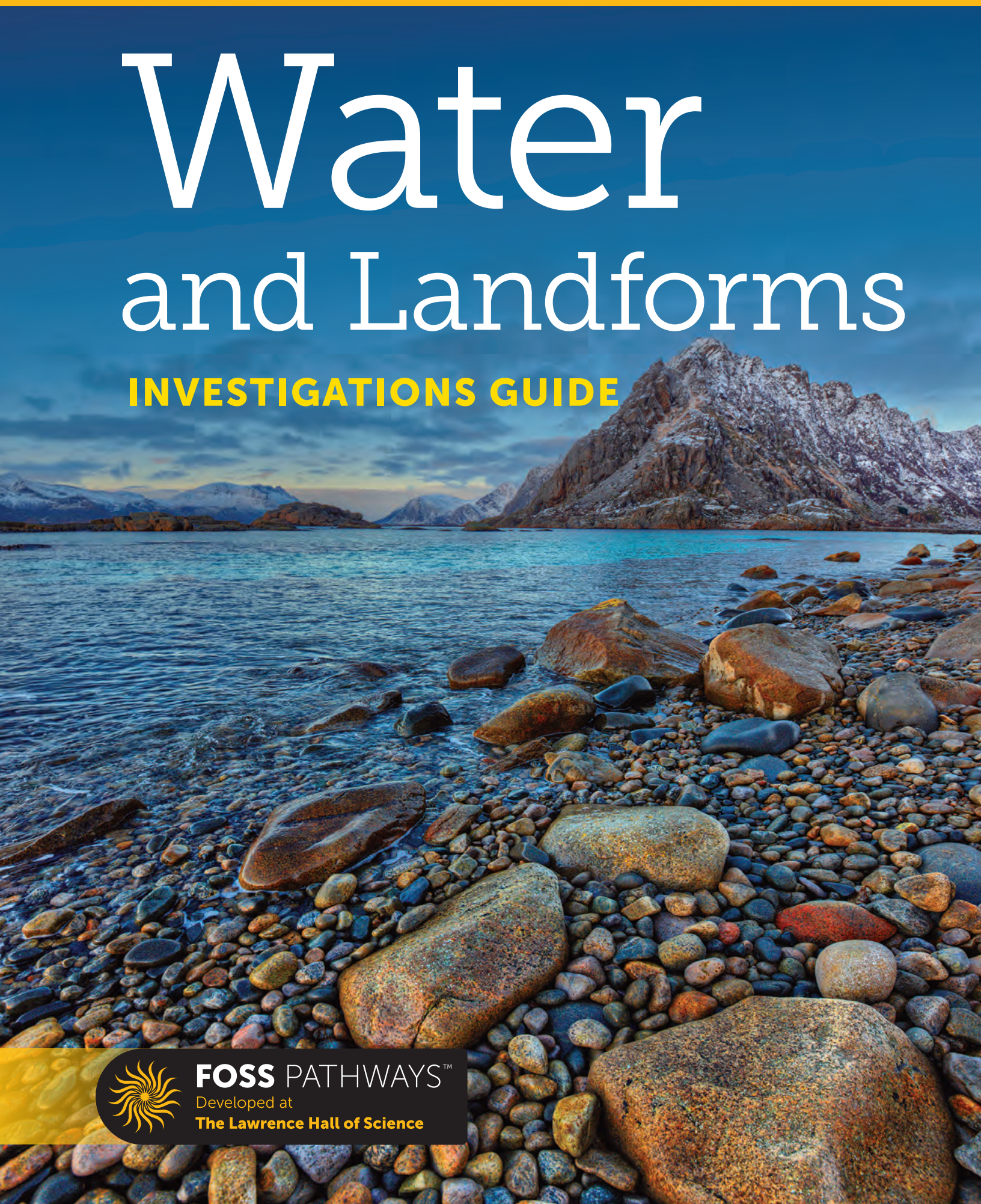
SAMPLER

Water and Landforms

INVESTIGATIONS GUIDE



FOSS PATHWAYS™
Developed at
The Lawrence Hall of Science

PreK–5 science that meets the challenge of our time

Welcome to new FOSS® Pathways™. Now as never before, the world needs scientific thinkers—to view the world thoughtfully, approach challenges analytically, and embrace opportunities enthusiastically. For educators to help unlock this potential in their students, they need powerful tools that work for the needs of today. A program that engages students of all backgrounds and experiences. Fully leverages modern digital technology. And does it all in the hours available.

