GRADE K

Building Blocks OF SCIENCE™ | 3D

Living Things and Their Needs

Program Highlights and Lesson Sampler

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

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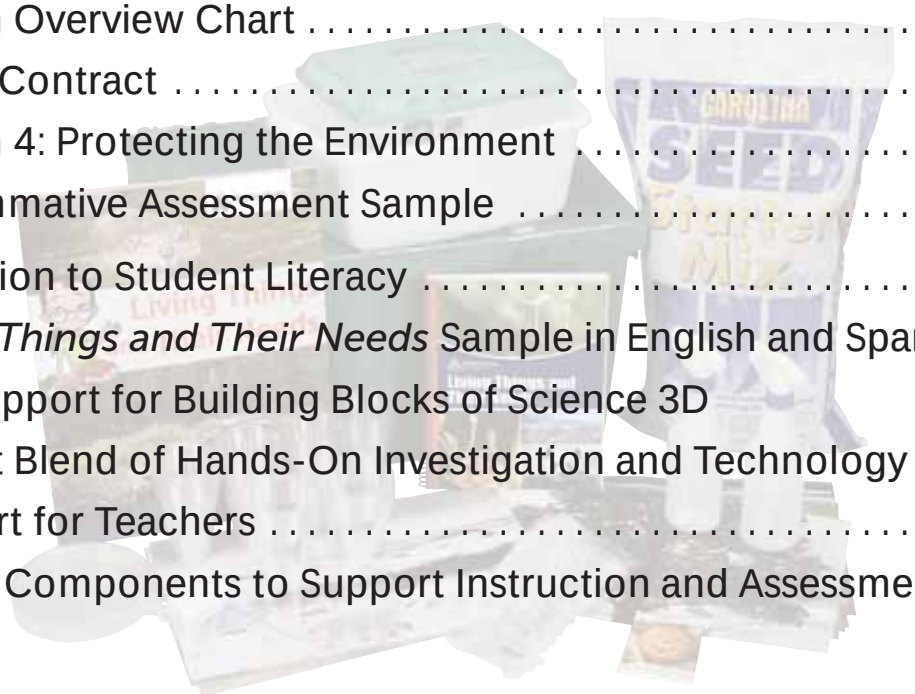


Living Things and Their Needs

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
Environment Photo Card Set	1			■	■
Hand lens	12	■			
Large choice chamber	4		■		
Large container	1	■			
Literacy Reader: *Living Things and Their Needs* Big Book	1		■	■	■
Live Coupon for bessbugs and rotting wood	1	■			
Living and Nonliving Things Photo Card Set	1	■			
Plastic cup, 9 oz	28	■			
Pumpkin seed	28	■			
Soil		■	■		
Spray bottle	2	■	■		
Terrarium with lid	1	■	■	■	■
Wide-mouth plastic cup, 9 oz	12	■			

Needed But Not Supplied Materials

Material	Quantity Needed	Lesson 1	Lesson 2	Lesson 3	Lesson 4
Area with plenty of sunshine or a grow light	1	■			
Chart paper or whiteboard		■	■	■	■
Crayons		■	■	■	■
Large sheet of drawing paper	24				■
Large spoon	1	■			
Marker		■	■	■	■
Paper clip	72–120		■	■	■
Roll of masking tape	1	■	■	■	
Sand	2 T		■		
Science notebook	24	■	■	■	■
Sheet of black construction paper, 11 x 17 in (or 8.5 x 11 in)	2 (or 4)		■		
Sheet of white paper	4		■		
Slice of apple	1		■		
Stapler	1		■		■
Water		■	■		

Unit Overview: *Living Things and Their Needs*

Our world includes living and nonliving things that interact in their environments. Every living thing has needs that it must meet if it is to live and grow. *Living Things and Their Needs* provides hands-on, inquiry-based investigations focused on phenomena that support ideas related to the preferred living habits of living things. Through a series of four lessons, students identify living and nonliving things, their needs, and the ways that living things can change their environment.

To begin, students identify living and nonliving things. They begin to focus on two types of living thing by planting pumpkin seeds and making predictions about their growth and by examining bessbugs in a classroom habitat. By studying these two organisms, students come to understand what living things need to survive.

Students collect data about the development of their pumpkin plants by measuring their height and counting the number of leaves each day. Pumpkin plants are grown in different conditions (i.e., without soil, without sunlight, and without water), and students compare how these plants grow to how a control plant develops. To explore preferences, students set up choice chambers for the bessbugs, observe their behaviors, and draw conclusions about the habitats that bessbugs prefer.

"Environment" is defined as the living and nonliving things in a certain area. Students examine different environments using photo cards and think about the ways that living things can change their environment. A nature walk encourages students to make connections between what they are learning about and their local environment; students observe the ways living things have affected the local environment. Human impact becomes a focus as students consider the positive and negative ways that humans change the environment. Working in pairs, students develop a solution to help protect the environment and share their idea with the class.

Credit: realcut/Shutterstock.com

Next Generation Science Standards

The Building Blocks of Science unit *Living Things and Their Needs* integrates process skills as defined by the Next Generation Science Standards (NGSS).

Performance Expectations

- **K-LS1-1:** Use observations to describe patterns of what plants and animals (including humans) need to survive.
- **K-ESS2-2:** Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
- **K-ESS3-1:** Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
- **K-ESS3-3:** Communicate solutions that will reduce the impact of humans on the land, water, air, and/or living things in the local environment.
- **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Disciplinary Core Ideas

- **LS1.C:** Organization for Matter and Energy Flow in Organisms
- **ESS2.E:** Biogeology
- **ESS3.A:** Natural Resources
- **ESS3.C:** Human Impacts on Earth Systems
- **ETS1.B:** Developing Possible Solutions

Science and Engineering Practices

- Developing and Using Models
- Analyzing and Interpreting Data
- Using Mathematics and Computational Thinking
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information

Crosscutting Concept

- Patterns
- Cause and Effect
- Systems and System Models

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.

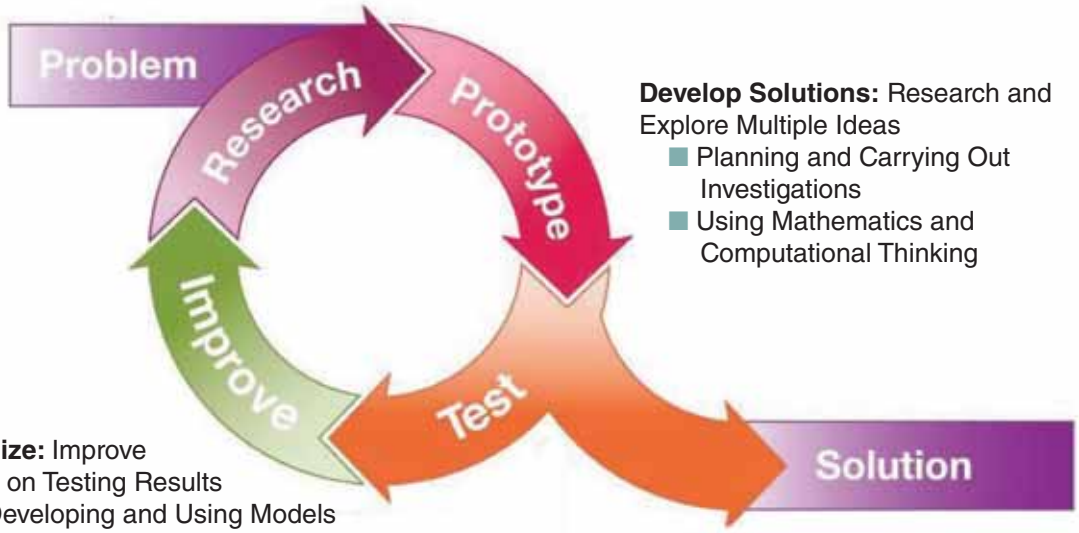
Through scientific engineering and design, students apply what they have learned to creatively solve real-world problems. This 21st-century skill encourages students to collaborate and exposes them to the idea that one problem can have multiple solutions.

