. • Learn to observe things closely.

An ecologist studies ecosystems.

Profesiones

Ecologista de animales

Los ecologistas de animales estudian cómo viven los animales en su hábitat. Estudian lo que comen y su conducta. También estudian el efecto que tienen ciertas cosas, como el clima y otros animales, en su hábitat.

¿Me gustaría esta profesión?	Te gustaría esta profesión si • te gusta investigar. • te gustan los animales y la naturaleza.
¿Qué tendría que hacer?	• Estudiarías los hábitats de animales. • Investigarías patrones en los animales.
¿Cómo puedo prepararme para esta profesión?	• Estudia ciencias y la naturaleza. • Aprende a observar en detalle las cosas.

Un ecologista estudia los ecosistemas.

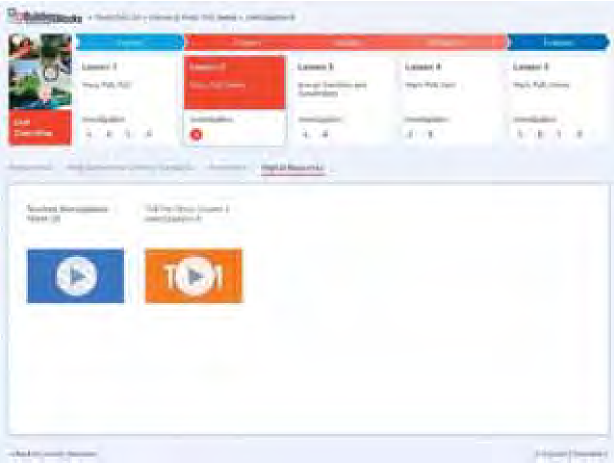
The Right Blend of Hands-On Investigation and Technology

Along with hands-on learning, Building Blocks of Science provides digital resources to enhance the classroom experience, offering an additional method of delivering content and support for teachers.

Support for Teachers

Everything you need to teach the lesson

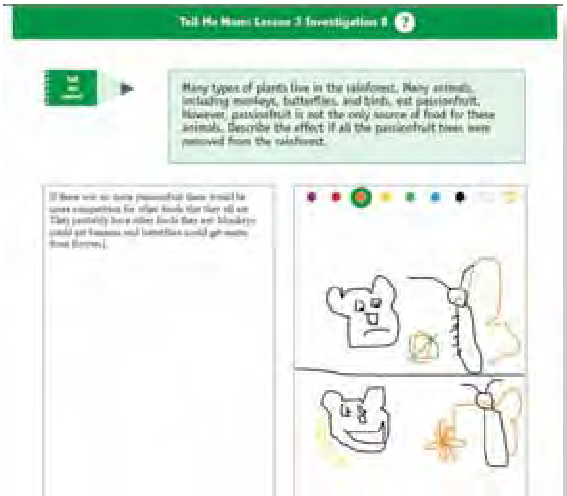
- Identification of where a lesson falls within the **5E Learning Cycle**
- Preparation—Includes investigation overview, materials list, and step-by-step teacher preparation instructions
- **NGSS Standards**—Includes the PEs, DCIs, SEPs, and CCCs that will be addressed within the investigation
- **Lesson Procedure**—Step-by-step instruction for each investigation within a lesson
- **Digital Resources**—All the digital resources available in one place, by lesson and by individual investigations within each lesson