A major advancement from a proven leader

FOSS®, a longtime leader in science education, has stepped forward to meet that challenge with the newly streamlined FOSS Pathways™. Pathways was designed to provide teachers with everything they need to meet standards in the time they have allotted to teach science. In these pages, you will see how Pathways:

Aligns to national science standards using three-dimensional teaching, learning, and assessment

Incorporates the digital tools for a flexible multimedia experience

Lends flexibility to teach in the class time allotted for science

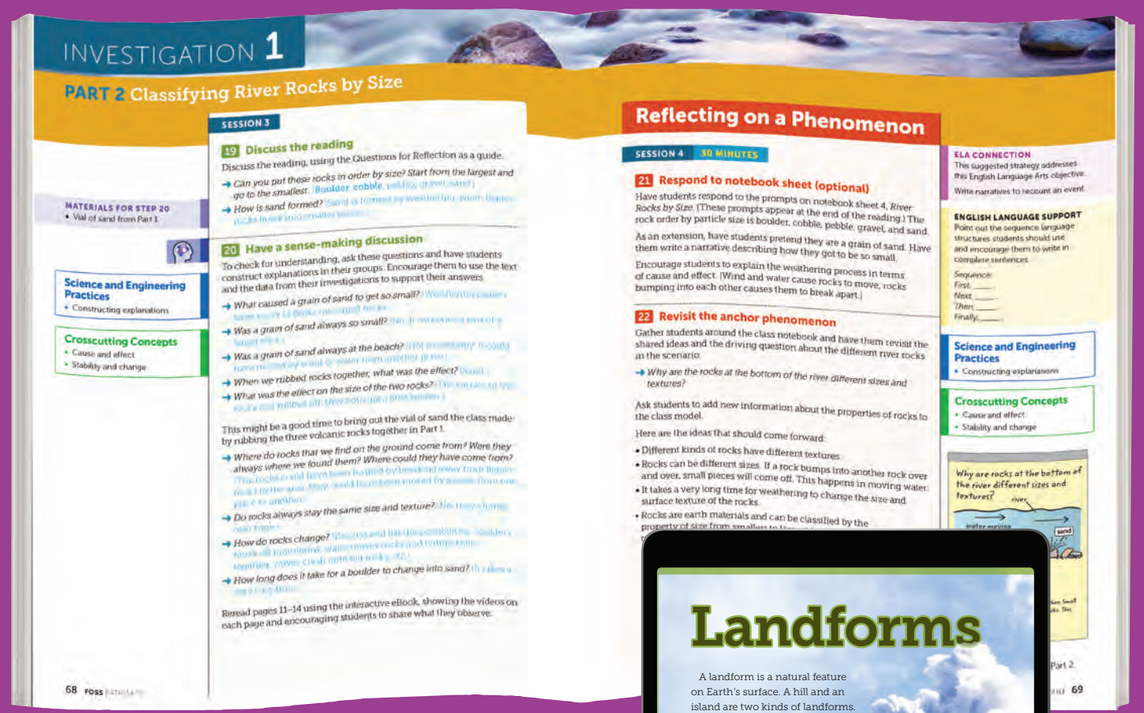
Utilizes a multimodal approach to resonate with every student

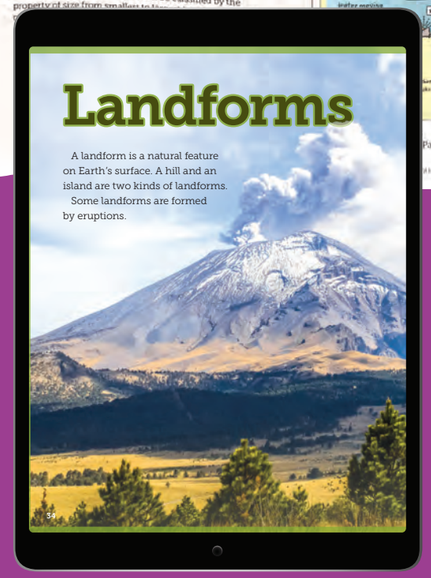
Immerses students in figuring out local and relevant phenomena and engineering problems

Provides unmatched teacher support to teach phenomena-based science

How Pathways develops the scientific thinkers of tomorrow

New FOSS Pathways supports today's demand to develop scientifically literate thinkers and problem solvers in a multitude of ways.