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 create a model, develop an experiment, or redesign 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

Phenomenon

NGSS Standard and 5E Alignment

Investigation Overview with Time Considerations

Vocabulary

Tell Me More Formative Assessment Questions

Teacher Tips and Differentiation Strategies

LESSON 3

Push, Pull, Tumble

LESSON ESSENTIALS

Performance Expectations
- K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
- K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Disciplinary Core Ideas
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- ETS1.B: Developing Possible Solutions

Science and Engineering Practice
- Planning and Carrying Out Investigations

Crosscutting Concept
- Cause and Effect

Literacy Components
- *Push, Pull, Go* Big Book pgs. 6, 11–14
- Literacy Article 3A: Falling Tree

Digital Component[1]
- Simulation: Dominoes

[1]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: You wait to go down the slide. It's finally your turn. You slide down fast! Oh, no! Your friends are standing at the bottom of the slide. You can't stop sliding. You slide into one friend. He starts to fall. He falls into another friend. She falls over. It is important to look before you slide! What does this make you wonder?

Anticipated Questions:
- Why can't you stop sliding?
- Why does your friend fall over?
- Why does your friend knock another person over

LESSON OVERVIEW

In the previous lessons, students built their knowledge of fo
by rolling balls and observing swinging. They learned that c
applied to a system will change how the system moves. In t
begin to understand that the motion of an object is also affe
Students learn about systems and use what they learn to e
of falling dominoes. In the next lesson, students will extend
systems to explore the spinning motion of a toy top. They w
pulling force of gravity and its effect on motion.

INVESTIGATION OVERVIEW

Investigation A: How Can I Make Dominoes Tumble?
Using dominoes, students explore the motion of tumbling and further investigate forces.
- **Teacher Preparation:** 10 minutes
- **Lesson:** 30 minutes

Investigation
System?
Students further
manipulating the
dominoes.
- **Teacher Prep**
- **Lesson:** 30 m

Cred

64 PUSH, PULL, GO

LESSON 3

MATERIALS
- **Student**
  1 Science notebook*
  1 Student Investigation Sheet 3B: *How Do Dominoes Move After a Push?*
- **Team of two students**
  8 Dominoes
- **Teacher**
  1 Student Investigation Sheet 3B: *How Do Dominoes Move After a Push?* (Teacher's Version)
  Assessment Observation Sheet: Lesson 3

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

*These materials are needed but not supplied.

OBJECTIVES
- Demonstrate that a force is any push or pull.
- Investigate and demonstrate that force causes an object to start moving, stop moving, or change direction.
- Predict and explore what happens if a component of a system in motion is missing or not working properly.
- Build on the understanding that position and motion can be changed by pushing and pulling objects.
- Gather evidence that it takes a push or pull to change the motion of objects.
- Build an understanding that objects move in different patterns (e.g., straight line, zigzag, curved line).

VOCABULARY
- Force
- Gravity
- Motion

TEACHER PREPARATION

Investigation A

1. Make a copy of Assessment Observation Sheet: Lesson 3 for yourself. During the investigations in this lesson, use the questions and prompts on this sheet to formatively assess students as they work.

2. Find an online video that shows large, complex domino setups. It will be helpful if the video uses dominoes similar to the ones students will use in the investigation.

3. Have eight dominoes from the kit available for each team of two students.

Investigation B

1. Have one copy of Student Investigation Sheet 3B: *How Do Dominoes Move After a Push?* for each student.

2. Have eight dominoes from the kit available for each team of two students.

3. Have your Assessment Observation Sheet handy to continue formatively assessing students.

Figure 3.1:

LESSON 3

Investigation B

WHAT IS A SYSTEM?

MATERIALS
- **Student**
  1 Science notebook*
  1 Student Investigation Sheet 3B: *How Do Dominoes Move After a Push?*
- **Team of two students**
  8 Dominoes
- **Teacher**
  1 Student Investigation Sheet 3B: *How Do Dominoes Move After a Push?* (Teacher's Version)
  Assessment Observation Sheet: Lesson 3

*These materials are needed but not supplied.

1. Review the term "system" with students by referencing the swing or the ramp and ball. Ask students to make connections to the dominoes. Ask:
- What are the parts of this system? *(Eight dominoes)*
- What force causes changes in this system? *(A push)*
- What changes occur? *(A force causes the dominoes to tumble over.)*
- Do you think the system still work if you take away one part of it? Make a prediction.

2. Instruct students to use their dominoes to test their predictions. Allow time for pairs to set up their dominoes and then test what will happen if one domino is removed from the middle of the system. Assist students who appear to be struggling. When all students have tested their predictions, ask:
- What happens to the motion in the system when pieces are removed? How do you know?
- What do you think would happen if you removed two dominoes? Make a prediction and try it.
- How does changing a system affect the way it moves?

3. Provide each student with a copy of Student Investigation Sheet 3B: *How Do Dominoes Move After a Push?* Allow time for students to draw what happens to the line of dominoes and to complete the sentence prompts. Answer any questions students have as they work.

How can you change how fast something tumbles?

Tell Me More!

Disciplinary Core Ideas
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- ETS1.B: Developing Possible Solutions

Science and Engineering Practice
- Planning and Carrying Out Investigations

Crosscutting Concept
- Cause and Effect

5Es
- Elaborate

Teaching Tip

Depending on the setup, some students' dominoes may continue to fall if they are very close together. If students appear to struggle with this concept, you may wish to lead a demonstration. Show what happens when you remove one of the middle dominoes, when you remove two dominoes that are side by side, and when you remove two dominoes from different locations.

LESSON 3 ■ PUSH, PULL, TUMBLE 69

Extensions

LESSON 3

EXTENSIONS | ASSESSMENT STRATEGIES

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.

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 Articles

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: Patryc

Take-Home Science Activities

Student Investigation Sheet 3B: How Do Dominoes

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!

GO EXPLORING!

Credit: Cathy Keifer /Shutterstock

© Carolina Biological Supply Company

Lesson 5 Take-Home Science Letter

Every unit anchored in phenomena

Living Things and Their Needs

Unit Overview

Our world includes living and nonliving things that interact in their environments. Every living thing has needs that it must meet if it is to live and grow. *Living Things and Their Needs* provides hands-on, inquiry-based investigations focused on phenomena that support ideas related to the preferred living habits of living things. Through a series of four lessons, students identify living and nonliving things, their needs, and the ways that living things can change their environment.

