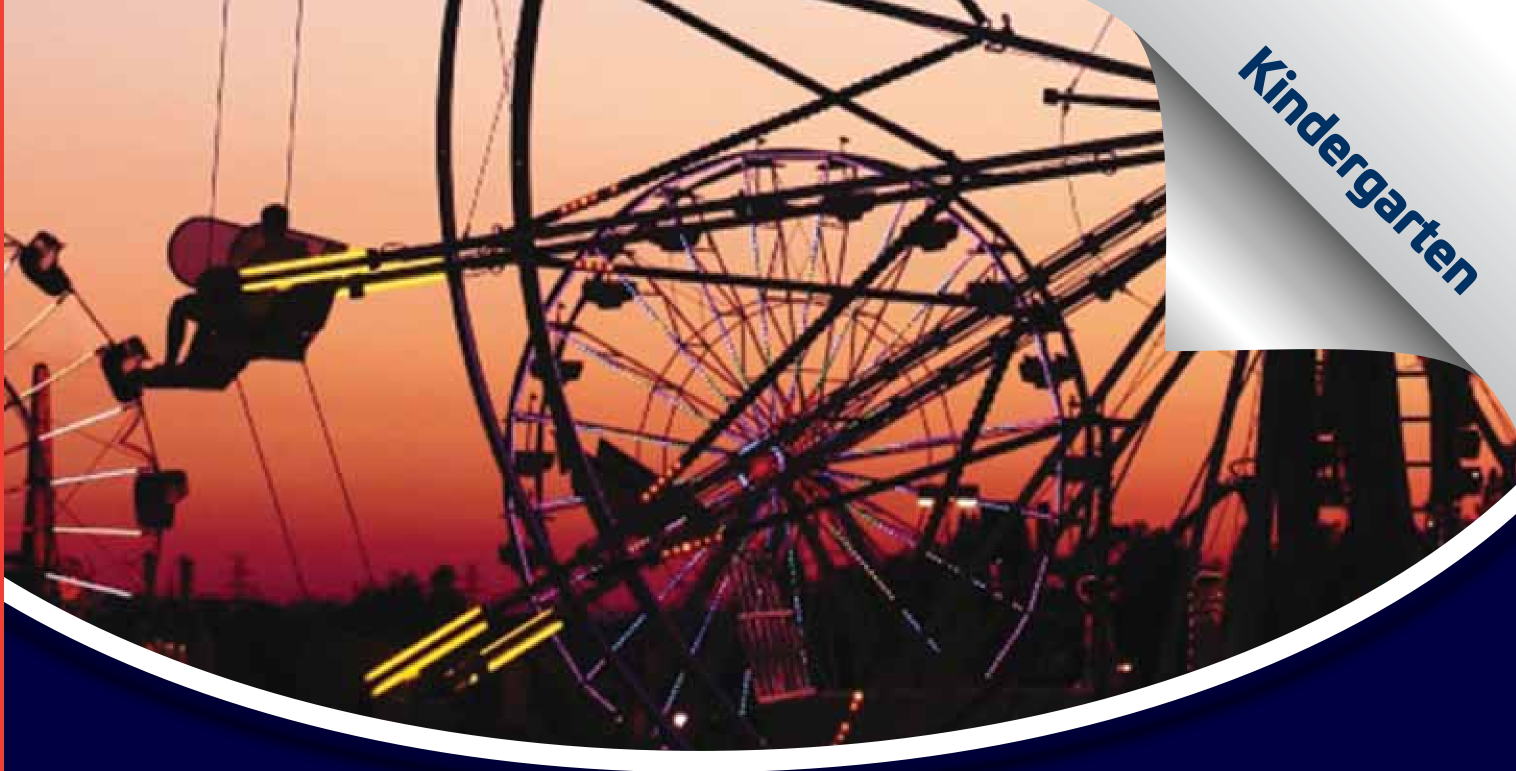


Kindergarten

Building Blocks OF SCIENCE™ | 3D

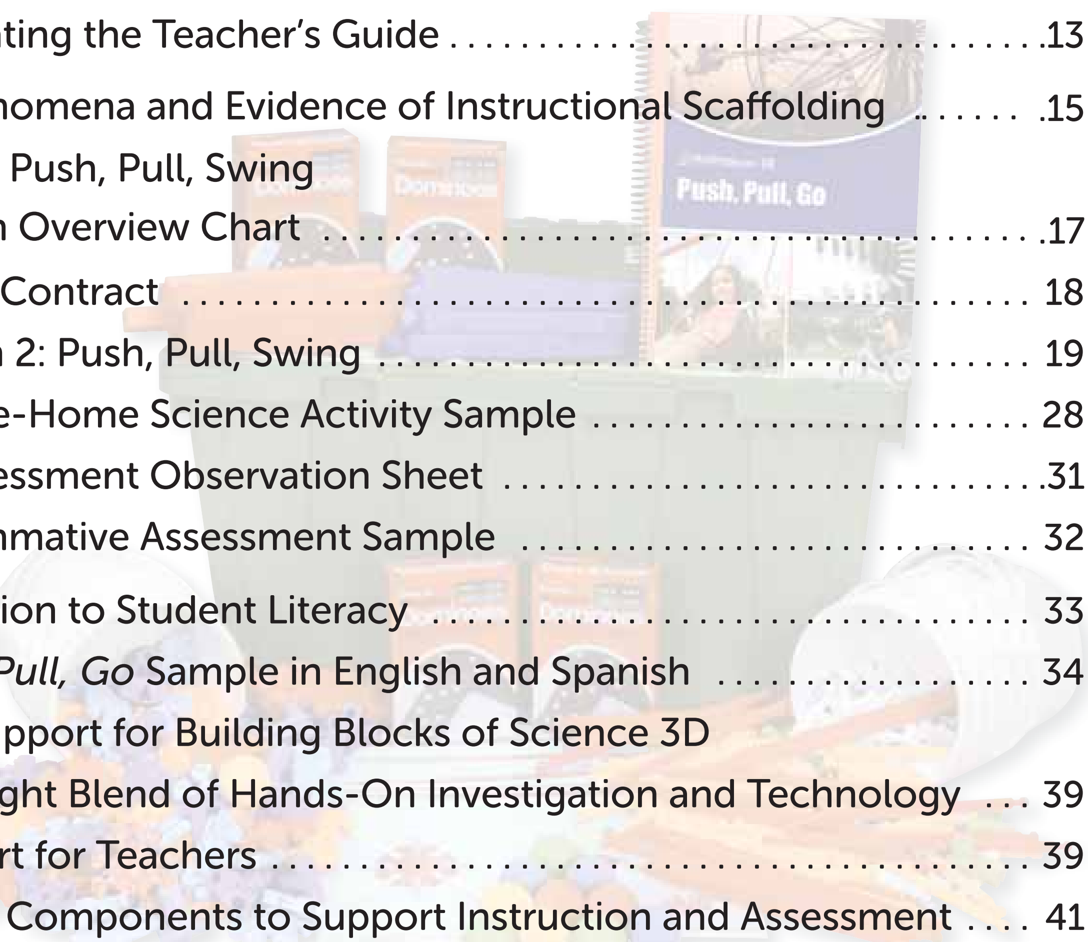
Push, Pull, Go

Program Highlights and Lesson Sampler

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

Table of Contents

Inside this sampler, you will find:



Push, Pull, Go

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
Blue Unifix® cubes	120	■				■
Bucket	12	■	■		■	■
Class set of Kid K'NEX® building pieces	1	■	■		■	■
Dominoes	96			■		■
Foam ball	12	■				■
Literacy Reader: *Push, Pull, Go* Big Book	1	■	■	■	■	
Ramp Instruction Card	12	■				■
Red Unifix cubes	120	■				■
Swing Set Instruction Card	12		■			■
Top Instruction Card	12				■	■

Needed But Not Supplied Materials

Material	Quantity Needed	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Chart paper or whiteboard		■			■	■
Markers		■			■	■
Masking tape		■				
Science notebook	24	■	■	■	■	■
Thick book	1	■				

Unit Overview: *Push, Pull, Go*

Motion and force are observable every day, but students may not be aware of different types of motion and the forces that cause them. In *Push, Pull, Go* students explore this important relationship through inquiry, discussion, engineering, and problem solving. Students also practice using descriptive words, building structures, measuring distance, making predictions, and identifying systems. Throughout a series of five lessons, students manipulate models to learn about motion and draw conclusions about force, energy, gravity, and friction.

Students begin by drawing upon previous knowledge to create definitions for “motion” and “force.” They first explore motion and force by rolling a ball and making observations. To further enforce the unit concepts, students begin working with K’NEX® pieces to build a ramp and roll a ball down it. Students practice measuring distance and relate the amount of force to the distance the ball rolls. Swinging motion is introduced as students build a toy swing set and explain the patterns of movement it produces. Dominoes are used to explore systems and the concept that force can be transferred between objects. Students discuss the motion of spinning and construct tops. Observing a top’s motion allows students to draw conclusions about the forces needed to make something spin, including gravity. In the final lesson, students design and build an invention that combines different motions to create a single system. After testing their inventions, teams define problems and share ideas about how they can be fixed. As a culmination, students revisit the class chart from Lesson 1 and evaluate what they have learned throughout the unit.

Credit: greenland/Shutterstock.com

Next Generation Science Standards

The Building Blocks of Science unit *Push, Pull, Go* integrates process skills as defined by the Next Generation Science Standards (NGSS).

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-PS2-2:** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.
- **K-2-ETS1-1:** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- **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
- **PS3.C:** Relationships between Energy and Forces
- **ETS1.A:** Defining and Delimiting Engineering Problems
- **ETS1.B:** Developing Possible Solutions

Science and Engineering Practices

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data

Crosscutting Concept

- Cause and Effect

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.

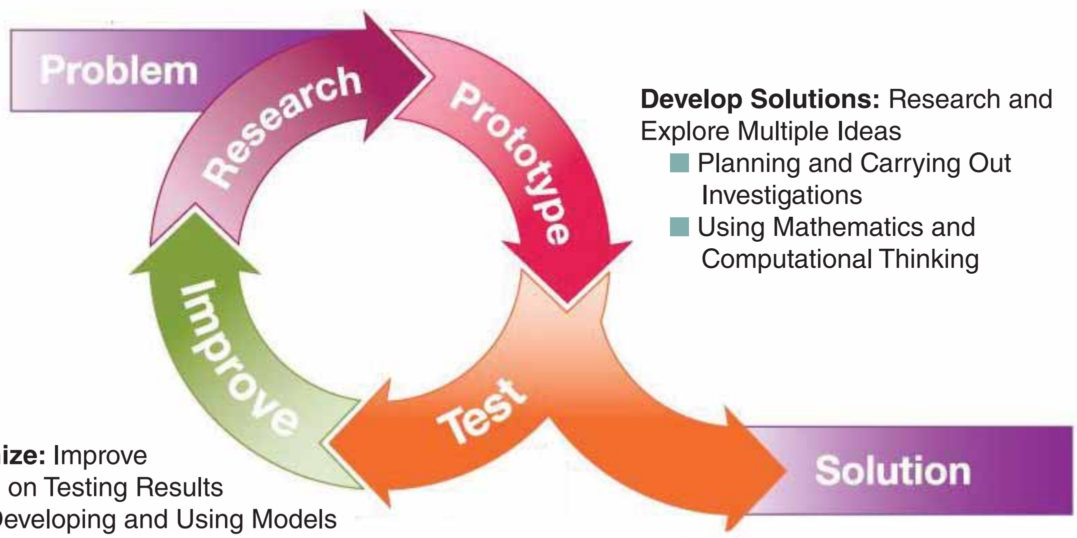
Through scientific engineering and design, students apply what they have learned to creatively solve real-world problems. This 21st-century skill encourages students to collaborate and exposes them to the idea that one problem can have multiple solutions.

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.

