

SAMPLER

Insects and Plants

INVESTIGATIONS GUIDE



FOSS PATHWAYS™

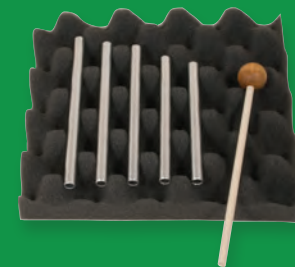
Developed at
The Lawrence Hall of Science

PreK–5 science that meets the challenge of our time

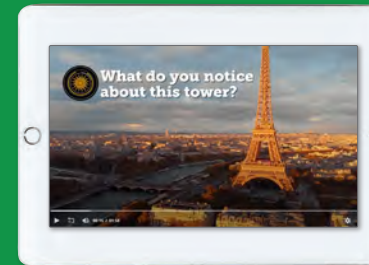
Welcome to new FOSS® Pathways™. Now as never before, the world needs scientific thinkers—to view the world thoughtfully, approach challenges analytically, and embrace opportunities enthusiastically. For educators to help unlock this potential in their students, they need powerful tools that work for 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.

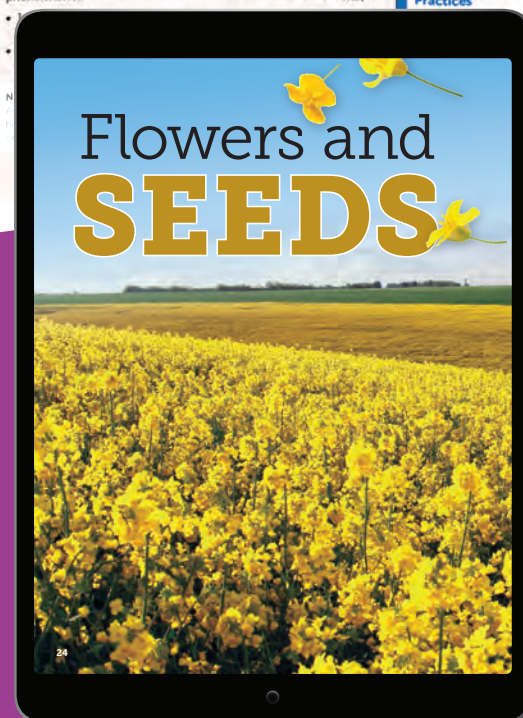


A logical progression

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

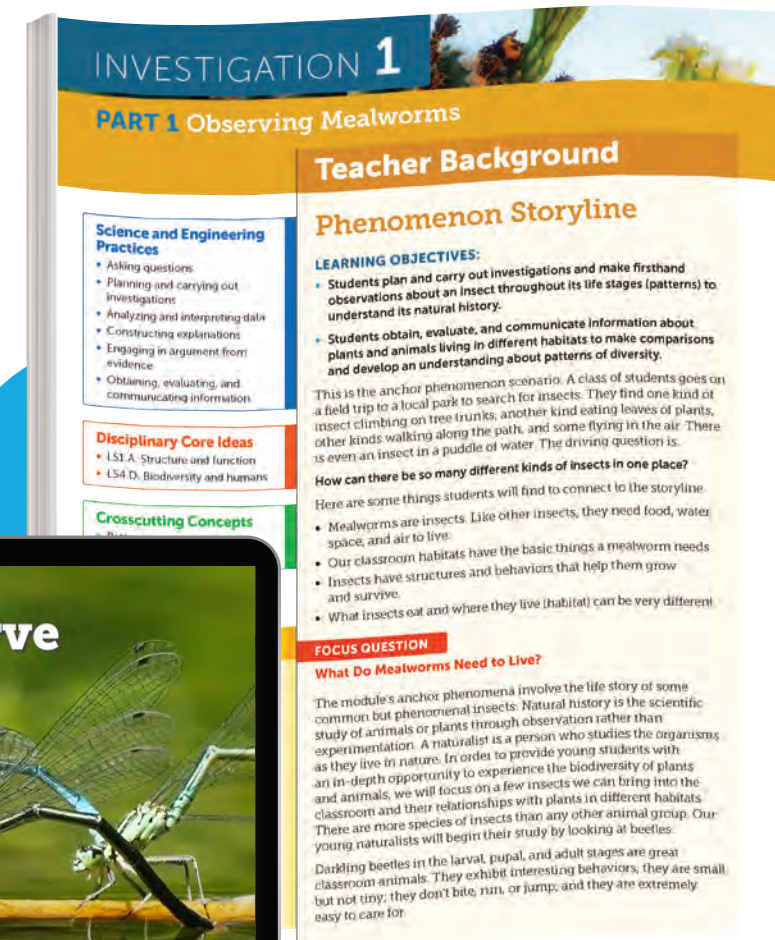
Research-based and field-tested assessments accurately measure student learning and progress. A variety of formative assessment tools provide evidence of students' use of the three dimensions and their knowledge of phenomena.