Unit Anchoring Phenomenon

All living things have similar needs for survival, including access to water, food, shelter, and air. When asked what a "need" is, students may list wants, or luxuries. Through this unit's explorations, students begin to understand that a need is a requirement for successful growth and survival. The anchoring phenomenon for *Living Things and Their Needs* is recognizing the needs of living things and their behaviors to obtain them.

	LESSON 1	LESSON 2
INVESTIGATIVE PHENOMENA	There are many plants in Penelope's garden. There are also rocks and soil. Some of the plants have bright flowers. Bees and butterflies sit on the bright flowers. Penelope plants seeds in the garden. She digs a hole in the soil. She puts the seeds in the hole. Penelope worries that rabbits will find the seeds. What does this make you wonder?	A few days after Penelope plants the seeds, there are more plants in her garden. The seeds have sprouted from the ground. Some of the plants in the garden have flowers. Some of the plants have tomatoes. All the plants have leaves. The plants in the shade are small. The plants in the Sun are big. A rabbit finds the garden. The rabbit eats a tomato. The rabbit eats the leaves of a plant. The rabbit prefers to eat the leaves. What does this make you wonder?
OBJECTIVES	■ Identify living and nonliving things. ■ Make observations and describe the patterns of living things. ■ Plant a pumpkin seed, and make predictions about what plants need to grow. ■ Observe bessbugs and describe their habitat.	■ Observe and identify the needs of living things. ■ Make predictions about the growth of plants in different conditions. ■ Determine the habitat preferences of bessbugs. ■ Monitor and collect data about plants.
SCAFFOLDING Students should know:	↓ Our world includes living and nonliving things. ↓ Examples of living things include plants and animals; humans are animals. ↓ Living things do similar things, like grow and eat, and need similar things, like air and water. ↓ A seed will grow into a plant. ↓ A habitat is a home for a living thing. ↓ Bessbugs are animals, specifically insects, that live in wet habitats.	↓ A prediction is a good guess about something. ↓ A seed without water, sunlight, or soil may not grow successfully. ↓ A preference is what you like. ↓ All living things have preferences for things, such as their habitat and the food they eat. ↓ Data is information or observations used to describe something, such as the height of a plant. ↓ Plants that have access to sunlight, soil, and water tend to be larger than plants that do not have access to those resources.

Concepts build from one lesson to the next

	LESSON 3	LESSON 4
	It is cloudy. It starts to rain. Penelope's garden becomes very wet. Penelope does not see any rabbits, bees, or butterflies. The rain stops. The Sun comes out. The rabbits drink from puddles nearby. Penelope checks her garden. The plants have grown bigger. One plant starts to grow between two rocks. A caterpillar eats the leaves on the plant. What does this make you wonder?	Penelope's garden is very big. It is full of plants. There are flowers. There are tomatoes. There are peppers. Penelope picks the plants from the soil. She sells the flowers, tomatoes, and peppers at the market. The rabbits, bees, caterpillars, and butterflies leave to find another garden. What does this make you wonder?
	■ Describe the needs of living things and explain how the environment provides them. ■ Observe different environments and identify the relationships among plants, animals, and their surroundings. ■ Use evidence and observations to draw a model of how a plant or an animal interacts with its environment. ■ Monitor and collect data about plants.	■ Monitor and collect data about plants to draw conclusions about their growth. ■ Review the needs of living things and how living things change the environment. ■ Discuss ways that humans impact their local environment. ■ Design solutions to reduce human impact on the local environment.
	↓ An environment is the living and nonliving things in a specific area. ↓ Living things can change their environment. ↓ The actions of living things can have beneficial or detrimental effects on the environment. ↓ Seeds will become plants, which increase in height and grow more leaves as they develop. ↓ Plants thrive when they have access to light, soil, and water.	↓ Plants and animals are living things. ↓ Living things have preferences for their habitat and may be able to change their environment. ↓ All living things grow, need energy, can reproduce, and respond to their environment. ↓ Plants continue to become taller or grow more leaves if they are provided with water, sunlight, and soil. ↓ Humans impact their environment in good and bad ways. ↓ By making good choices, humans can protect the environment instead of harm it.

NOTES

Lesson 4: Protecting the Environment

NGSS correlations by lesson

Investigation Overview

Investigation A: What Do Living Things Need?
5Es: Explain, Elaborate
Students review the needs of living things.
- **Teacher Preparation:** 10 minutes
- **Lesson:** 30 minutes

Tell Me More! What do you need to live? Write or draw a picture.

Investigation B: How Big Did My Plant Grow?
5Es: Explain, Elaborate, Evaluate
Students measure the height of and count the number of leaves on their pumpkin plants to make conclusions about how plants grow.
- **Teacher Preparation:** 10 minutes
- **Lesson:** 30 minutes

Tell Me More! What does a plant need to grow well?

Investigation C: How Do Humans Impact the Environment?
5Es: Explain, Elaborate
Students think about how humans can change the environment in negative and positive ways.
- **Teacher Preparation:** 15 minutes
- **Lesson:** 30 minutes

Investigation D: Can I Design a Solution to Protect the Environment?
5Es: Explain, Elaborate, Evaluate
Students develop a solution to protect their local environment and share it with the class.
- **Teacher Preparation:** 10 minutes
- **Lesson:** 30 minutes

Summative Assessment

30-minute investigations fit into your busy day

Standards

Next Generation Science Standards Performance Expectations
- **K-ESS3-3:** Communicate solutions that will reduce the impact of humans on the land, water, air, and/or living things in the local environment.
- **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Disciplinary Core Ideas
- **LS1.C:** Organization for Matter and Energy Flow in Organisms
- **ESS2.E:** Biogeology
- **ESS3.A:** Natural Resources
- **ESS3.C:** Human Impacts on Earth Systems
- **ETS1.B:** Developing Possible Solutions

Science and Engineering Practices
- Developing and Using Models
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts
- Patterns
- Cause and Effect
- Systems and System Models

Language and Math Standards
Language Arts
- **SL.K.2:** Comprehension and Collaboration
- **SL.K.5:** Presentation of Knowledge and Ideas
- **W.K.2:** Text Type and Purposes
- **W.K.8:** Research to Build and Present Knowledge

Math
- **K.MD.A.2:** Describe and compare measurable attributes.

Integrated ELA and math

Resources

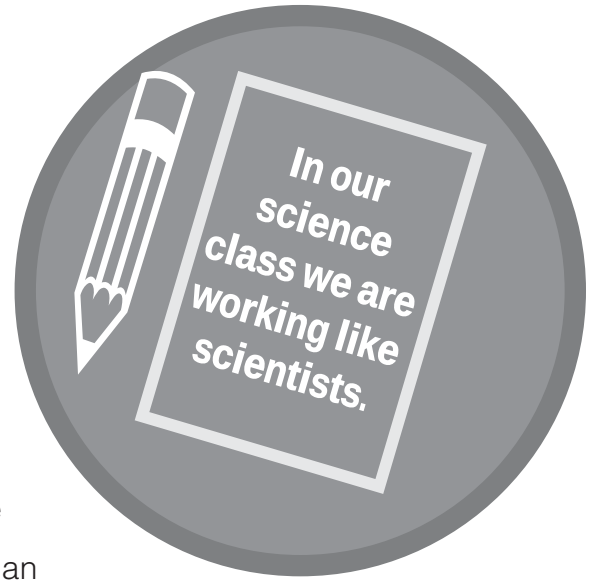
Student Investigation Sheets
- Plant Data Sheet
- Summative Assessment