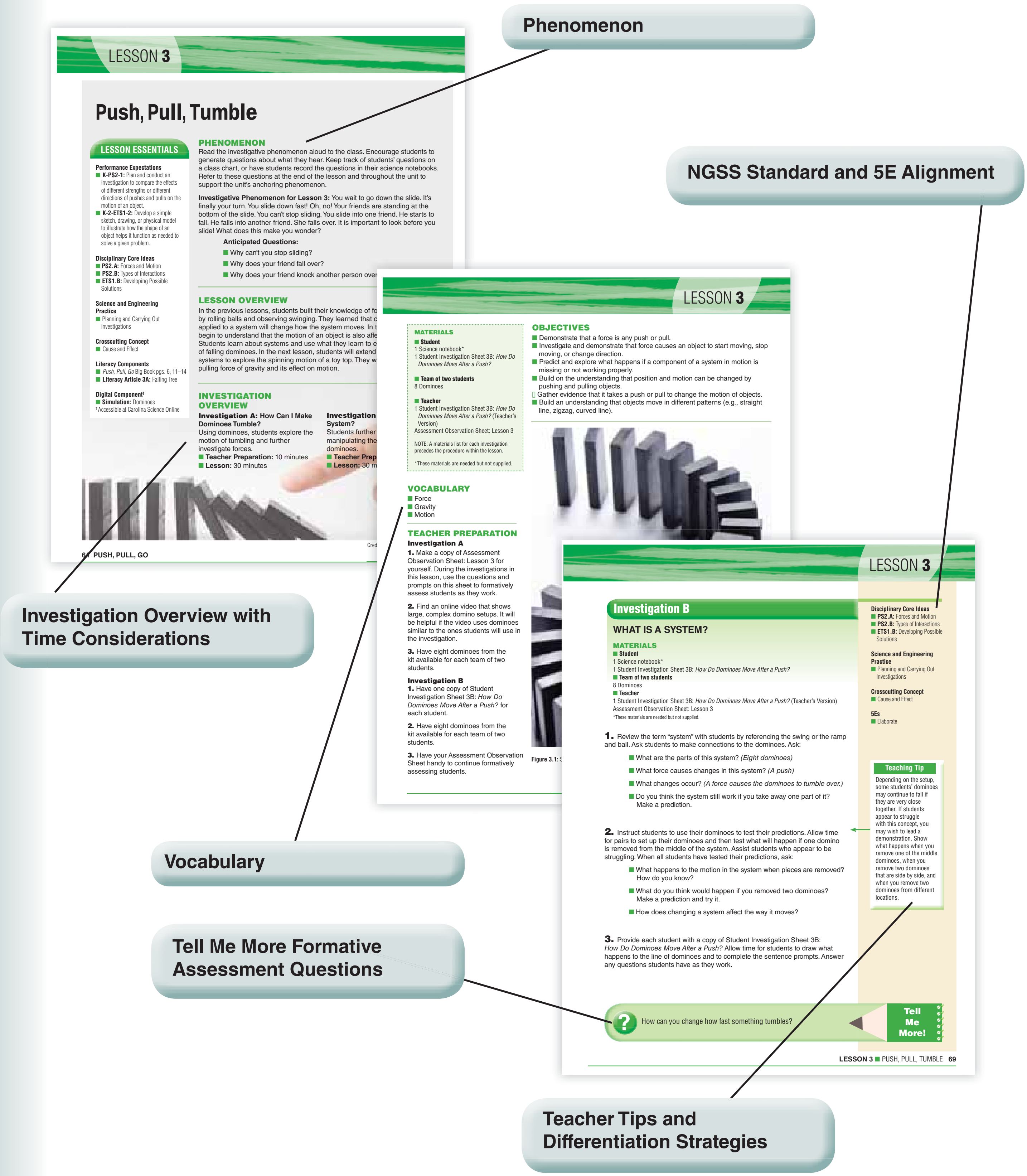
Additionally, there is a second end-of-unit assessment accessible only online. This digital summative assessment is **scenario-based** and touches upon all the standards from the unit. It includes both close-ended and open-ended questions.

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



Push, Pull, Go

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: Patryc

Literacy Articles

Take-Home Science Activities

Student Investigation Sheet 3B: How Do Dominoe

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

Push, Pull, Go

Unit Overview

Motion and force are observable every day, but students may not be aware of different types of motion and the forces that cause them. In *Push, Pull, Go* students explore this important relationship through inquiry, discussion, engineering, and problem solving. Students also practice using descriptive words, building structures, measuring distance, making predictions, and identifying systems. Throughout a series of five lessons, students manipulate models to learn about motion and draw conclusions about force, energy, gravity, and friction.

Unit Anchoring Phenomenon

Movement is important as students learn about the world around them. Playgrounds provide abundant opportunities for students to manipulate, observe, and interact with objects and systems. In time, students may begin to notice patterns in movement. The anchoring phenomenon for *Push, Pull, Go* is recognizing forces and their resulting motions on the playground.

	LESSON 1	LESSON 2
INVESTIGATIVE PHENOMENA	You and your friend are playing catch with a ball. Oh, no! You miss the ball! The ball keeps rolling. The ball rolls down a hill. The ball rolls fast. The ball rolls far. Finally, the ball stops. What does this make you wonder?	Let's swing! You kick your legs back and forth. The swing starts moving. Your friend gives you a push. You move faster. You swing your legs side-to-side. The swing begins to twist. The swing starts to slow down. The swing stops. What does this make you wonder?
OBJECTIVES	■ Begin building an age-appropriate understanding of force and motion. ■ Observe, measure, and record the change in position of an object over time. ■ Explore the movement of a rolling ball and begin to build an understanding that motion is predictable (the ball travels in a straight line until a force stops it or changes its direction).	■ Explore changes in position and motion by pushing and pulling. ■ Demonstrate that the greater the force (push or pull), the greater the change in motion. ■ Begin to collect evidence about the invisible force of gravity.
SCAFFOLDING Students should know:	↓ Motion is caused by forces, which include pushes and pulls. ↓ The amount of force applied to an object will affect the way it moves. ↓ Rolling and bouncing are types of motion. ↓ The speed or direction of an object will change by adding force. ↓ The distance an object will move depends on the amount of force applied to it. ↓ Objects in motion have more energy than objects that are still.	↓ Swinging, rolling, and bouncing are types of motion. ↓ Swinging motion is affected by the amount of force applied by a push or pull. ↓ The speed of a swing depends on the amount of force used during the push or pull. ↓ The motion of a swing is typically back-and-forth, but the direction can change by adding force. ↓ A swing is a system.

Concepts build from one lesson to the next

LESSON 3	LESSON 4	LESSON 5
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. What does this make you wonder?	You and your friends want to ride the merry-go-round. You need someone to push it. Your teacher will push the merry-go-round! Your teacher pushes. The merry-go-round starts moving. You hold on tight. Your teacher pushes it many times. The merry-go-round is moving very fast! You are getting dizzy! Your teacher stops pushing. The merry-go-round slows down. It comes to a stop. What does this make you wonder?	Have you ever seen an obstacle course? They use many types of equipment or skills. Some obstacle courses include running. Some include climbing. Others include balancing. People try to complete the obstacle course as quickly as they can. They don't stop moving until they reach the end. Anyone can design an obstacle course! You can design one at your playground. What does this make you wonder?
■ 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).	■ Build on the concept that the greater the force applied to an object, the greater the change in the object's motion. ■ Describe motion over time by exploring the motion—the slowing and the stopping—of a spinning top. ■ Continue to compare patterns of movement such as sliding, rolling, and spinning. ■ Begin building an understanding that it takes a force (a push or pull) to change the motion of objects.	■ Apply concepts explored in Lessons 1–4 to build a motion invention (model) that works. ■ Describe how force and motion work together in the model. ■ Demonstrate the effect of missing or nonworking parts of a system. ■ Evaluate learning from throughout the unit about force and motion, and compare that knowledge to initial ideas from the beginning of the unit.
↓ Tumbling, swinging, rolling, and bouncing are types of motion. ↓ To make an object tumble, a force must be applied. ↓ A system includes all the components that are affected by a force and set into motion. ↓ The speed and direction in which an object tumbles are affected by the forces applied. ↓ Objects that tumble into still objects may cause the still objects to move. ↓ An object that tumbles faster has more energy.	↓ Spinning, twirling, tumbling, swinging, rolling, and bouncing are types of motion. ↓ A top displays a spinning motion, which requires a push force to start. ↓ A top is a system of spinning motion. ↓ In order to change the direction of spinning or twirling, an additional force must be applied. ↓ The speed of spinning can be changed by applying different amounts of force. ↓ The faster an object spins, the more energy it has.	↓ There are many types of motion, which are all caused by forces. ↓ Systems can be combined to create one large system of motion. ↓ Increasing the amount of force at the beginning of a system will increase the speed of the motion throughout the system. ↓ Problems should be fixed to improve an invention. ↓ Force affects the motion, speed, direction, and distance an object travels. ↓ Gravity and friction slow objects that are in motion.