A logical progression

Students develop core ideas in a relevant and coherent learning progression that allows them to construct an explanation of the phenomena they have experienced.

Support for students

Comprehensive support and multimodal instructional experiences engage learners of all languages and cultures, taking advantage of prior experiences so all students can reason scientifically.

Evidence of learning

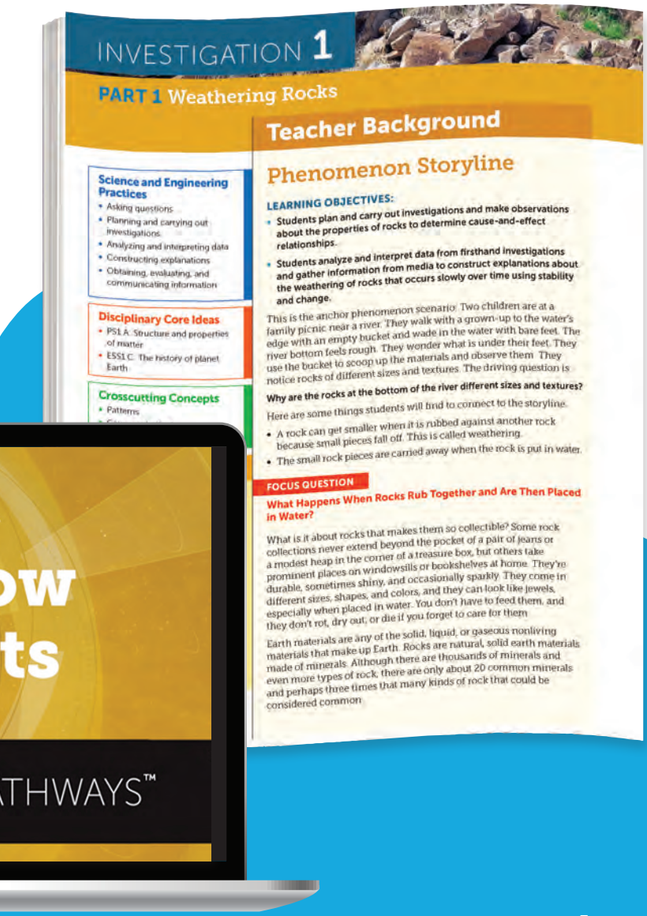
Research-based and field-tested assessments accurately measure student learning and progress. A variety of formative assessment tools provide evidence of students' use of the three dimensions and their knowledge of phenomena.

Support for teachers

Phenomena-based instruction is facilitated by appropriate educative support. This includes explicit background information needed for teachers to engage students in making the connection between the anchor phenomenon being investigated and the core ideas being exposed.

Rich digital resources

Digital resources for students and teachers are provided through FOSSweb on ThinkLink™. These multimedia materials are purposefully designed to enhance the learning experience and lend the flexibility to keep active science teaching viable if classroom circumstances change.



How FOSS Pathways aligns with today's standards

In this Sampler, pages 9-19 and 21-43 are provided from the teacher *Investigations Guide*. As you review, you will begin to witness the numerous ways that FOSS Pathways supports the development of tomorrow's scientists, engineers, and informed citizens. You'll see examples for:

Investigations driven by local, relevant phenomena and real-world problems

Instruction led by multimodal experiences that cognitively engage students to figure out phenomena

Identification of performances to meet targeted learning goals and elicit evidence of students' use of all three dimensions

Instructional support for teachers that provides an explicit connection between the phenomenon, three-dimensional learning, and multimodal learning experiences

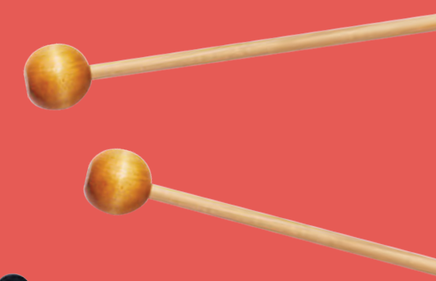
Clear integration of ELA/ELD skills and practices, with ties to standards and resources for engaging multilingual students

Cross-curricular activities that give students a choice and voice to differentiate instruction

▶ Images on this page include actual components, resources and/or materials provided in FOSS kits.