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 21-45 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

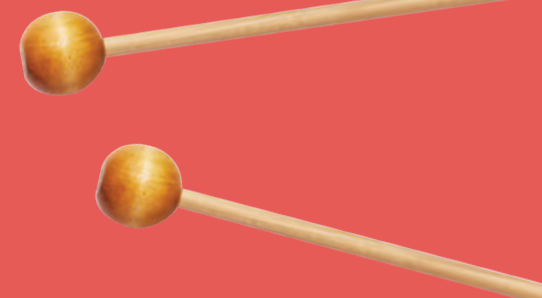
Cross-curricular activities that give students a choice and voice to differentiate instruction

► 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 Insects and Plants Module	
	Investigation(s)	Benchmark Assessment
2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.	Investigation 2	<ul style="list-style-type: none"> Investigations 1–2 I-Check
2-LS2-2. Develop a simple model that mimics the function of an animal dispersing seeds or pollinating plants.	Investigation 2 Investigation 3	<ul style="list-style-type: none"> Investigations 1–2 I-Check Investigation 3 I-Check
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.	Investigation 1 Investigation 3	<ul style="list-style-type: none"> Investigations 1–2 I-Check Investigation 3 I-Check
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.	Investigation 2 Investigation 3	<ul style="list-style-type: none"> Investigations 1–2 I-Check Investigation 3 I-Check



Insects and Plants Investigations

Insects and Plants

▶ Start here to begin your review of the Grade 2 Insects and Plants Investigations Guide.

Investigation 1: Habitats

- Part 1: Observing Mealworms
- Part 2: Comparing Habitats
- Part 3: Mealworm Growth and Changes

Investigation 2: Planting Seeds

- Part 1: Observing Brassica Growth
- Part 2: Plant Growth Lab
- Part 3: Seed Movement

Investigation 3: Diversity of Life

- Part 1: Butterflies
- Part 2: Flower Powder

Introduction

This module provides grade 2 students with life science core ideas dealing with organisms, their interactions, and the diversity of habitats where they live. In order to provide young students with in-depth opportunities to experience biodiversity, they will become naturalists and study insects and plants in and out of their classroom.

Students investigate three phenomena:

- Anchor phenomenon 1—Different insects in the park
- Anchor phenomenon 2—Plants growing in sidewalk cracks
- Anchor phenomenon 3—Bees and butterflies visiting flowers

Students ask questions to find out about organisms based on firsthand observations with several organisms they observe over time in the classroom while using media to compare the organisms that live in different habitats. They plan and carry out investigations with beetles and butterflies to analyze and interpret data about an animal's needs in their habitat during different stages in their life. They grow a flowering plant in the classroom and use a simulation to test conditions needed for plant growth. They gain experience with the ways plants and insects interact in feeding relationships and pollination and how animals facilitate seed dispersal.

Throughout the **Insects and Plants Module**, 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; systems and system models; and structure and function.

CONTENTS

- Introduction
- Module Matrix
- Conceptual Flow of Module
- FOSS Pathways Teaching Schedule
- FOSS Investigation Organization
- The Elements of the FOSS Instructional Design
- Diversity, Equity, and Inclusion
- Establishing a Classroom Culture

The NGSS Performance Expectations bundled in this module include:

- Life Sciences**
- 2-LS2-1
 - 2-LS2-2
 - 2-LS4-1

- Engineering, Technology, and Applications of Science**
- K-2 ETS1-2

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
<p>INV. 1 Habitats</p> <p>Phenomenon 1—Different insects in the park: A class of students goes on a field trip to a local park to search for insects. They find one kind of insect climbing on tree trunks, another kind eating leaves of plants, other kinds walking along the path, and some flying in the air. There is even an insect in a puddle of water.</p> <p>Storyline: Students are introduced to biodiversity by focusing on insects and plants and their interactions. Students take on the role of naturalists finding out about an organism through its life in its habitat. Students begin by investigating mealworms firsthand and observing their structures and behaviors in their habitat. Over 10 weeks, students observe the larvae grow, molt, pupate, and turn into beetles (adults). Students read to gather information about the diversity of plants and animals that live in eight different land and water habitats. They look for similarities in different habitats by matching organisms' photographs with the appropriate habitat.</p>	<p><i>How can there be so many different kinds of insects in one place?</i></p> <p>FOCUS QUESTIONS:</p> <p>What do mealworms need to live?</p> <p>What structures or behaviors do plants and animals have that help them live in their habitat?</p> <p>How do mealworms grow and change?</p>	<p>LS1.A: Structure and function LS4.D: Biodiversity and humans</p> <ul style="list-style-type: none"> • Insects are animals and need air, food, water, and space. They need to be treated with care and respect. • There are many different kinds of living things and they live in different places on land and in water. • A habitat is a place where plants and animals live. It provides what a plant or animal needs to live. • Plants and animals have structures and behaviors that help them survive in different habitats. • Habitats can be wet, dry, cold, or hot. Different plants and animals are able to survive in each different habitat. • Insects have characteristic structures and behaviors. • Insects have predictable characteristics at different stages of development. 	<p>Science and Engineering Practices</p> <p>Asking questions Planning and carrying out investigations Analyzing and interpreting data Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information</p> <p>Crosscutting Concepts</p> <p>Patterns Structure and function</p>	<p>2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.</p>
<p>INV. 2 Planting Seeds</p> <p>Phenomenon 2—Plants growing in sidewalk cracks: Students noticed small plants growing in a crack in the sidewalk. They think this is a strange place for someone to plant seeds.</p> <p>Storyline: Students engage with the natural history of a flowering plant and find out what plants need to grow. Each student plants tiny rapid-cycling brassica seeds in a planter cup. The brassica plants grow under continuous light and develop for a month. The students combine their firsthand observations of brassica growth with data gathered by planning and carrying out simulated experiments to test the effects of water and light on brassica seedling growth. Students are introduced to pollination by cross-pollinating their brassica plants and observing the complete life cycle from seed to seed. Students end the investigation by constructing explanations about how seeds can travel away from the parent plant to land in a crack in the sidewalk where they have access to light and water to grow into a mature plant and produce seeds.</p>	<p><i>How do the plants grow in the sidewalk crack?</i></p> <p>FOCUS QUESTIONS:</p> <p>How does a plant change as it grows?</p> <p>What do plants need to grow?</p> <p>How do seeds move away from the parent plant?</p>	<p>LS1.A: Structure and function LS1.B: Growth and development of organisms LS2.A: Interdependent relationships in ecosystems ETS1.B: Developing possible solutions</p> <ul style="list-style-type: none"> • Plants are living organisms that need water, air, nutrients, light, and space to grow. • Plants produce seeds that develop into new plants that look like the parent plant. • As plants grow, they develop roots, stems, leaves, buds, flowers, and seeds in a sequence called the life cycle. • Bees and other insects help some plants by moving pollen from flower to flower. • Seeds move away from parent plants via a number of seed-dispersal mechanisms, including wind and animals. • Structure-function relationships allow some animals to disperse seeds. 	<p>Science and Engineering Practices</p> <p>Asking questions Developing and using models Planning and carrying out investigations Analyzing and interpreting data Constructing explanations and designing solutions Using mathematics and computational thinking Obtaining, evaluating, and communicating information</p> <p>Crosscutting Concepts</p> <p>Patterns Cause and effect Structure and function</p>	<p>2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow.</p> <p>2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.</p> <p>K–2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it to function as needed to solve a given problem.</p>