Literacy Components
- *Living Things and Their Needs* Big Book, pgs. 13–14

Digital Components
- Interactive Whiteboard: Bessbug and Pumpkin Plant Environments
- Interactive Whiteboard: How Do We Change the Environment?
- Interactive Whiteboard: What Do All Living Things Do? (from Lesson 1)
- Simulation: Pollution

Vocabulary
- Solution

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

Protecting the Environment

LESSON ESSENTIALS

Performance Expectations
- **K-ESS3-3:** Communicate solutions that will reduce the impact of humans on the land, water, air, and/or living things in the local environment.
- **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Disciplinary Core Ideas
- **LS1.C:** Organization for Matter and Energy Flow in Organisms
- **ESS2.E:** Biogeology
- **ESS3.A:** Natural Resources
- **ESS3.C:** Human Impacts on Earth Systems
- **ETS1.B:** Developing Possible Solutions

Science and Engineering Practices
- Developing and Using Models
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts
- Patterns
- Cause and Effect
- Systems and System Models

Literacy Components
- *Living Things and Their Needs* Big Book, pgs. 13–14

Digital Components‡
- **Interactive Whiteboard:** Bessbug and Pumpkin Plant Environments
- **Interactive Whiteboard:** How Do We Change the Environment?
- **Interactive Whiteboard:** What Do All Living Things Do? (from Lesson 1)
- **Simulation:** Pollution

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 to support the unit's anchoring phenomenon.

Investigative Phenomenon for Lesson 4: Penelope's garden is very big. It is full of plants. There are flowers. There are tomatoes. There are peppers. Penelope picks the plants from the soil. She sells the flowers, tomatoes, and peppers at the market. The rabbits, bees, caterpillars, and butterflies leave to find another garden. What does this make you wonder?

Anticipated Questions:
- Why did the animals leave to find another garden?
- Will the plants grow back?

LESSON OVERVIEW

During this unit, students have explored living things, their needs, and how living things impact the environment to meet their needs. Using bessbugs and pumpkin plants as model organisms, students have learned that all living things grow and survive when they have access to all the things they need; however, a living thing can change its environment while trying to meet its needs. In this final lesson, students review what they've learned throughout the unit. They revisit and revise their responses to the two questions they were asked in Lesson 1: "What do all living things do?" and "What do living things need to live?" Students relate this understanding to their pumpkin plants and analyze the data they have collected about their plants to draw conclusions about how the plants have grown throughout the unit. Students also consider how humans change their local environment and how those changes can be both positive and negative. Students work in pairs to develop solutions that might help reduce the impact of humans on their local environment. They make posters to communicate these solutions to their classmates.

OBJECTIVES
- Monitor and collect data about plants to draw conclusions about their growth.
- Review the needs of living things and how living things change the environment.
- Discuss ways that humans impact their local environment.
- Design solutions to reduce human impact on the local environment.

VOCABULARY
- Solution

Credit: Sunny studio/Shutterstock.com

INVESTIGATION OVERVIEW

Investigation A: What Do Living Things Need?
Students review the needs of living things.
- **Teacher Preparation:** 10 minutes
- **Lesson:** 30 minutes

Investigation B: How Big Did My Plant Grow?
Students measure the height of and count the number of leaves on their pumpkin plants to make conclusions about how plants grow.
- **Teacher Preparation:** 10 minutes
- **Lesson:** 30 minutes

Investigation C: How Do Humans Impact the Environment?
Students think about how humans can change the environment in negative and positive ways.
- **Teacher Preparation:** 15 minutes
- **Lesson:** 45 minutes

Investigation D: Can I Design a Solution to Protect the Environment?
Students develop a solution to protect their local environment and share it with the class.
- **Teacher Preparation:** 10 minutes
- **Lesson:** 30 minutes

MATERIALS

Student
1 Science notebook*
1 Plant Data Sheet
Completed copies of Plant Journal Sheet
Completed copies of Plant Data Sheet
1 Summative Assessment
3–5 Paper clips*

Team of two students
2 Large sheets of drawing paper*
Crayons*

Teacher
1 Summative Assessment Answer Key
1 Environment Photo Card Set
1 Pumpkin plant
1 Stapler*
Bessbug habitat
Chart paper or whiteboard*
Markers*
"What Do All Living Things Do?" class chart* (from Lesson 1)
"What Do All Living Things Need to Live?" class chart* (from Lesson 1)

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

*These materials are needed but not supplied.

TEACHER PREPARATION

Investigation A

1. Using two sheets of chart paper or a whiteboard, create two T-charts. Title one chart "Bessbug Environment." Beneath the title, set up a T-chart that includes one column for "Living Things" and one column for "Nonliving Things." Title the second chart "Pumpkin Plant Environment." Beneath the title, set up a T-chart that includes one column for "Living Things" and another column for "Nonliving Things." Alternatively, use Interactive Whiteboard: Bessbug and Pumpkin Plant Environments.

2. Have the "What Do All Living Things Do?" and "What Do All Living Things Need to Live?" class charts from Lesson 1 posted where all students can see them. You may want

to have an extra sheet of chart paper on hand in case students have a lot of revisions.

3. Have available the control plant from the growing experiments and the bessbug habitat.

Investigation B

1. Make one copy of the Plant Data Sheet for each student.

2. Have each student's completed copies of the Plant Journal Sheet and the Plant Data Sheet from throughout the unit available to pass back to students.

3. Obtain three to five paper clips for each student. These can be reused from Lesson 3.

4. Students will need crayons. If students can't provide their own, make some crayons available for the class to share.

5. Have a stapler on hand.

Investigation C

1. The Environment Photo Card Set should still be hung up around the room. If not, repost the cards at this time. Students will review all the cards briefly but will discuss Cards 7 and 8 in greater depth.

2. Write "How Do We Change the Environment?" on a sheet of chart paper or on the board. Alternatively, use Interactive Whiteboard: How Do We Change the Environment?

3. Have available a large sheet of drawing paper for each pair of students.

4. Each pair of students will need crayons. If students can't provide their own, make crayons available for the class to share.

Investigation D

1. Have available a large sheet of drawing paper for each pair of students.

2. Each pair of students will need crayons. If students can't provide their own, make crayons available for the class to share.

3. For each student, make a copy of the summative assessment.

Just-in-time background information

BACKGROUND INFORMATION

All living things make changes to their environment. Humans make conspicuous changes to our environments—changes as slight as wearing down a path in the woods to make a trail or as large as clear-cutting a forest in the Amazon. Depending on the point of view, these changes can be considered helpful or harmful.

After students take final measurements of their pumpkin plants and review the needs of living things for survival, they are asked to think about and discuss different ways that humans change their local environment. The class works together to make a list of changes, and then pairs of students select one environmental change from the class list. They will work together to determine a **solution** for reducing the impact this activity has on the surrounding area.

NOTES

Investigation A

3-dimensional learning

WHAT DO LIVING THINGS NEED?

MATERIALS

■ **Student**
1 Science notebook*
■ **Teacher**
Bessbug habitat
Chart paper or whiteboard*
Markers*
"What Do All Living Things Do?" class chart* (from Lesson 1)
"What Do All Living Things Need to Live?" class chart* (from Lesson 1)
*These materials are needed but not supplied.