How FOSS aligns to NGSS Performance Expectations

Grade 2 NGSS Performance Expectations	FOSS Water and Landforms Module	
	Investigation(s)	Benchmark Assessment
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	**Investigation 1** **Investigation 2**	• Investigation 1 I-Check • Investigations 2–3 I-Check
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	**Investigation 1** **Investigation 2** **Investigation 3**	• Investigation 1 I-Check • Investigations 2–3 I-Check
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	**Investigation 3**	• Investigations 2–3 I-Check
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.	**Investigation 4**	• Investigation 4 I-Check
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.	**Investigation 4**	• Investigation 4 I-Check
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**Investigation 3**	• Investigations 2–3 I-Check



Water and Landforms Investigations

Investigation 1: Rocks

Part 1: Weathering Rocks
Part 2: Classifying River Rocks by Size

Investigation 2: Soil

Part 1: Sand and Silt
Part 2: Homemade Soil

Investigation 3: Changes to Landforms

Part 1: Erosion
Part 2: Fast and Slow Earth Events

Investigation 4: Water and Land

Part 1: Natural Sources of Water
Part 2: Describing Water and Landforms

Water and Landforms

▶ Start here to begin your review of the Grade 2 Water and Landforms Investigations Guide.

Introduction

This module provides grade 2 students with earth science core ideas dealing with earth materials and Earth events that cause changes to landforms. Students engage with the anchor phenomenon of earth materials that cover the planet's surface. They observe rocks and classify them based on properties, study the results of weathering and erosion, locate natural sources of water, and determine how to represent the shapes and kinds of land and bodies of water on Earth.

Students investigate two phenomena and two problems:

- Anchor phenomenon 1—Rocks in a river
- Anchor phenomenon 2—Different materials in soil
- A problem to solve 3—Reduce soil erosion
- A problem to solve 4—Plan for soil erosion study

Students use simple tools to observe, describe, analyze, and classify solid earth materials. The investigations complement the students' experiences in the **Solids and Liquids Module** with a focus on earth materials and the influence of engineering and science on society and the natural world. Students explore how wind and water change the shape of the land and compare ways to slow the process of erosion.

Students develop and use models, plan and carry out investigations, and analyze data to answer questions and construct explanations. Students gain experiences that contribute to their understanding of the crosscutting concepts of patterns; cause and effect; stability and change; and scale, proportion, and quantity.

CONTENTS

The NGSS Performance Expectations bundled in this module include:

Earth and Space Sciences
2-ESS1-1
2-ESS2-1
2-ESS2-2
2-ESS2-3

Physical Sciences
2-PS1-1

Engineering, Technology, and Applications of Science
K–2-ETS1-3

NOTE

The three modules for grade 2 in FOSS Pathways are:

- Water and Landforms
- Solids and Liquids
- Insects and Plants

Module Matrix
At a Glance

Phenomenon and Storyline	Driving Question and Focus Questions	Content and Disciplinary Core Ideas	Practices and Crosscutting Concepts	NGSS PEs
INV. 1 Rocks **Phenomenon 1—Rocks in a river:** Two children are at a family picnic near a river. With a grown-up, they walk to the water's edge with an empty bucket and wade in the water with bare feet. The river bottom feels rough. They wonder what is under their feet. They use the bucket to scoop up the materials and observe them. They notice rocks of different sizes, shapes, and textures. **Storyline:** Students are introduced to the phenomenon that rocks are not all the same. They investigate several kinds of volcanic rocks and begin to understand the properties of rocks. Students observe rocks (using hand lenses), rub rocks, wash rocks, classify rocks, and describe rocks. After rubbing two samples together, students find that rock is hard but also susceptible to weathering. Students investigate a mixture of different-sized river rocks. They separate the rocks using a series of three screens to identify five sizes of rock classifications: large pebbles, small pebbles, large gravel, small gravel, and sand. Weathering of earth materials results in rocks of small sizes that can have different textures.	***Why are the rocks at the bottom of a river different sizes and textures?*** **FOCUS QUESTIONS:** **What happens when rocks rub together and are then placed in water?** **How can rocks be separated by size?**	**PS1.A:** Structure and properties of matter **ESS1.C:** The history of planet Earth • Rocks are the solid material of Earth. Rocks can be described by their properties (color, shape). • Smaller rocks (sand) result from the breaking (weathering) of larger rocks. • When rocks are washed in water, their colors or sparkling qualities are enhanced. • Some rocks (such as tuff, scoria, and basalt) are formed from lava and other materials produced by volcanic eruptions. • Screens can be used to sort the size of earth materials. • Rock sizes include sand, small gravel, large gravel, small pebbles, and large pebbles. • Rocks larger than pebbles are cobbles. • Rocks larger than cobbles are boulders.	**Science and Engineering Practices** Asking questions Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Constructing explanations Obtaining, evaluating, and communicating information **Crosscutting Concepts** Patterns Cause and effect Stability and change Scale, proportion, and quantity	**2-PS1-1:** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. **2-ESS1-1:** Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
INV. 2 Soil **Revisit Phenomenon 1—Rocks in a river:** Two children are at a family picnic near a river. With a grown-up, they walk to the water's edge with an empty bucket and wade in the water with bare feet. The river bottom feels rough. They wonder what is under their feet. They use the bucket to scoop up the materials and observe them. They notice rocks of different sizes, shapes, and textures. **Phenomenon 2—Different materials in soil:** A student is digging with a shovel in the garden. When they turn over the soil, they observe some rock particles and other material. **Storyline:** Students continue observing the results of weathering of rocks by motion and moving water. Students take a close look at sand and separate sand particles from silt particles. They observe that the sand settles to the bottom and silt forms a layer on top of the sand. This leads students to the study of soil, a material composed of earth materials and humus. Students put the components together to make soil and use tools to separate it into its components. With this understanding of soil, students can investigate soil erosion in the next investigation.	***Why are the rocks at the bottom of a river different sizes and textures?*** ***What is soil?*** **FOCUS QUESTIONS:** **Is there an earth material smaller than sand?** **What is soil?**	**PS1.A:** Structure and properties of matter **ESS1.C:** The history of planet Earth • Sand often contains smaller particles called silt. • Weathering causes large rocks to break into small rocks. The effect is rocks of different sizes that can be sorted and described. • Water can be used to sort the sizes of earth materials. • Humus is decayed material from plants and animals. • The ingredients of soil can be observed by mixing soil with water, shaking it, and letting it settle. • Soil is made partly from weathered rock and partly from organic material.	**Science and Engineering Practices** Asking questions Planning and carrying out investigations Analyzing and interpreting data Constructing explanations Obtaining, evaluating, and communicating information **Crosscutting Concepts** Patterns Cause and effect Stability and change Scale, proportion, and quantity	**2-PS1-1:** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. **2-ESS1-1:** Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Module Matrix
At a Glance CONTINUED