Module Matrix

At a Glance CONTINUED



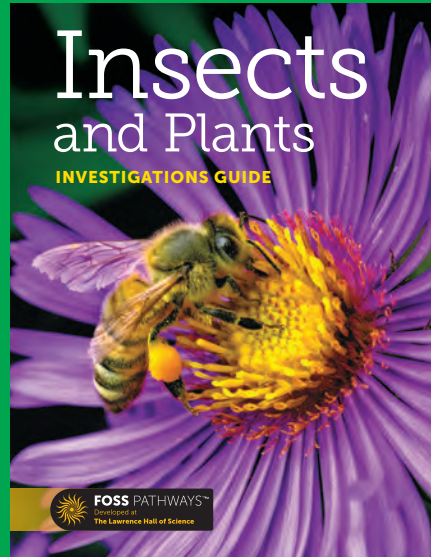
Phenomenon and Storyline	Driving Question and Focus Questions	Content and Disciplinary Core Ideas	Practices and Crosscutting Concepts	NGSS PEs
<p>INV. 3 Diversity of Life</p> <p>Phenomenon 3—Bees and butterflies visiting flowers: Several students visited the school garden and observed bees and butterflies of different kinds fly over and around the plants. The students followed individual insects and noticed that they would land on one flower, then fly and land on a second flower and so on.</p> <p>Storyline: Students conclude their study of animal biodiversity by nurturing and studying another insect—the painted lady butterfly. The class observes painted lady larvae grow, pupate, and emerge as adult butterflies. Students study pollination, make outdoor flowering plant observations, and construct, test, and share models of pollinators. Through reading and firsthand investigations in the schoolyard, students explore the phenomenon of pollination and the important role insects play in the life cycle of flowering plants.</p>	<p><i>What are the bees and butterflies doing when visiting flowers?</i></p> <p>FOCUS QUESTIONS:</p> <p>What is the natural history of a butterfly?</p> <p>How does pollen move from flower to flower?</p>	<p>LS1.A: Structure and function LS2.A: Interdependent relationships in ecosystems LS4.D: Biodiversity and humans ETS1.B: Developing possible solutions</p> <ul style="list-style-type: none"> • There are many different kinds of living things that live in different places. • Natural histories are different for different animals. • The natural history of the butterfly involves egg, larva that eats leaves, pupa, and adult that feeds on plant nectar. The larva crawls using legs and the adult flies with wings. • Bees, butterflies, other insects, and some birds help certain plants by moving pollen stuck to their bodies from flower to flower. • Bees visit flowers to gather food—pollen and nectar. • Butterflies and hummingbirds visit flowers to drink nectar. 	<p>Science and Engineering Practices</p> <p>Asking questions Developing and using models Planning and carrying out investigations Analyzing and interpreting data Constructing explanations and designing solutions Obtaining, evaluating, and communicating information</p> <p>Crosscutting Concepts</p> <p>Patterns Structure and function Systems and system models</p>	<p>2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.</p> <p>2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.</p> <p>K–2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it to function as needed to solve a given problem.</p>

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

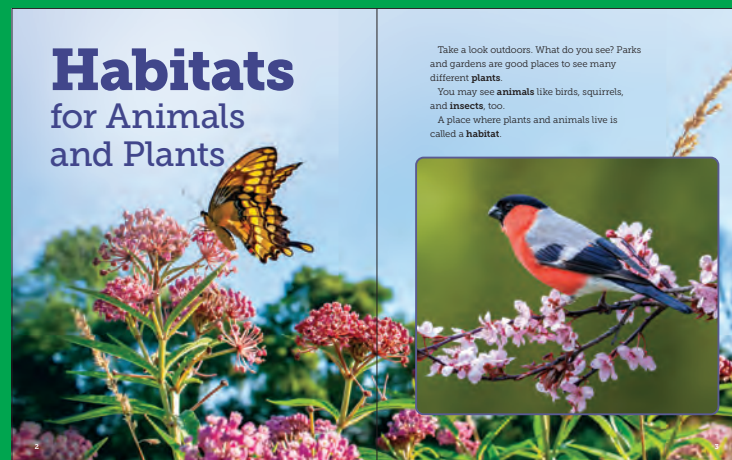


Science Resources Student Book

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

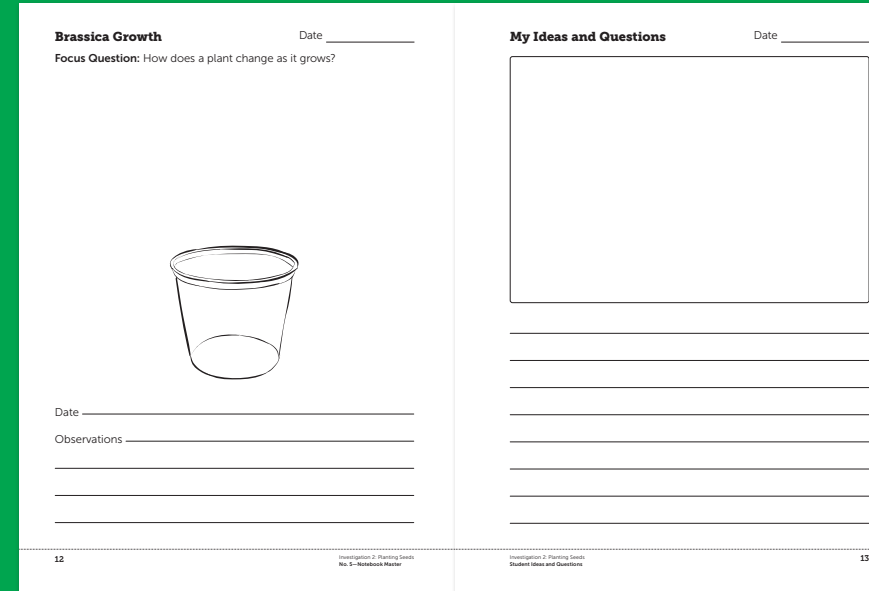
Available in print and as an interactive eBook in English and Spanish.