Digital resources by lesson

Everything you need to teach ALL your students

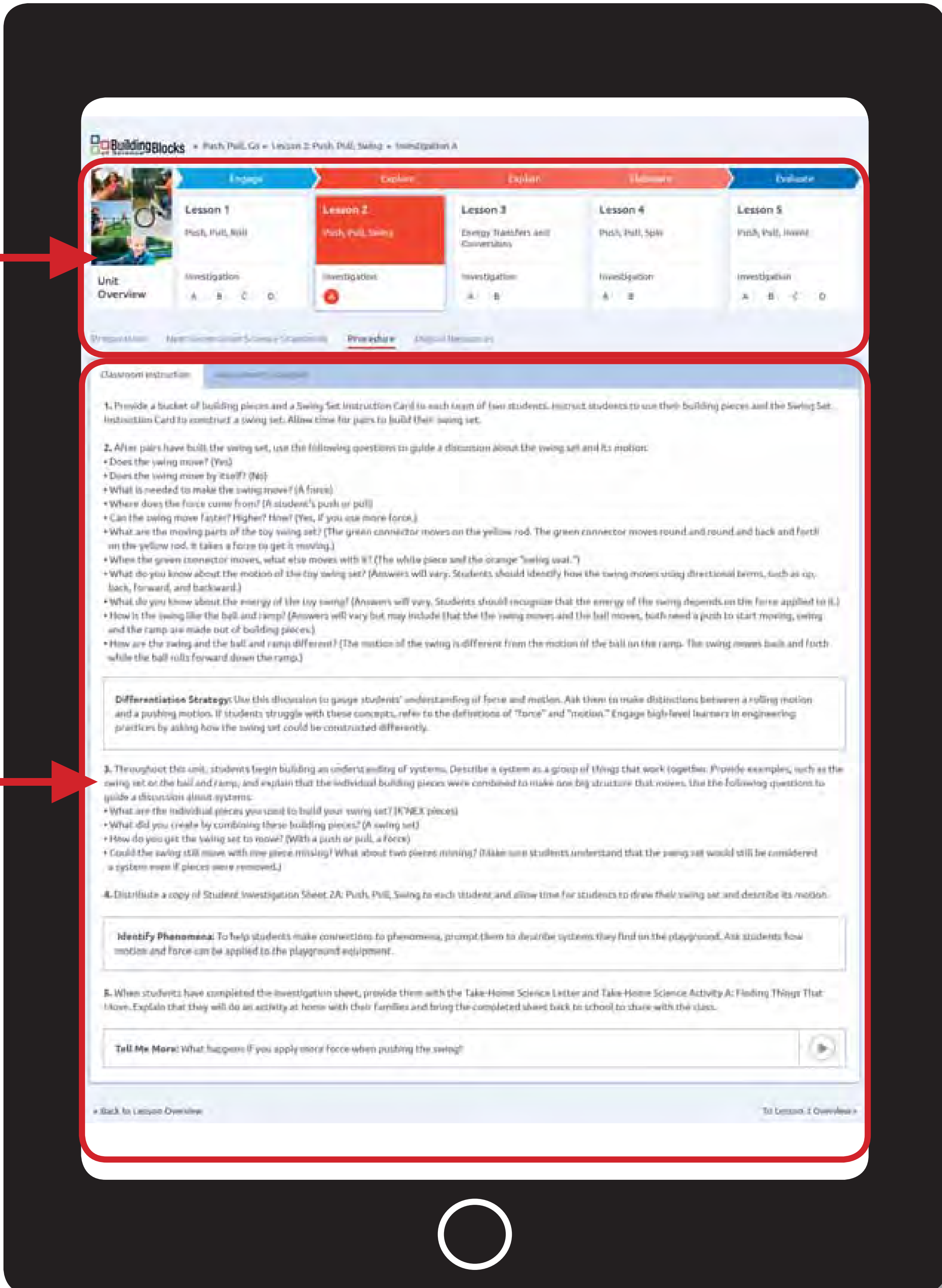
- Step-by-step instruction including guiding questions and anticipated responses
- Differentiation strategies at point of use within each investigation
- **Identify Phenomena** provides teachers with prompts to help students make connections to phenomena addressed within an investigation
- Assessment Strategies including **Tell Me More** formative assessment to help gauge student understanding