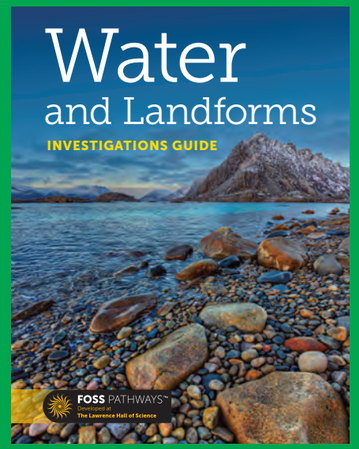
Phenomenon and Storyline	Driving Question and Focus Questions	Content and Disciplinary Core Ideas	Practices and Crosscutting Concepts	NGSS PEs
INV. 3 Changes to Landforms **A problem to solve 3—Reduce soil erosion:** A class makes regular visits to observe the hillside near the playground. The students know that the last storm washed away part of the hillside. The weather report predicts big rainstorms in the next few months. **Storyline:** Students use the online activity "Storm Lab" to test and collect data on soil erosion and methods to reduce the impact on a playground. They make decisions about which methods to test, how to test them, and then compare the results. Students gather and discuss information from a reading about other erosion problems caused by wind and water in different environments and the methods used to reduce the impact. They read about ways that wind and water move and shape the land. Students compare the time it takes to change the surface of the land.	***How can they protect the hillside from soil erosion?*** **FOCUS QUESTIONS:** **How can soil erosion be reduced?** **Which Earth events cause fast changes and which cause slow changes?**	**ESS1.C:** The history of planet Earth **ESS2.A:** Earth materials and systems **ETS1.C:** Optimizing the design solution • Wind and water change the shape of the land. • Engineers design methods to slow erosion by wind and water. • A landform is a natural feature on Earth's surface. • Some Earth events happen very quickly (volcanic eruptions, floods, soil erosion); others occur very slowly over a long period of time (weathering of rock). • The shapes and kinds of land can be represented in photos.	**Science and Engineering Practices** Asking questions Planning and carrying out investigations Analyzing and interpreting data Constructing explanations and designing solutions Obtaining, evaluating, and communicating information **Crosscutting Concepts** Cause and effect Stability and change	**2-ESS1-1:** Use information from several sources to provide evidence that Earth events can occur quickly or slowly. **2-ESS2-1:** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. **K–2-ETS1-3:** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
INV. 4 Water and Land **A problem to solve 4—Plan for soil erosion study:** Engineers are going to study our community to see if there are areas that might need protection from soil erosion. The engineers need a plan to study the landforms and water nearby. **Storyline:** Students are asked to help engineers plan for a soil erosion study. They begin by reading about sources of natural water, sort images of water sources, both fresh and salt water, and find out where water is found in their community. Students end the module by studying a variety of images (photographs, drawings, and maps) representing different landforms and bodies of water, and identify common features and differences. Students interpret models in a reading and then develop a model of water and land in their community.	***What would engineers need to know to begin their study of possible erosion in our community?*** **FOCUS QUESTIONS:** **Where is water found in our community?** **How can we show bodies of water and land formations?**	**ESS2.C:** The roles of water in Earth's surface processes **ESS2.B:** Plate tectonics and large-scale system interactions • Earth materials are natural resources. • Natural sources of water include streams, rivers, ponds, lakes, marshes, and the ocean. Sources of water can be fresh or salt water. • Water can be observed as a solid or liquid in nature. • The shapes and kinds of land and water can be represented in photos, drawings, and maps.	**Science and Engineering Practices** Asking questions Developing and using models Analyzing and interpreting data Constructing explanations Obtaining, evaluating, and communicating information **Crosscutting Concepts** Patterns Scale, proportion, and quantity	**2-ESS2-2:** Develop a model to represent the shapes and kinds of land and bodies of water in an area. **2-ESS2-3:** Obtain information to identify where water is found on Earth and that it can be solid or liquid.

FOSS Pathways includes:

Investigations Guide

The *Investigations Guide* is a spiral-bound guide containing everything you need to teach the module. FOSS active investigation lesson plans include:

- Three-dimensional learning objectives
- Relevant and local phenomena storylines with driving questions
- Sense-making discussions
- Embedded assessment and “What to Look For” guidance
- Vocabulary reviews
- English language support strategies
- ELA strategies and connections

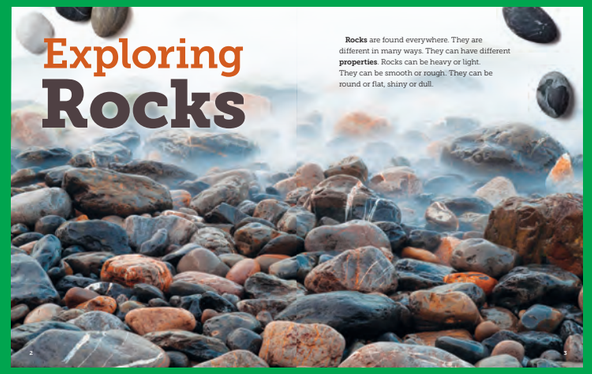


Science Resources Student Book

The *FOSS Science Resources* student book contains readings developed to reinforce, extend, or apply core ideas covered during FOSS active investigations. Readings give students opportunities to:

- Use text to obtain, evaluate, and communicate information
- Use evidence to support their ideas during sense-making discussions and focus question responses
- Integrate information from multiple sources
- Interpret graphs, diagrams, and photographs to build understanding