NGSS correlations by lesson

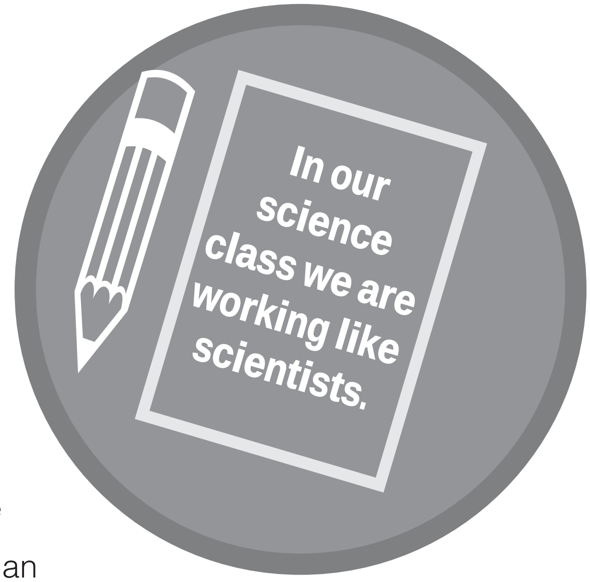
Lesson 2: Push, Pull, Swing

Investigation Overview	Standards	Resources
Investigation A: How Does a Swing Move? **5Es:** Explore, Explain, Elaborate Students use their building pieces to construct a swing set and explain how force makes it move. ■ **Teacher Preparation:** 5 minutes ■ **Lesson:** 30 minutes **Tell Me More!** What happens if you apply more force when pushing the swing?	**Next Generation Science Standards 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 ■ **PS3.C:** Relationships between Energy and Forces ■ **ETS1.B:** Developing Possible Solutions **Science and Engineering Practice** ■ Planning and Carrying Out Investigations **Crosscutting Concept** ■ Cause and Effect **Language and Math Standards** **Language Arts** ■ **L.K.5:** Vocabulary Acquisition and Use ■ **L.K.6:** Vocabulary Acquisition and Use ■ **SL.K.2:** Comprehension and Collaboration ■ **SL.K.5:** Presentation of Knowledge and Ideas ■ **W.K.5:** Production and Distribution of Writing ■ **W.K.8:** Research to Build and Present Knowledge **Math** ■ **K.CC.A.1:** Know number names and the count sequence. ■ **K.MD.A.2:** Describe and compare measurable attributes.	**Student Investigation Sheets** ■ Student Investigation Sheet 2A: *How Does a Swing Move?* ■ Take-Home Science Activity A: *Finding Things That Move* **Literacy Components** ■ *Push, Pull, Go* Big Book, pgs. 4–5, 10 ■ Literacy Article 2A: Swinging on the Tire Swing **Digital Component** ■ Simulation: Swing Set **Vocabulary** ■ Force ■ Motion ■ Swing

30-minute investigations fit into your busy day

Integrated ELA and math

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.

Push, Pull, Swing

All lessons are anchored in phenomena

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
- **PS3.C:** Relationships between Energy and Forces
- **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. 4–5, 10
- **Literacy Article 2A:** Swinging on the Tire Swing

Digital Component‡

- **Simulation:** Swing Set

‡Accessible at Carolina Science Online

Credit: Felix Mizioznikikov/Shutterstock.com

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 2: Let's swing! You kick your legs back and forth. The swing starts moving. Your friend gives you a push. You move faster. You swing your legs side-to-side. The swing begins to twist. The swing starts to slow down. The swing stops. What does this make you wonder?

Anticipated Questions:

- How did you start moving on the swing?
- Why did you start moving faster?
- Why did the swing twist when you moved?

LESSON OVERVIEW

In Lesson 1, students were introduced to force and motion. They used a ramp and a ball to examine how the amount of force applied to an object affects its resulting motion. Students also practiced measuring distance and found that greater forces cause an object to move more and travel farther. In Lesson 2, students apply what they know about force and motion to describe a swing set. Students will begin to notice patterns of movement, which will be further discussed in the next lesson, in which students observe tumbling dominoes.

INVESTIGATION OVERVIEW

Investigation A: How Does a Swing Move?

Students use their building pieces to construct a swing set and explain how force makes it move.

- **Teacher Preparation:** 5 minutes
- **Lesson:** 30 minutes

OBJECTIVES

- Explore changes in position and motion by pushing and pulling.
- Demonstrate that the greater the force (push or pull), the greater the change in motion.
- Begin to collect evidence about the invisible force of gravity.

VOCABULARY

- Force
- Motion
- Swing

MATERIALS

Student

1 Science notebook*
1 Student Investigation Sheet 2A: *How Does a Swing Move?*
1 Take-Home Science Letter
1 Take-Home Science Activity A: *Finding Things That Move*

Team of two students

1 Bucket of Kid K'NEX® building pieces
1 Swing Set Instruction Card

Teacher

1 Student Investigation Sheet 2A: *How Does a Swing Move?* (Teacher's Version)
Assessment Observation Sheet: Lesson 2

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. Make one copy of Student Investigation Sheet 2A: *How Does a Swing Move?*, one copy of Take-Home Science Activity A: *Finding Things That Move*, and one copy of the Take-Home Science Letter for each student.

2. Make a copy of Assessment Observation Sheet: Lesson 2 for yourself. During the investigations in this lesson, use the questions and prompts on this sheet to formatively assess students as they work.

3. Have one Swing Set Instruction Card and a bucket of building pieces available for each team of two students.

Credit: karelnoppe/Shutterstock.com

BACKGROUND INFORMATION: The Swing Set

Throughout this unit, students explore how things move, patterns of movement, and the **force** it takes to make objects move, stop, or change direction. In this lesson, students use a swing set to investigate the push-and-pull forces it takes to cause movement. This investigation provides a good opportunity to make connections to playground phenomena. As the lesson progresses, expect students to begin to recognize the following:

- When the **swing** is still, it takes a force (a push or pull) for the swing to move.
- A bigger push moves the swing higher and faster than a smaller push.
- When the swing is moving, it takes a force to stop the swing.
- The **motion** of the swing is predictable.
- The swing has energy.

Just-in-time background information

The swing set is a system just as the ramp and ball from Lesson 1 are a system. All the K'NEX® pieces work together to make the system. Forces such as the push or pull by the student, gravity, and friction act on the system. The student pushes or pulls the swing upward from its lowest point to start the motion. The friction between the yellow rod and the green "T" connector at the pivot point of the swing slows and eventually stops the swing's motion. Gravity continually pulls the swing back toward the lowest point, keeping the motion going until friction eventually stops it.

NOTES

Investigation A

HOW DOES A SWING MOVE?