Tell Me More, a formative assessment strategy

For a closer look, visit:

www.carolina.com/bbs3dreview


BuildingBlocks
Engage
Explore
Explain
Elaborate
Evaluate
Unit Overview
Lesson 1
Push, Pull, Roll
Lesson 2
Push, Pull, Swing
Lesson 3
Energy Transfers and Conversions
Lesson 4
Push, Pull, Spin
Lesson 5
Push, Pull, Invent
Investigation
Procedure
Classroom Instruction
1. Provide a bucket of building pieces and a Swing Set Instruction Card to each team of two students. Instruct students to use their building pieces and the Swing Set Instruction Card to construct a swing set. Allow time for pairs to build their swing set.
2. After pairs have built the swing set, use the following questions to guide a discussion about the swing set and its motion.
• Does the swing move? (Yes)
• Does the swing move by itself? (No)
• What is needed to make the swing move? (A force)
• Where does the force come from? (A student's push or pull)
• Can the swing move faster? Higher? How? (Yes, if you use more force.)
• What are the moving parts of the toy swing set? (The green connector moves on the yellow rod. The green connector moves round and round and back and forth on the yellow rod. It takes a force to get it moving.)
• When the green connector moves, what else moves with it? (The white piece and the orange "swing seat.")
• What do you know about the motion of the toy swing set? (Answers will vary. Students should identify how the swing moves using directional terms, such as up, back, forward, and backward.)
• What do you know about the energy of the toy swing? (Answers will vary. Students should recognize that the energy of the swing depends on the force applied to it.)
• How is the swing like the ball and ramp? (Answers will vary but may include that the the swing moves and the ball moves, both need a push to start moving, swing and the ramp are made out of building pieces.)
• How are the swing and the ball and ramp different? (The motion of the swing is different from the motion of the ball on the ramp. The swing moves back and forth while the ball rolls forward down the ramp.)
Differentiation Strategy: Use this discussion to gauge students' understanding of force and motion. Ask them to make distinctions between a rolling motion and a pushing motion. If students struggle with these concepts, refer to the definitions of "force" and "motion." Engage high-level learners in engineering practices by asking how the swing set could be constructed differently.
3. Throughout this unit, students begin building an understanding of systems. Describe a system as a group of things that work together. Provide examples, such as the swing set or the ball and ramp, and explain that the individual building pieces were combined to make one big structure that moves. Use the following questions to guide a discussion about systems.
• What are the individual pieces you used to build your swing set? (K'NEX pieces)
• What did you create by combining these building pieces? (A swing set)
• How do you get the swing set to move? (With a push or pull, a force)
• Could the swing still move with one piece missing? What about two pieces missing? (Make sure students understand that the swing set would still be considered a system even if pieces were removed.)
4. Distribute a copy of Student Investigation Sheet 2A: Push, Pull, Swing to each student and allow time for students to draw their swing set and describe its motion.
Identify Phenomena: To help students make connections to phenomena, prompt them to describe systems they find on the playground. Ask students how motion and force can be applied to the playground equipment.
5. When students have completed the investigation sheet, provide them with the Take-Home Science Letter and Take-Home Science Activity A: Finding Things That Move. Explain that they will do an activity at home with their families and bring the completed sheet back to school to share with the class.
Tell Me More: What happens if you apply more force when pushing the swing?
« Back to Lesson Overview
To Lesson 3 Overview »