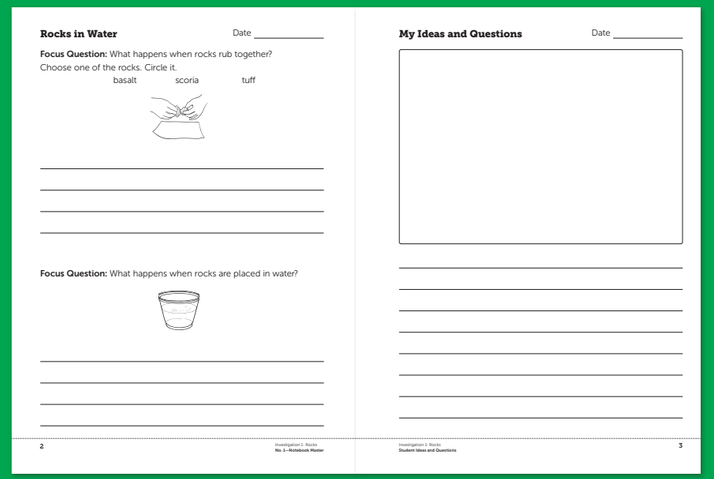
Available in print and as an interactive eBook in English and Spanish.

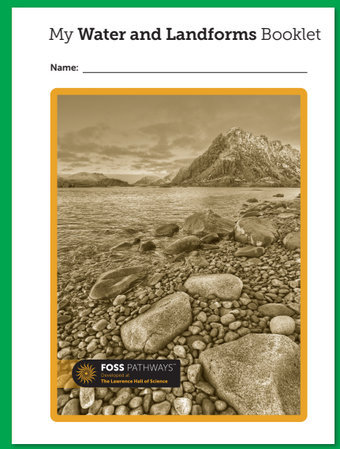


▶ Images on this page include actual components, resources and/or materials provided in FOSS kits.

Consumable Booklets

FOSS Booklets contain the Science Notebook Masters in a convenient booklet along with additional pages for writing and/or drawing opportunities and anchor phenomena explanations. There is one copy included in the kit. Additional copies are sold separately.





Equipment Kit

FOSS provides the equipment needed for all the investigations, including metric measuring tools. Our high-quality, classroomtested materials are long-lasting and packaged by investigation to facilitate preparation and clean up. There is enough permanent equipment in each kit for 24 students. Consumable materials are supplied for three uses. Convenient grade-level and refill kits are available.

Technology

Online resources include duplication masters, eInvestigations Guide, teaching slides, FOSSmap online assessment, streaming videos, virtual investigations, and tutorials, as well as a library of teacher resources, including access and equity, three-dimensional teaching and learning, and environmental literacy.

SCAN HERE FOR A TOUR OF FOSSWEB!

FOSSweb

FOSSweb digital resources are delivered on School Specialty's curriculum platform called ThinkLink.

- Supports single sign-on and class management with Google classroom and learning management systems.
- Provides access to both teacher and student digital resources, including duplication masters, teaching slides, FOSSmap online assessment, streaming videos, and online activities.

Teaching Slides

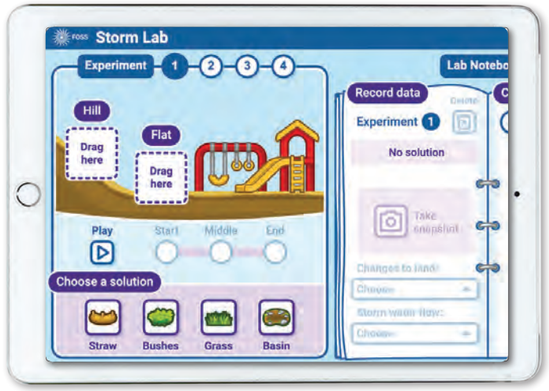
Downloadable and editable slides from FOSSweb can be used to facilitate each part of each investigation. Teaching slides are available as Google slides in English and Spanish.

Streaming Videos

New engaging content videos in English and Spanish were developed to specifically support FOSS investigations.

Online Activities

New engaging simulations developed to address core ideas in FOSS, and interactive virtual investigations and tutorials offer additional content support for students.