3-dimensional alignment

MATERIALS

- **Student**

1 Science notebook*
1 Student Investigation Sheet 2A: *How Does a Swing Move?*
1 Take-Home Science Letter
1 Take-Home Science Activity A: *Finding Things That Move*

- **Team of two students**

1 Bucket of Kid K'NEX building pieces
1 Swing Set Instruction Card

- **Teacher**

1 Student Investigation Sheet 2A: *How Does a Swing Move?* (Teacher's Version)
Assessment Observation Sheet: Lesson 2
Chart paper or whiteboard*
Markers*

*These materials are needed but not supplied.

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)*
- How could you add energy to the toy swing? *(Use 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.)*

Disciplinary Core Ideas
- **PS2.A:** Forces and Motion
- **PS2.B:** Types of Interactions
- **PS3.C:** Relationships between Energy and Forces
- **ETS1.B:** Developing Possible Solutions

Science and Engineering Practice
- Planning and Carrying Out Investigations

Crosscutting Concept
- Cause and Effect

5Es
- Explore
- Explain
- Elaborate

Literacy Components
- *Push, Pull, Go* Big Book, pgs. 4–5, 10
- **Literacy Article 2A:** Swinging on the Tire Swing

Digital Component
- **Simulation:** Swing Set

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.

Differentiation

■ 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, the 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; the ball rolls forward down the ramp.)*

Digital simulations to enrich concepts

Digital Tip

Further enforce the concept of swinging motion by sharing the Swing Set simulation during the discussion.

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 bigger structures that are systems of motion. 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 if two pieces were missing? *(Make sure students understand that the swing set would still be considered a system even if pieces were removed.)*

Connect to phenomena

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.

4. Distribute a copy of Student Investigation Sheet 2A: *How Does a Swing Move?* to each student and allow time for students to draw their swing set and describe its motion.

Literacy Tip

After students complete their drawings, read Literacy Article 2A: Swinging on the Tire Swing together as a class. Ask students to think about how a tire swing moves differently than the swing they built.

5. Ask students to think about how they could make the swing move faster or in a different direction. Encourage students to brainstorm with a partner, and then ask them to volunteer their ideas.

6. Instruct students to test their predictions to try to make the swing move faster or in a different direction. Remind students that stopping the swing is a change in direction. After some time, gather the class to discuss their results. Ask:

■ How did you make the swing move faster? *(Students should explain that more force made the swing move faster.)*

■ How did you make the swing change direction? *(Students should have stopped the swing by holding it or pulling it down.)*

■ What did you notice about the swing's energy? *(Students should recognize that the swing's energy depends on the force applied to it.)*

7. 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.

Formative assessment

Tell Me More!

? What happens if you apply more force when pushing the swing?

Take-Home Science

Activity A: *Finding Things That Move*
In *Finding Things That Move*, students play a game with their families in which they identify things that move and the forces that move them.

Connecting science to home

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 forces and their resulting motions on the playground. By the end of the lesson, students should be able to explain that:

- Adding force to a motionless swing will cause it to begin moving.
- When your friend pushes the swing, it has more energy and will move faster.
- Swinging your legs side to side on a swing creates an additional force that will cause the swing to change direction.
- A swing can be pushed or pulled to cause motion.

Connecting ideas about phenomena to evidence

Math connection K.MD.A.2

ELA connection W.K.5, W.K.8

EXTENSIONS

A Counting Force

1. Guide students to discuss their ideas about how to measure force. Ask:

- Is there a way to measure the amount of force used to push the swing? *(Answers will vary.)*
- What are your ideas? *(Answers will vary.)*
- How do you know if you used more force to push the swing than your partner used? *(The swing moves higher with more force.)*

2. Challenge students to explore the ideas they just discussed. Ask:

- Can you push the swing so that it will swing four times and stop? *(Answers will vary.)*
- What happens if you use too much force? *(The swing moves more than four swings.)*
- What happens if you use too little force? *(The swing stops before it swings four times.)*

3. Challenge students with different numbers of swings. Allow ample time for them to explore and try their ideas. Students are collecting evidence that more force moves the swing higher and for a greater number of swings than less force. Move around the room and encourage students to clarify their understanding.

Story Starter

As a class, write a group story on chart paper. Use the following story starter and guiding questions to help your students develop the story.

Story Starter:

A rabbit hops by a very wide swing hung from a very tall tree in the woods.

- Which forest animals get on the swing to ride?
- How many animals get on the swing at one time?
- Which animal pushes? Which animal pulls?
- What happens next?

Movement Education

Take students outside and allow them to observe the pushes, pulls, and predictable patterns of movement on the playground. For example, observe how swings move. Bring students inside and do a quick charting activity. Title the chart "What Do We Know About How Swings Move?" Ask students how the swing outside is the same as and different from the model swing set they built. Provide opportunities for students to observe and chart about other playground equipment and the pushes, pulls, and patterns of movement.

ASSESSMENT STRATEGIES

1. Investigation A

- Use Student Investigation Sheet 2A: *How Does a Swing Move?* to determine students' understanding of force in the form of a push. If students do not seem to understand this concept, you may wish to provide supplemental review.
- Use students' responses to the Tell Me More question to assess how well they understand that changing the amount of force applied affects the movement of an object.

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

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

Formative assessment

Name: ______________ Date: __________

Swinging on the Tire Swing

Get on. Push off. The tire is heavy. You push again. You push harder. You lean forward. You lean back.

Now you are moving faster! You swing back. You swing forth. You spin. You move high. The tire swing is fun!

Time to stop! You push the ground. You push again. The tire swing slows. It stops.

Will you ride the tire swing tomorrow?

ELA connection L.K.5, L.K.6, SL.K.2

Credit: Monkey Business Images/Shutterstock.com

Name: ____________ Date: ______

This is a swing set.

ELA connection SL.K.5, SL.K.6

It moves when you ____________

____________ it.

A big push makes it move ____________

____________.

Take-Home Science

Connecting science to 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.