1. Display the control pumpkin plant and the bessbug habitat for the class. Ask:

- What is an environment? *(An environment is the living and nonliving things in a certain area.)*
- Describe your environment. *(Answers will vary based on your region.)*
- Where do you find plants in your environment? *(Answers will vary based on your region.)*
- Where do you find insects in your environment? *(Answers will vary based on your region.)*

2. Display the "Bessbug Environment" T-chart you prepared. Instruct students to look carefully at the bessbug habitat and to identify the living and nonliving things in this environment. Record their responses in the appropriate columns of the T-chart.

3. Post the "Pumpkin Plant Environment" T-chart you prepared. Instruct students to look carefully at the pumpkin plant and to identify the living and nonliving things in its environment. Record their responses in the appropriate columns of the T-chart.

4. Facilitate a class discussion to confirm that pumpkin plants and bessbugs are living things. Ask:

- What have you observed that indicates that your pumpkin plant is a living thing? *(Students should realize that they have observed all four defining characteristics of living things: they measured the growth of their plants over time; the plants used energy from the Sun to grow from a seed; their plants will eventually produce seeds that can grow into new plants; and their plants responded to changes in their environment, as demonstrated by the experiments in which they varied the plants' growing conditions.)*

Disciplinary Core Ideas
- **LS1.C:** Organization for Matter and Energy Flow in Organisms
- **ESS2.E:** Biogeology
- **ESS3.A:** Natural Resources

Science and Engineering Practices
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence

Crosscutting Concepts
- Patterns
- Cause and Effect

5Es
- Explain
- Elaborate

Digital Components
- **Interactive Whiteboard:** What Do All Living Things Do? (from Lesson 1)
- **Interactive Whiteboard:** Bessbug and Pumpkin Plant Environments

Teaching Tip

Explain to students that the rotting wood in the bessbug habitat is not alive but that it was once part of a living tree. Relate this to leaves on the ground during fall.

Tips for teaching in every lesson

ELA connection W.K.8

- What have you observed that indicates that the bessbugs are living things? *(While students likely did not observe bessbug reproduction, they likely will note that they have observed that the bugs ate the wood in the tank and that this provided energy for the bugs to move and grow, and that the bessbugs responded to changes in the environment when they were placed in the choice chambers in Lesson 2.)*
- Do bessbugs change their environment? *(Students should point out some changes they observed in the bessbug habitat during the unit—for example, the dirt is moved around or there was evidence that the bugs ate the wood in the terrarium. Explain that bessbugs in the wild change their environment in similar ways.)*
- Do pumpkin plants change their environment? *(Students should recognize that pumpkin plants will eventually grow and change the appearance of their environment. Their roots, stem, and leaves will take up space. These plants act as a food source for other animals, which is beneficial to the environment.)*

5. Direct students' attention to the class charts from Lesson 1: "What Do All Living Things Do?" and "What Do All Living Things Need to Live?" As a class, review students' initial ideas from the charts. Ask:

- Think about what you have learned during this unit. How would you change this chart? *(Answers will vary. Cross out and add to these charts as needed.)*

As the class revises the charts, guide students to the understanding that all living things:

- Grow
- Need energy
- Can produce other living things of their own kind
- Respond to their environment

ELA connection W.K.8

Circle these needs on the charts. If there is not room on the original charts, list these needs of living things on a separate sheet of chart paper or on the board.

Tell Me More!

What do you need to live? Write or draw a picture.

Formative assessment

Investigation B

HOW BIG DID MY PLANT GROW?

MATERIALS

■ **Student**
1 Plant Data Sheet
Completed copies of Plant Journal Sheet
Completed copies of Plant Data Sheet
3–5 Paper clips*

■ **Teacher**
1 Pumpkin plant
1 Stapler*
Bessbug habitat
Chart paper or whiteboard*
Markers*
"What Do All Living Things Do?" class chart* (from Lesson 1)
"What Do All Living Things Need to Live?" class chart* (from Lesson 1)

*These materials are needed but not supplied.

1. Ask students to think about how their pumpkin plants have changed since they planted the pumpkin seeds at the start of the unit. Encourage students to share their observations about how their plant has grown and to make predictions about the continued growth of their plant. For example, you may ask students what structures the plant will eventually grow (pumpkins, or fruits).

2. Tell students that this is the last time they will observe their pumpkin plant and record information to describe its growth. Remind students that they will collect data on their plant's height and the number of leaves it has.

3. Distribute a Plant Data Sheet, a few paper clips, and their pumpkin plant to each student. Have crayons available. Allow time for students to collect and record their data, and assist them as needed. If students need to be reminded how to measure their plant's height, demonstrate how they previously used paper clips to do so. Remind them that they may have to describe the height using more than one paper clip or portions of a paper clip.

4. Once all students have finished recording data on the Plant Data Sheet, facilitate a class discussion about the growth of the pumpkin plants. Ask:

- What patterns did you notice as your plant grew? *(Answers will vary. Students should recognize that their plants grew taller and grew more leaves.)*
- What did your plant use to grow? *(Sunlight, soil, water)*
- What do you think would happen if you didn't provide those things to the plant? *(Students should realize that their plants would not grow as well if they did not have access to all the resources.)*

Disciplinary Core Ideas
- **LS1.C:** Organization for Matter and Energy Flow in Organisms
- **ESS3.A:** Natural Resources

Science and Engineering Practices
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence

Crosscutting Concept
- Patterns

5Es
- Explain
- Elaborate
- Evaluate

Teaching Tip

Display the four experimental plants. Compare the growth of each plant, and challenge students to think about which needs are most important to the plant.

Math connection K.MD.A.2

Teaching Tip

You will no longer need any of the pumpkin plants. You may want to have students display their plants and Pumpkin Plant Growth Journals in the classroom or another area of the school. Alternatively, allow students to take their plants home and continue their observations.

5. Poll the class to see whose pumpkin plant grew the tallest and whose plant had the most leaves. Have students report their pumpkin plant's height in units of paper clips. As a class, discuss why some plants grew taller than others. Guide students to think about where the plant was stored, how often it was watered, and the amount of soil it was planted in.

6. Provide each student with all of his or her completed copies of the Plant Journal and Plant Data Sheets. Ask students to put the sheets in order from their first observation to their last. Staple each student's sheets together to create a complete Pumpkin Plant Growth Journal.

Tell Me More!

What does a plant need to grow well? ?

ELA connection SL.K.2

Investigation C

HOW DO HUMANS IMPACT THE ENVIRONMENT?

Disciplinary Core Idea
- **ESS3.C:** Human Impacts on Earth Systems

Science and Engineering Practices
- Developing and Using Models
- Engaging in Argument from Evidence

Crosscutting Concepts
- Cause and Effect
- Systems and System Models

5Es
- Explain
- Elaborate

Literacy Component
- *Living Things and Their Needs* Big Book, pgs. 13–14

Digital Components
- **Interactive Whiteboard:** How Do We Change the Environment?
- **Simulation:** Pollution

MATERIALS

- **Student**
  1 Science notebook*
- **Team of two students**
  1 Large sheet of drawing paper*
  Crayons*
- **Teacher**
  1 Environment Photo Card Set
  Chart paper or whiteboard*
  Markers*

*These materials are needed but not supplied.