Interactive eBooks

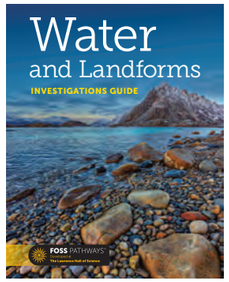
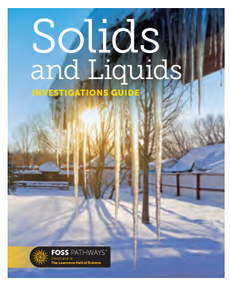
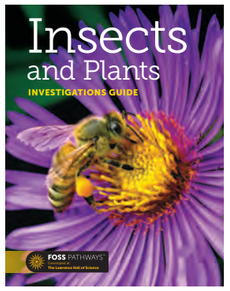
Keep your students engaged while teaching literacy skills with interactive *FOSS Science Resources* eBooks. The eBooks include integrated audio with text syncing and links to online activities and videos that bring the photos to life.

FOSSmap Online Assessment

Students in grades 3–5 can take summative assessments online with automatic coding of most responses. Student- and class-level reports help you identify the need for instructional next steps.

Grade Level Planning Guide

FOSS Pathways Modules Grade 2

FOSS Module	Module Overview/Bundled Performance Expectations	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
 Earth Science	The Water and Landforms Module provides experiences with Earth's natural resources—rocks, soil, and water—and provides opportunities for students to engage in science and engineering practices. Students explore the natural world by using simple tools to observe and describe the properties of earth materials. **NGSS PEs:** **Earth and Physical Sciences:** **2-ESS1-1** **2-ESS2-1** **2-ESS2-2** **2-ESS2-3** **2-PS1-1** **ETAS:** **K-2-ETS1-3**	**ESS1.C:** The history of planet Earth **ESS2.A:** Earth materials and systems **ESS2.B:** Plate tectonics and large-scale system interactions **ESS2.C:** The roles of water in Earth's surface processes **PS1.A:** Structures and properties of matter **ETS1.C:** Optimizing the design solution	• Asking questions • Planning and carrying out investigations • Analyzing and interpreting data • Constructing explanations • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Stability and change • Scale, proportion, and quantity
 Physical Science	In the Solids and Liquids Module, students observe, describe, and compare properties of common solids and liquids through firsthand experience. They plan and carry out investigations to find out what happens when solids and water are mixed and when liquids and water are mixed. They gain firsthand experience with reversible and irreversible changes caused by heating or cooling, and then expand their data collection through a simulation. They use evidence to engage in argumentation and support claims about reversible and irreversible changes to materials due to temperature changes. **NGSS PEs:** **Physical Sciences:** **2-PS1-1** **2-PS1-2** **2-PS1-3** **2-PS1-4** **ETAS:** **K-2-ETS1-1** **K-2-ETS1-2** **K-2-ETS1-3**	**PS1.A:** Structure and properties of matter **ETS1.A:** Defining and delimiting an engineering problem **ETS1.B:** Developing possible solutions **ETS1.C:** Optimizing the design solution	• Asking questions and defining problems • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Constructing explanations and designing solutions • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Energy and matter • Structure and function
 Life Science	The Insects and Plants Module builds understanding of growth and development of plants by observing new organisms over time. Students see the life cycles of insects unfold in real time and compare the structures and functions exhibited by each species to reveal patterns. At the same time, they grow a flowering plant in the classroom and gain experience with pollination, seed dispersal, and the ways in which plants and insects interact in feeding relationships. **NGSS PEs:** **Life Sciences:** **2-LS2-1** **2-LS2-2** **2-LS4-1** **ETAS:** **K-2-ETS1-2**	**LS1.B:** Growth and development of organisms **LS2.A:** Independent relationships in ecosystems **LS4.D:** Biodiversity and humans **ETS1.B:** Developing possible solutions	• Asking questions • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Constructing explanations • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Structure and function

FOSS® Pathways™ is an engaging PreK–5 science program developed at the Lawrence Hall of Science for the Next Generation Science Standards (NGSS). This sampler will introduce you to the major components of the program and show examples from FOSS Pathways Water and Landforms Investigations Guide.

Recommended Scope and Sequence

FOSS Pathways

GRADE	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
PK		Observing Nature	
K	Materials and Forces	Trees and Weather	Animals Two by Two
1	Sound and Light	Changes in the Sky	Plants and Animals
2	Solids and Liquids	Water and Landforms	Insects and Plants
3	Motion	Water and Climate	Structures of Life
4	Energy	Soils, Rocks, and Landforms	Senses and Survival
5	Mixtures and Solutions	Earth and Sun	Living Systems

Learn more at **FOSSPathways.com**

Scan the QR code and explore additional FOSS Pathways Samplers today.

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