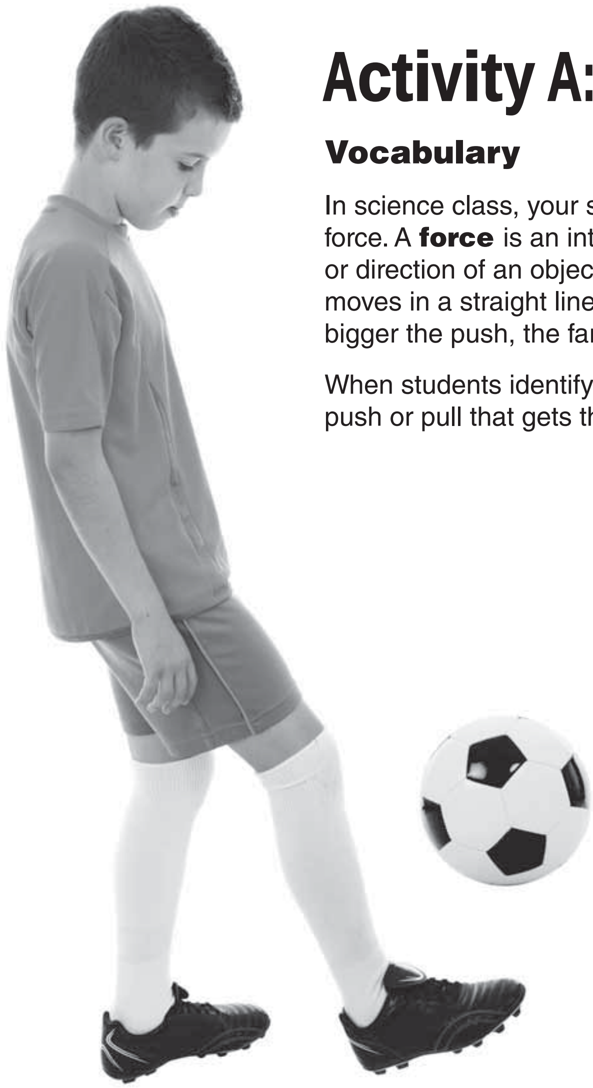
The activities are simple and can be completed within 20 minutes using items normally found in the home. A section of the investigation sheet is for your student to complete and bring back to school. In class, students will have the opportunity to share their experiences and results with one another.

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

GO EXPLORING!

Credit: Cathy Keifer/Shutterstock.com

Name: ______________ Date: ________



Credit: cristovao/Shutterstock.com

Activity A: Finding Things That Move

Vocabulary

In science class, your student is beginning to build an understanding of the word force. A **force** is an interaction, such as a push or pull, that changes the speed or direction of an object. For example, push on a ball and the ball moves. The ball moves in a straight line until another force stops it or changes its direction. The bigger the push, the farther and faster the ball travels.

When students identify the force that moves an object, they simply determine the push or pull that gets the thing moving.

Game

1. Ask your student to look around the house and find the following objects. Encourage others to join you.

Find an Object That:

- Rolls
- Turns
- Pulls open
- Moves back and forth
- Spins

2. Talk with your student about what force moves each object. Ask what words can tell about the object and how it moves. Can your student move like one of the objects?

3. Ask your child to choose two objects from the list and draw, dictate, or write how the object moves. (Your child may enjoy cutting pictures out of old magazines or catalogs to record items that roll, turn, pull open, etc.)

Take-Home Science

Name: ____________ Date: ________

This is one thing I found.

I found ____________________.

It moves ____________________.

Assessment Observation Sheet

Lesson 2—Push, Pull, Swing

Formative assessment—How are they progressing?

Consider the following observations and talking points during student exploration activities, quiet conversations, and class discussions.

A. Encourage students to use vocabulary to describe the force, energy, and motion of the swing set.

B. Can students demonstrate a way to stop motion or change its direction?

C. Encourage students to test their ideas about how the swing moves and its patterns of motion.

D. Talk informally about gravity with students. Listen for an intuitive understanding that gravity is a force that pulls on everything.

E. Encourage students to demonstrate what they have found out about motion and force by making comparisons to earlier lessons.

F. Additional considerations:

NOTES

Summative Assessment

Name: ______________ Date: __________

1. A ball is rolling down a hill. You push the ball up the hill. What happened?

   a. The ball changed direction.

   b. The ball tumbled dominoes.

   c. The ball stopped.

What have they learned?

2. A toy car is on a ramp. Another toy car is on the floor. Both cars are pushed. Which car moves faster?

   Car on ramp   Car on floor

Building Blocks of Science Student Literacy

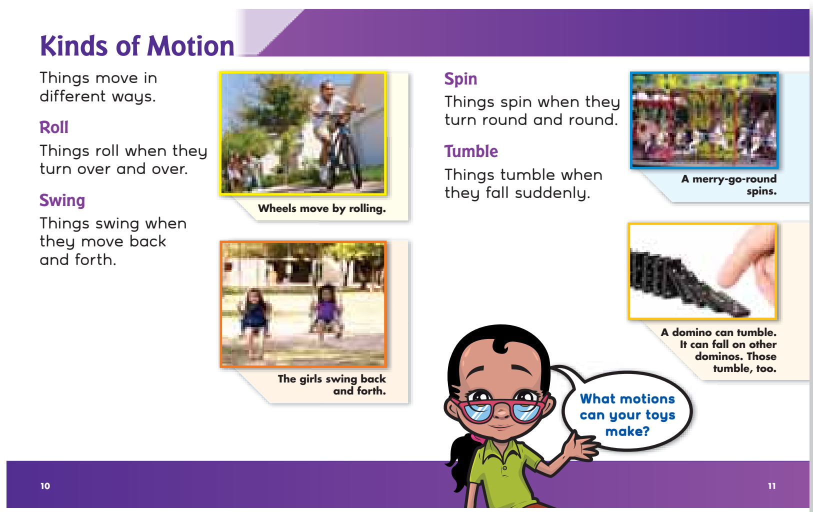
Build students' literacy skills with literacy components found within lessons and Literacy Readers.

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



What else to look for?

Literacy Articles—These encourage students to elaborate upon unit topics, discuss real-world applications and phenomena, and ask student to connect this to concepts in the unit. Corresponding questions ask student to access high-level thinking and draw upon previous knowledge. (See page 26 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

Push, Pull, Go!

Motion and Force

Things that move are all around us.

A door opens. A ball rolls. A frog jumps.

They are in motion.

They move from one place to another place.

The ball is in motion.

Motion is a change in a thing's position.

Force makes things change position.

You use force when you move things.

The girls use force to move the ball.