Digital Components to Support Instruction and Assessment

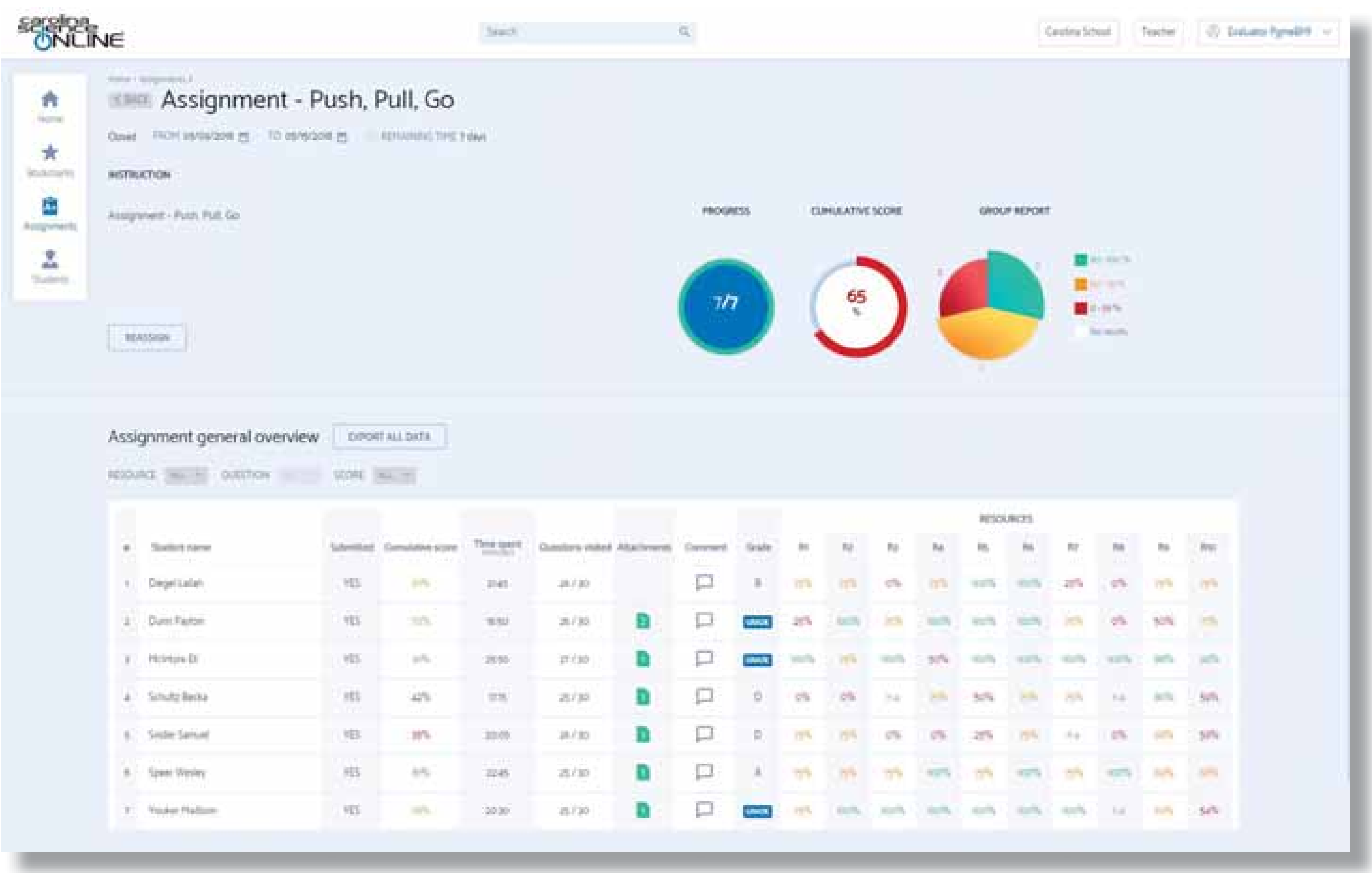
For the Teacher—Customizable Digital Planning at Your Fingertips

Building Blocks of Science 3D goes beyond just providing you access to your content. You can also:

- Use the assignment management system to create and grade custom assignments for classes and individual students to help differentiate instruction
- Create customizable bookmarks that include your student and instruction resources as well as URL links, PDF files, PowerPoint® presentations, and video files

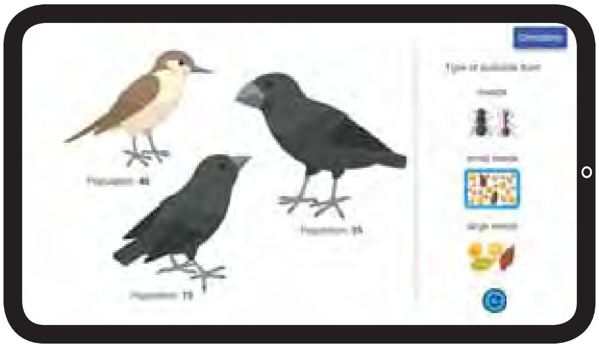
The assignment management system dashboard allows you to:

- Track the progress of your classes and individual students
- See student assignment results for the class at a glance and by individual student in detail
- Automatically grade close-ended questions (e.g., multiple choice, matching, fill-in-the-blank)
- Adjust student grades based on individual student performance and open-ended responses
- Assign remediation to student groups that need additional support or enrichment to groups that need a challenge



Digital components for students enhance and deepen student understanding, differentiate learning, and provide multiple modalities for delivering information.