1. Direct students' attention to the Environment Photo Cards that are hanging up around the room, and ask them to recall the nature walk they took. Ask:

- What are some ways you have observed living things making changes to their environment? *(Accept answers that cite observations from the nature walk or the pictures in the Environment Photo Card Set.)*
- How do you interact with the environment? What do you use in the environment? *(Answers will vary. Students may explain that they drink water and eat plants and animals for food.)*

Digital Tip

Introduce pollution using the Pollution simulation. Challenge students to identify examples of pollution in the animation.

Digital integration

2. Direct students' attention to Environment Card 7 and Card 8. Ask:

- What changes did humans make to each of these environments? *(For Card 7, students should identify that the boy is digging in the ground and may be planting a seed. For Card 8, students should identify that humans are changing the land by cutting down and clearing away trees.)*

- How might the environment in each of these pictures be different if humans had not made changes to the environment? *(For Card 7, students might suggest that there would be different plants or no plants growing in the soil. For Card 8, students should identify that trees would cover the entire area if humans hadn't cut them down.)*

3. Ask students to think about and describe some ways that humans can change their local environment. Record their answers in the "How Do We Change the Environment?" chart. Students may suggest some of the following:

- Building buildings
- Making parking lots
- Clearing land
- Planting a garden
- Littering
- Air pollution from vehicles
- Water pollution from boats
- Litter contaminating waterways
- Moving or killing animals in an area

4. Prompt students to think about whether changes to the environment are good, bad, or both. Ask students the following questions about the changes the class listed. Students' responses will vary based on the changes on the class list, but guide them to understand that the changes humans make to their environment can often be both good and bad.

- Are these changes good, bad, or both?
- Do these changes last for a long time?
- Do these changes affect water, food, or shelter for living things?
- Do these changes help living things? Do they harm living things?

5. Divide the class into pairs, and provide each pair with a large sheet of drawing paper and crayons.

6. Tell students that they will work with their partner to draw a picture of one thing humans do to change their environment in a negative, or bad, way. Direct pairs to agree on one example from the class list to illustrate.

7. Give students ample time to make their illustrations. Collect them when each pair finishes.

Connect to phenomena

Identify Phenomena

Help students make connections to human impact by citing examples from your nature walk or things students may have seen in your local environment.

Differentiation

Differentiation Strategy

You may wish to use different colors to mark the good and bad changes on the chart.

ELA connection SL.K.5

ELA connection SL.K.5

Disciplinary Core Ideas
- **ESS3.C:** Human Impacts on Earth Systems
- **ETS1.B:** Developing Possible Solutions

Science and Engineering Practices
- Developing and Using Models
- Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts
- Cause and Effect
- Systems and System Models

5Es
- Explain
- Elaborate
- Evaluate

Identify Phenomena

If your school has a recycling program, discuss the process of recycling and the benefits it has on the environment. Encourage students to practice recycling in their own homes.

Teaching Tip

Display students' drawings in the classroom or the hallway.

Investigation D

CAN I DESIGN A SOLUTION TO PROTECT THE ENVIRONMENT?

MATERIALS

- **Student**

1 Science notebook*
1 Summative Assessment

- **Team of two students**

1 Large sheet of drawing paper*
Crayons*

- **Teacher**

1 Summative Assessment Answer Key
1 Environment Photo Card Set
Chart paper or whiteboard*
Markers*

*These materials are needed but not supplied.

1. Instruct students to divide into their pairs from Investigation C. Return each pair's drawing of a negative human impact.

2. Ask students to look at their drawing and think about how their drawing would be different if there were less of the human activity they represented in the drawing. Allow time for students to brainstorm with their partner.

3. Ask students to share their ideas about how their drawing would be different. Ask students to think about how humans can change their behavior to benefit, or protect, the environment. Explain that students will develop a solution to protect the environment. If students appear to struggle with this idea, prompt them with the following questions:

- What things do people do that harm the environment?
- What can people do to help other living things?
- What things can people stop doing to prevent, or stop, harm to the environment?

4. Provide each pair of students with crayons and a second sheet of drawing paper, and ask them to illustrate a solution to the problem they illustrated in their first drawing. Give pairs ample time to complete their illustrations.

5. Allow time for each pair to share their drawing and explain their solution to the class. After all pairs have presented, ask the following questions to prompt a discussion about human impact:

- How do humans hurt the environment? *(Answers will vary. Examples include eating plants and animals, clearing away land, and littering.)*
- How do humans help the environment? *(Answers will vary. Examples include planting a garden, feeding animals, and growing trees.)*

- Why do humans need the environment? *(The environment provides resources such as food, water, and materials we can use to build shelter.)*
- What changes can humans make to protect the environment? *(Answers will vary based on students' drawings.)*

6. Distribute a copy of the summative assessment to each student. Allow ample time for students to answer the questions individually. Collect the assessments and use them to evaluate students' understanding of key unit concepts.

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: recognizing the needs of living things and their behaviors to obtain them. By the end of the lesson, students should be able to explain that:

- Humans can impact their environment in positive ways. Planting a garden will help the environment by providing food for people and animals.
- Humans can impact their environment in negative ways. By removing the plants, Penelope removed food and shelter for the bees, caterpillars, rabbits, and butterflies.
- Penelope can protect the environment by planting another garden for the animals to use.

Connecting ideas about phenomena to evidence

NOTES

ENVIRONMENTAL CONNECTION

Credit: NPeter/Shutterstock.com

Given the implications for the future, it is vital that students are aware of the interactions between natural systems and human activity. This lesson incorporates several environmental principles and concepts that are important for students to recognize. Investigations C and D focus on the environment and human impact. The exchange between living things and the environment has been a long-existing, important part of our world. Students develop an understanding that humans rely on their environment because it provides the things they need to live and grow. They also explore how humans can change the environment in beneficial and detrimental ways. Students consider how they can change their behaviors to better protect the environment.

Connecting investigations to environmental principles and concepts

EXTENSIONS

Environmental Speaker
Invite a speaker to class who deals with environmental issues, such as an environmental engineer, landscaper, local health department inspector, or environmental scientist. Ask them to talk with students about their job, what they do, and how they determine solutions that reduce the impact of humans on the local environment.

We're Going to the Zoo!
Take the class to a local zoo. As you visit different animal habitats, ask students to identify the living and nonliving parts of each animal's environment. Discuss where these animals would be found around the world (this information is usually posted near each habitat). Discuss how the environments of the animals in the zoo exhibits might be similar to and different from their natural environment.

Look What My Plant Made
Challenge students to take their pumpkin plants home and have their families help them transplant them to a larger container or to an outdoor garden. Ask students to bring in pictures of their plant as it grows and produces pumpkins.

The Lorax
Read the Dr. Seuss classic *The Lorax* aloud to the class. As you read, ask students to identify what changes are made to the environment, who makes the changes, what effect those changes have on the living things in the environment, and what solution they might have to reduce the impact of those changes.

NOTES

ASSESSMENT STRATEGIES

Formative assessment

1. Investigation A

- Review the charts "What Do Living Things Need?" and "What do Living Things Do?" Check that students demonstrate a deeper understanding of living things and their needs compared to Lesson 1.
- Use students' responses to the Tell Me More question to assess their understanding of what humans need to live. Look for answers that include food, water, and shelter rather than material objects.