► 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, the *Investigations 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.



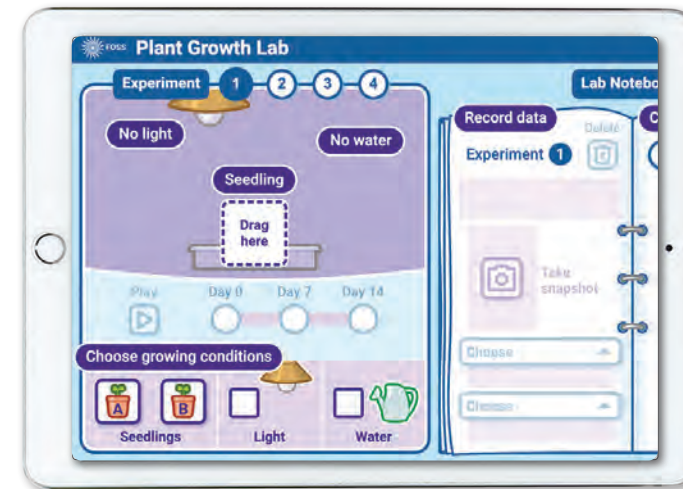
Streaming Videos

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



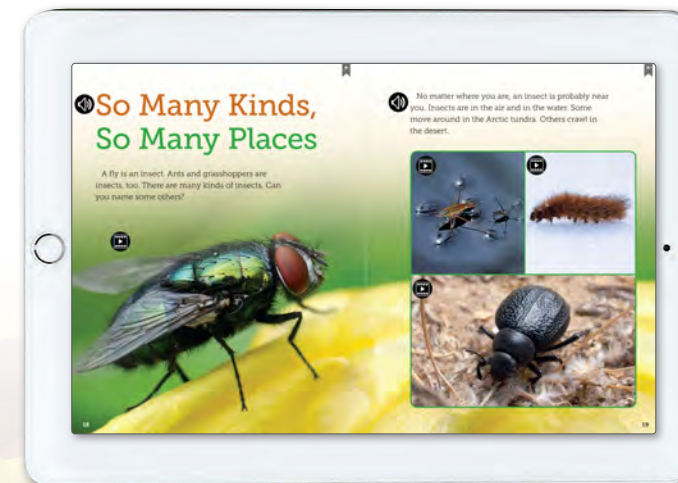
Online Activities

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.

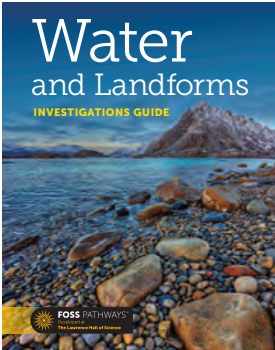
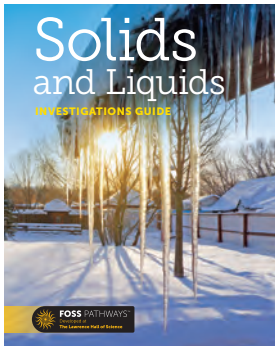
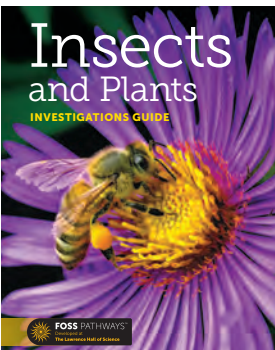


FOSSmap Online Assessment

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
 <p>Water and Landforms INVESTIGATIONS GUIDE</p> <p>Earth Science</p>	<p>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.</p> <p>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</p>	<p>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</p>	<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and interpreting data Constructing explanations Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Patterns Cause and effect Stability and change Scale, proportion, and quantity
 <p>Solids and Liquids INVESTIGATIONS GUIDE</p> <p>Physical Science</p>	<p>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.</p> <p>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</p>	<p>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</p>	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Patterns Cause and effect Energy and matter Structure and function
 <p>Insects and Plants INVESTIGATIONS GUIDE</p> <p>Life Science</p>	<p>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.</p> <p>NGSS PEs: Life Sciences: 2-LS2-1 2-LS2-2 2-LS4-1 ETAS: K-2-ETS1-2</p>	<p>LS1.B: Growth and development of organisms LS2.A: Independent relationships in ecosystems LS4.D: Biodiversity and humans ETS1.B: Developing possible solutions</p>	<ul style="list-style-type: none"> Asking questions Developing and using models Planning and carrying out investigations Analyzing and interpreting data Constructing explanations Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> 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 Insects and Plants 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

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FOSS Pathways Samplers today.



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