"Digital Tips" take the guesswork out of integrating the following digital resources with hands-on investigations:



Simulations: Flexible enough to be used to introduce, support, or review a topic or concepts. Simulations are manipulative and provide a visual for differentiation.

Interactive Whiteboard Activities: With typing and drawing capabilities, IWB activities bring investigation-aligned classroom charts to life and are perfect for individual student review.

Student Investigation Sheets:
Students record their observations and data digitally when completing investigations.

Interactive Literacy Readers:
These enhanced versions of the printed student readers include check-for-understanding questions and animations to support the concepts covered in the text, enforce literacy skills, and provide additional practice.

Building Blocks OF SCIENCE™ | 3D

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Learning Framework

Kindergarten	**Push, Pull, Go** *K-PS2-1; K-PS2-2; K-2-ETS1-1;K-2-ETS1-2*	**Living Things and Their Needs** *K-LS1-1; K-ESS2-2;K-ESS3-1;K-ESS3-3; K-2-ETS1-2*	**Weather and Sky** *K-PS3-1;K-PS3-2;K-ESS2-1; K-ESS3-2; K-2-ETS1-1; K-2-ETS1-2*
1st Grade	**Light and Sound Waves** *1-PS4-1; 1-PS4-2; 1-PS4-3; 1-PS4-4; K-2-ETS1-1; K-2-ETS1-2*	**Exploring Organisms** *1-LS1-1; 1-LS1-2; 1-LS3-1; K-2-ETS1-2*	**Sky Watchers** *1-ESS1-1; 1-ESS1-2*
2nd Grade	**Matter** *2-PS1-1; 2-PS1-2; 2-PS1-3; 2-PS1-4; K-2-ETS1-1; K-2-ETS1-2*	**Ecosystem Diversity** *2-LS2-1; 2-LS2-2; 2-LS4-1; K-2-ETS1-2; K-2-ETS1-3*	**Earth Materials** *2-PS1-1; 2-ESS1-1; 2-ESS2-1; 2-ESS2-2; 2-ESS2-3; K-2-ETS1-1; K-2-ETS1-2*
3rd Grade	**Forces and Interactions** *3-PS2-1; 3-PS2-2; 3-PS2-3; 3-PS2-4; 3-5-ETS1-1; 3-5 ETS1-2*	**Life in Ecosystems** *3-LS1-1; 3-LS2-1; 3-LS3-1; 3-LS3-2; 3-LS4-1; 3-LS4-2; 3-LS4-3; 3-LS4-4; 3-5-ETS1-2*	**Weather and Climate Patterns** *3-ESS2-1; 3-ESS2-2;3-ESS3-1; 3-5-ETS1-2*
4th Grade	**Energy Works** *4-PS3-1; 4-PS3-2; 4-PS3-3; 4-PS3-4; 4-PS4-1; 4-PS4-3; 4-ESS3-1; 3-5 ETS1-2; 3-5-ETS1-3*	**Plant and Animal Structures** *4-LS1-1; 4-LS1-2; 4-PS4-2; 3-5-ETS1-2*	**Changing Earth** *4-ESS1-1; 4-ESS2-1; 4-ESS2-2; 4-ESS3-2; 3-5-ETS1-2*
5th Grade	**Structure and Properties of Matter** *5-PS1-1; 5-PS1-2; 5-PS1-3; 5-PS1-4; 3-5-ETS1-2*	**Matter and Energy in Ecosystems** *5-PS3-1; 5-LS1-1; 5-LS2-1; 5-ESS2-1; 5-ESS3-1; 3-5-ETS1-3*	**Earth and Space Systems** *5-PS2-1; 5-ESS1-1; 5-ESS1-2; 5-ESS2-1; 5-ESS2-2; 5-ESS3-1; 3-5-ETS1-2*

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