2. Investigation B

- Use students' responses to the Tell Me More question to determine if they understand what plants need to grow well. Students should write or draw a light source, water, and soil.

3. Investigation C

- Use students' drawings to assess their understanding of the effects of human impact. Provide additional review for students who appear to struggle with recognizing the harmful effects of human impact.

4. Investigation D

- Use students' presentations to assess their understanding of human impact and their ability to brainstorm and design solutions. Provide additional review for students who appear to struggle with developing solutions for human impact.

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

6. Refer to the General Rubric included in Appendix A to assess individual progress.

7. Use the summative assessment to help evaluate student understanding of key unit concepts.

NOTES

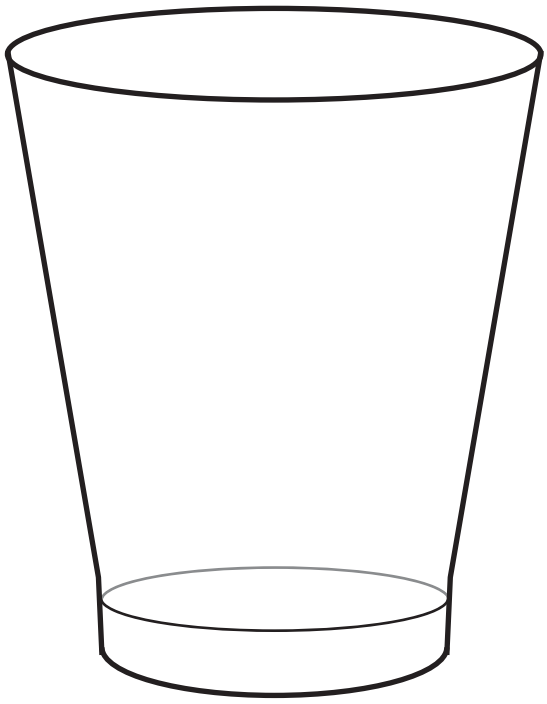
Plant Data Sheet

Name: _____ Date: _____

Day _____ of plant growth.

ELA connection
W.K.2

Draw and label your plant below.



My plant has _____ leaves.

My plant is _____ paper clips tall.

Summative Assessment

What have they learned?

Name: _____ Date: _____

1. Circle LIVING or NONLIVING for each:

a. Soil LIVING NONLIVING

b. Lion LIVING NONLIVING

c. Grass LIVING NONLIVING

d. Sun LIVING NONLIVING

2. Turtles can live in the ocean. Turtles can also live in a pond. What do turtles need?

a. Sunlight

b. Water

c. Fur

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
- Incorporate science connections into your language arts sessions
- Differentiate instruction
- Review previously learned concepts

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

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

Living Things and Their Needs

Student literacy–available in digital and print

How Beaver Dams Help

The pond also makes a home for other animals.

Fish, ducks, geese, and frogs come to the pond. They can live there, too.

Sometimes ducks and geese build their **nests** on top of beaver dams!

Now other animals can make their homes there.

Home Sweet Home

Beaver has built a dam and a lodge to help him survive.

Sometimes Beaver is called "nature's engineer." An engineer builds things.

Science in the world

Careers

Civil Engineer

Civil engineers build things.

They build roads and bridges.

They build tunnels and buildings.

They even build dams.

They try to protect and improve our environment.

Civil engineers build structures that we use every day.

Profesiones

Spanish literacy–available in digital and print

Ingeniero civil

Los ingenieros civiles construyen cosas.

Construyen caminos y puentes.

Construyen túneles y edificios.

Incluso construyen diques.

Tratan de proteger y mejorar nuestro medio ambiente.

Los ingenieros civiles construyen estructuras que nosotros usamos todos los días.

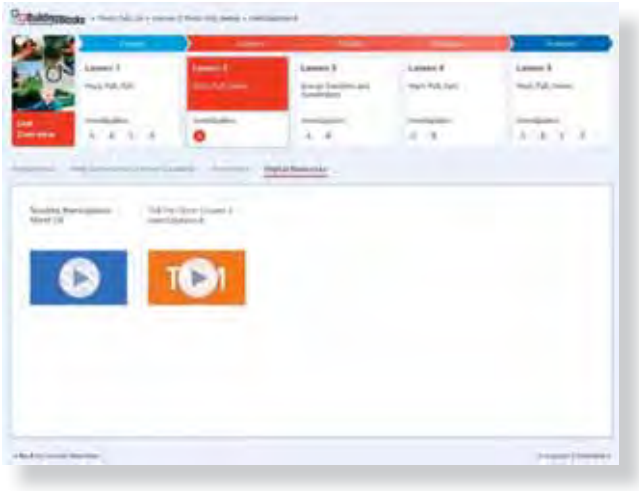
The Right Blend of Hands-On Investigation and Technology

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

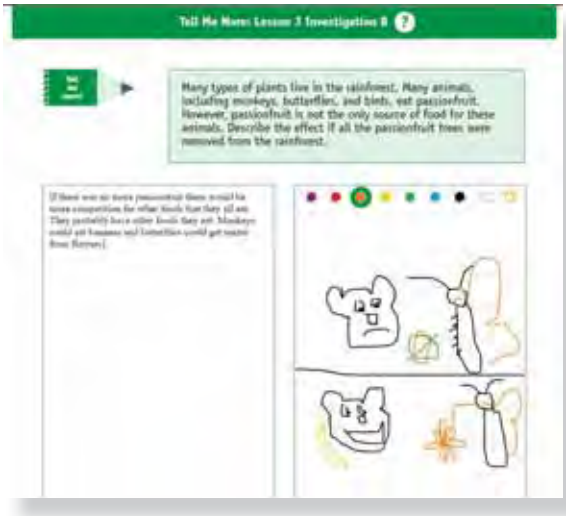
- Identification of where a lesson falls within the **5E Learning Cycle**
- Preparation—Includes investigation overview, materials list, and step-by-step teacher preparation instructions
- **NGSS Standards**—Includes the PEs, DCIs, SEPs, and CCCs that will be addressed within the investigation
- **Lesson 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