Careers

Science in the world

Playground Builder

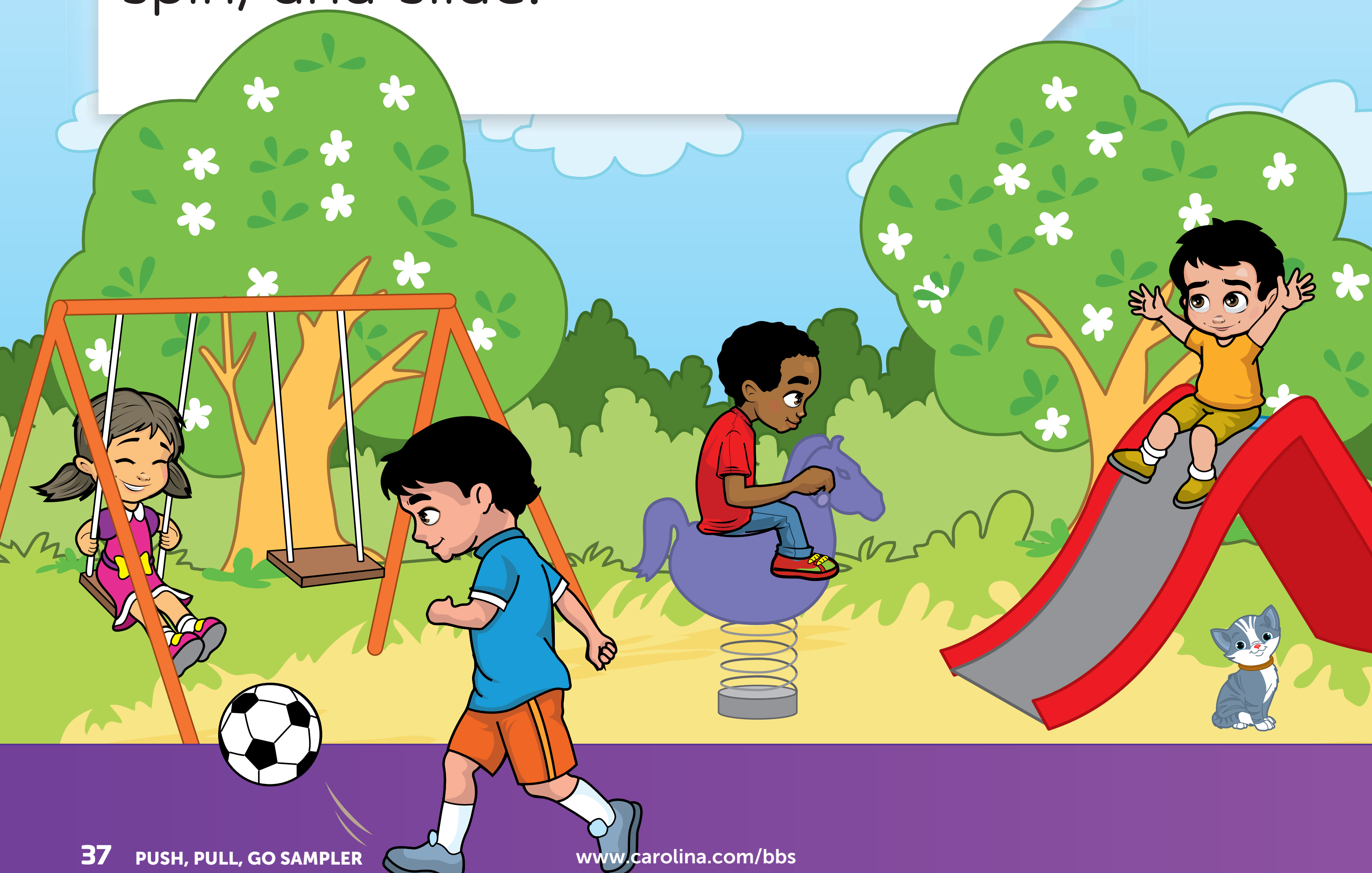
Some builders make playgrounds.

They make plans for play areas.

They shape places where children can run and climb.

They make things to push or pull.

They build things that swing, spin, and slide.



Profesiones

Constructor de parques infantiles

Algunos constructores hacen parques de juegos.

Dibujan planos de las áreas de juego.

Construyen lugares donde los niños pueden correr, trepar, empujar, jalar y deslizarse.

También construyen cosas que oscilan y giran.

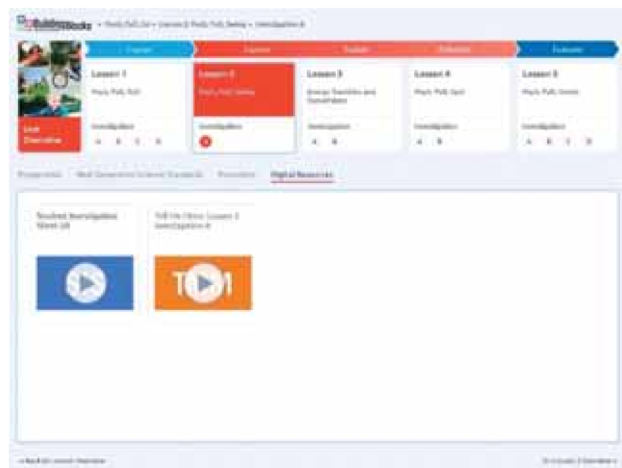
The Right Blend of Hands-On Investigation and Technology

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

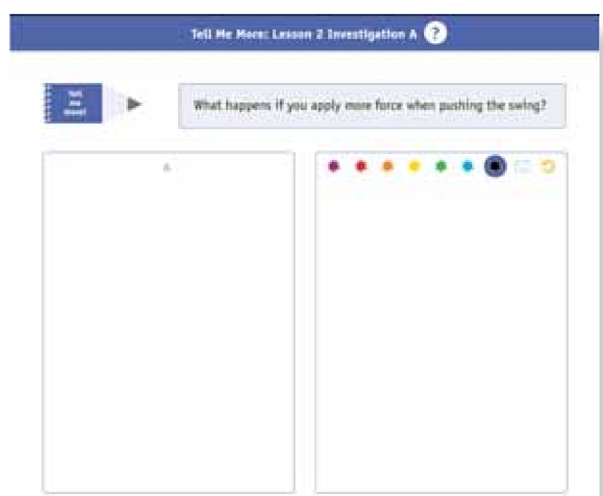
- Identification of where a lesson falls within the **5E Learning Cycle**
- Preparation—Includes investigation overview, materials list, and step-by-step teacher preparation instructions
- **NGSS Standards**—Includes the PEs, DCIs, SEPs, and CCCs that will be addressed within the investigation
- **Lesson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