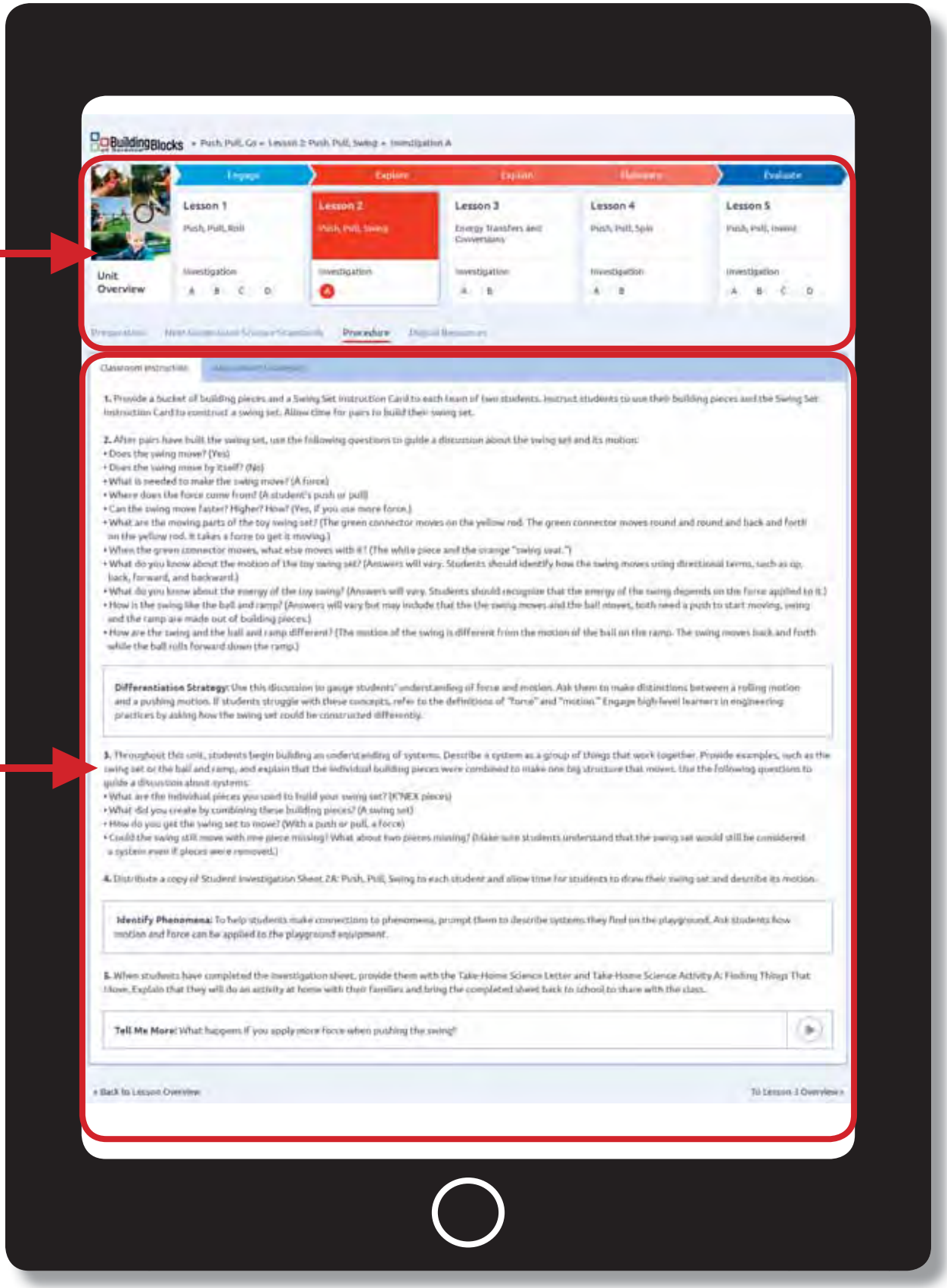
- Step-by-step instruction including guiding questions and anticipated responses
- Differentiation strategies at point of use within each investigation
- **Identify Phenomena** provides teachers with prompts to help students make connections to phenomena addressed within an investigation
- Assessment 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
Lesson 1
Push, Pull, Roll
Lesson 2
Push, Pull, Swing
Lesson 3
Energy Transfers and Conversions
Lesson 4
Push, Pull, Spin
Lesson 5
Unit Overview
Procedure
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?

Digital Components to Support Instruction and Assessment

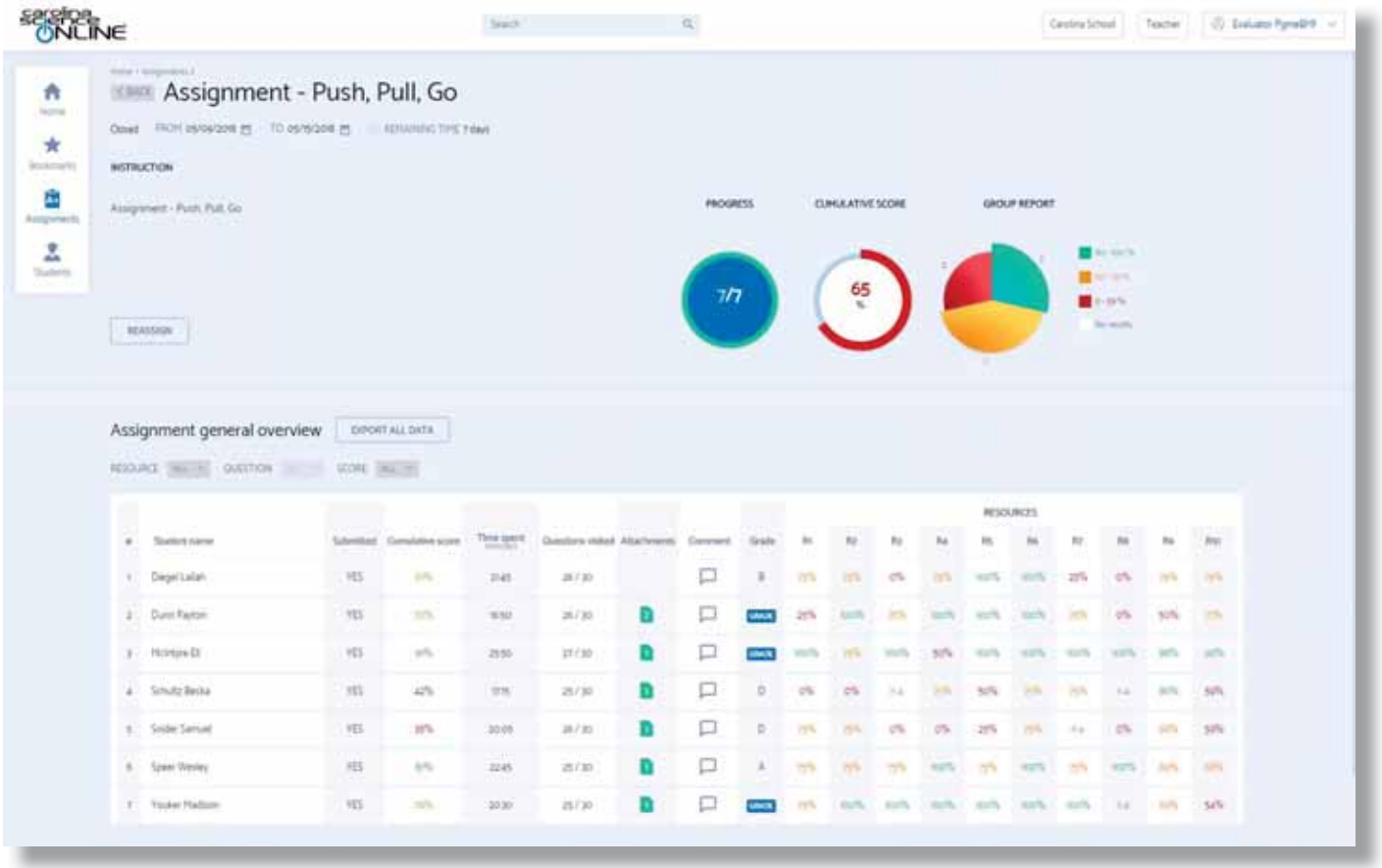
For the Teacher—Customizable Digital Planning at Your Fingertips

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.

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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*

Phenomenon-based investigations with digital support in 30-minute lessons!

For more information, visit www.carolina.com/bbs