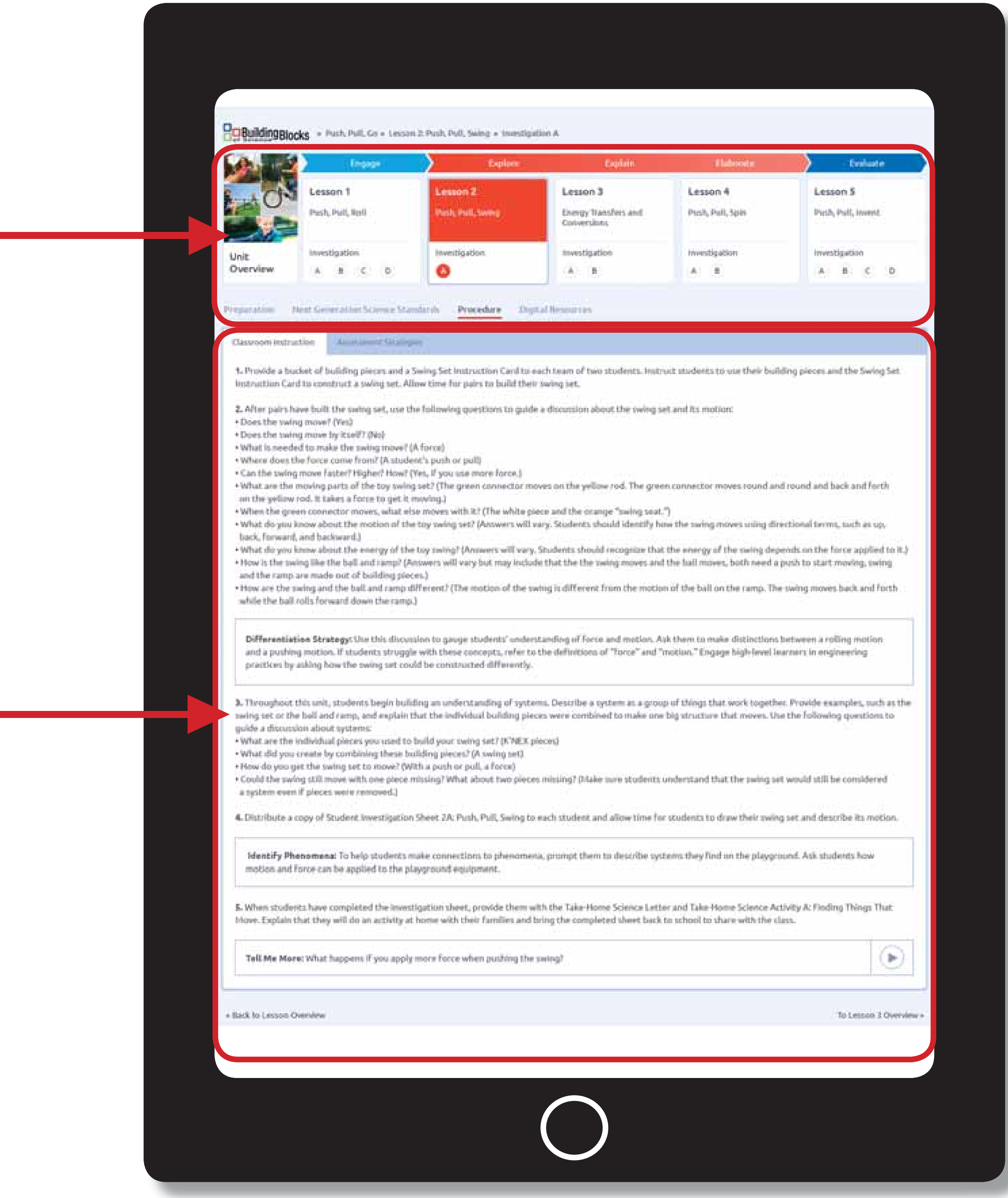
- Step-by-step instruction including guiding questions and anticipated responses
- Differentiation strategies at point of use within each investigation
- **Identify Phenomena** provides teachers with prompts to help students make connections to phenomena addressed within an investigation
- Assessment 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 » Push, Pull, Go » Lesson 2: Push, Pull, Swing » Investigation A
Engage
Explore
Explain
Elaborate
Evaluate
Unit Overview
Lesson 1
Push, Pull, Roll
Investigation
A B C D
Lesson 2
Push, Pull, Swing
Investigation
A
Lesson 3
Energy Transfers and Conversions
Investigation
A B
Lesson 4
Push, Pull, Spin
Investigation
A B
Lesson 5
Push, Pull, Invent
Investigation
A B C D
Preparation
Next Generation Science Standards
Procedure
Digital Resources
Classroom Instruction
Assessment Strategies
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

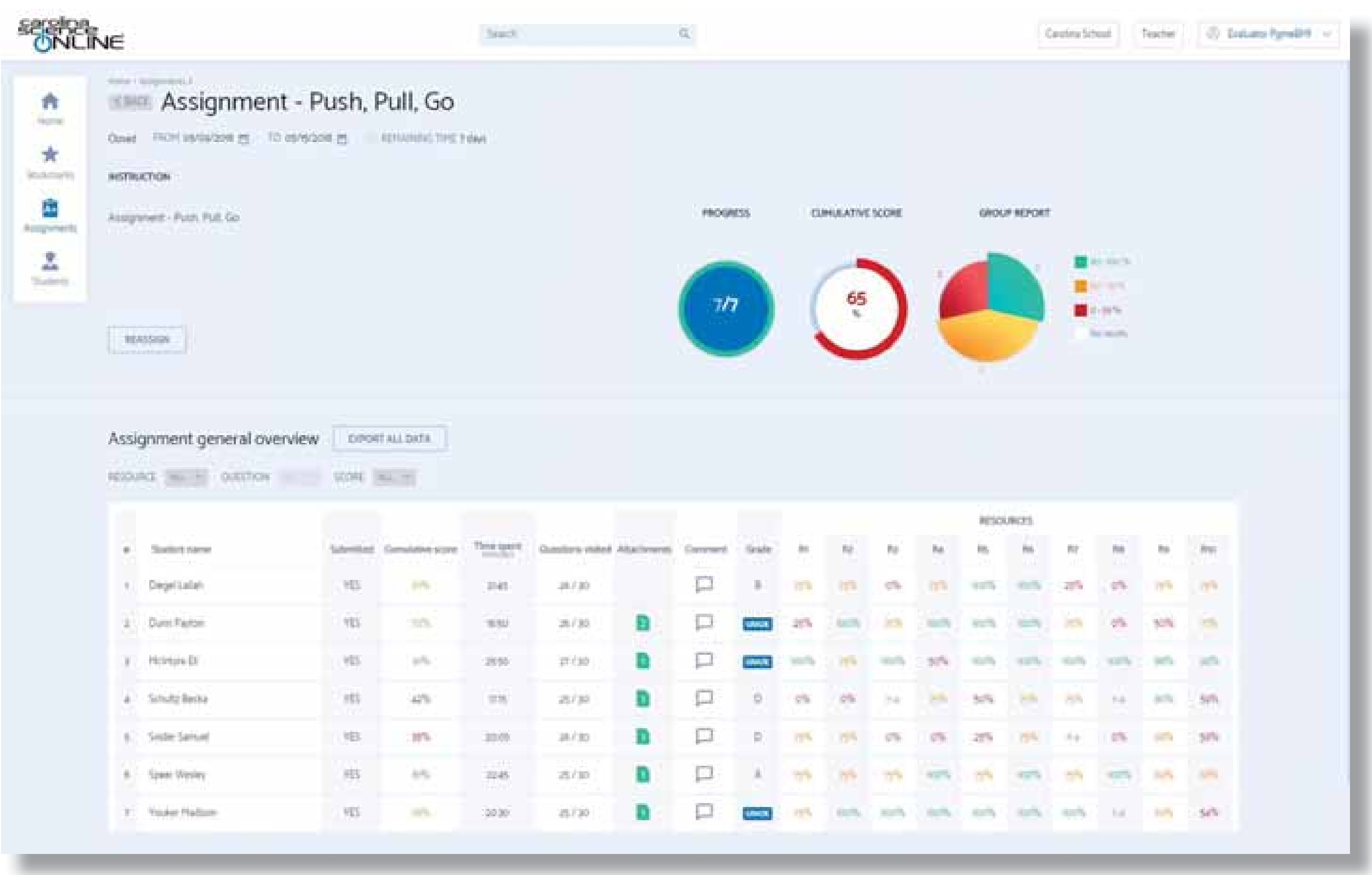
For the Teacher—Customizable Digital Planning at Your Fingertips

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

CAROLINA®
www.carolina.com

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

CCPBB18110901