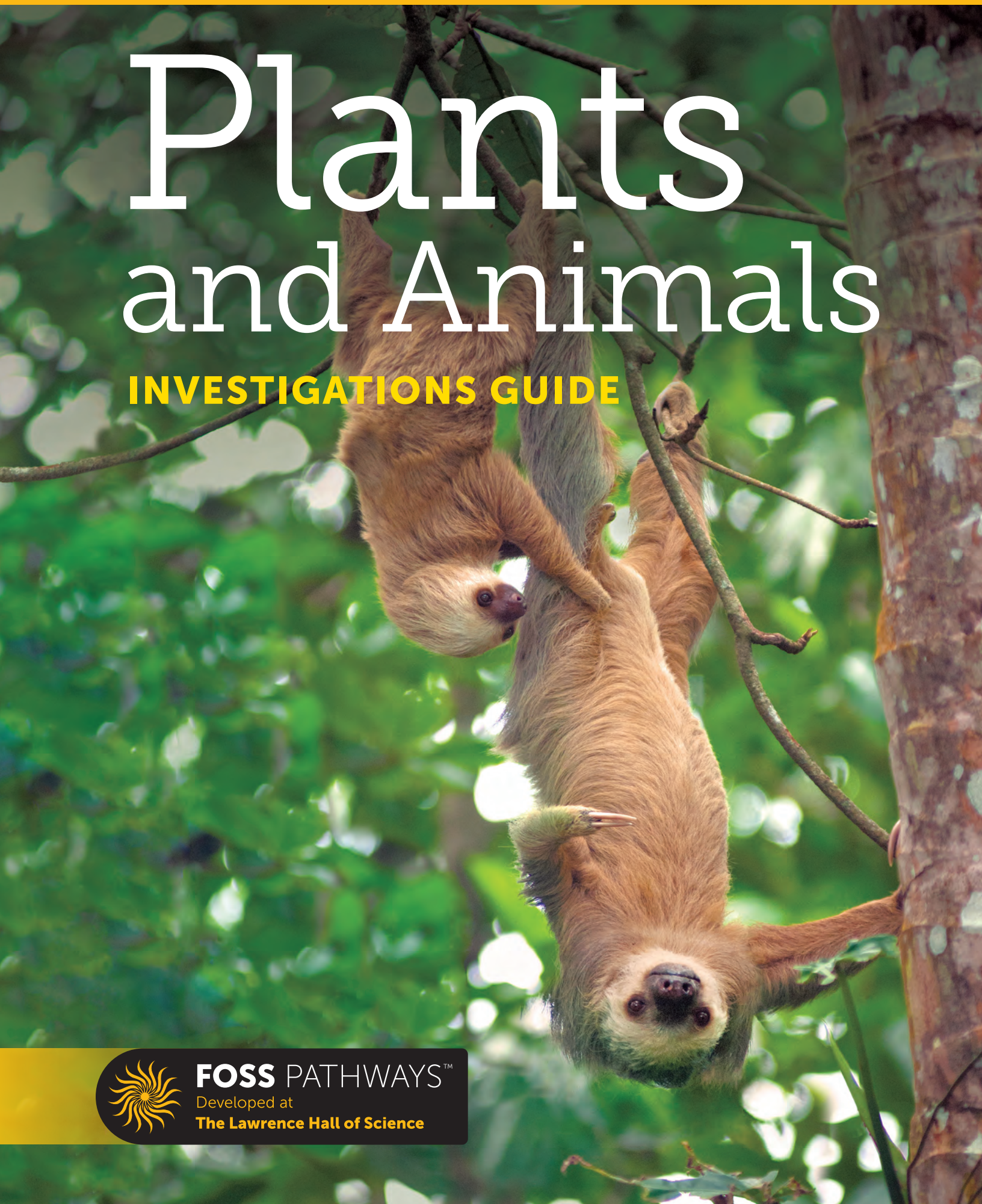
SAMPLER

Plants and Animals

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

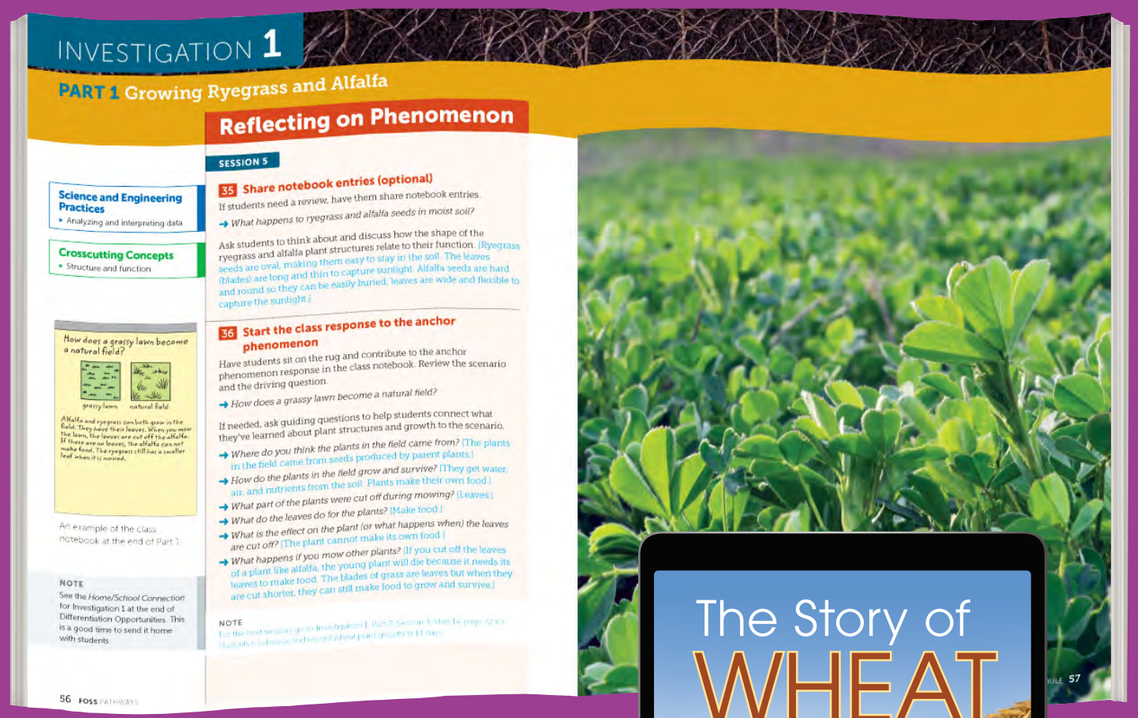
Utilizes a multimodal approach to resonate with every student

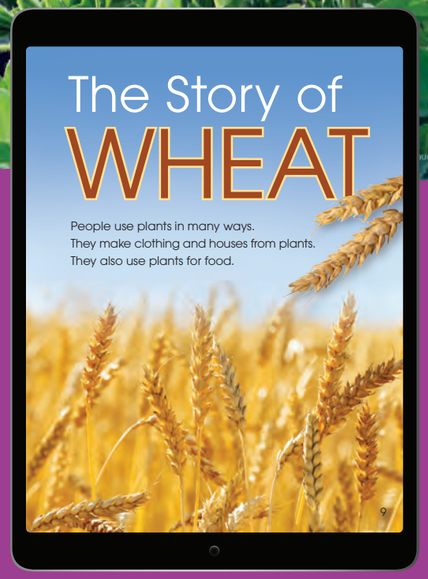
Immerses students in figuring out local and relevant phenomena and engineering problems

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

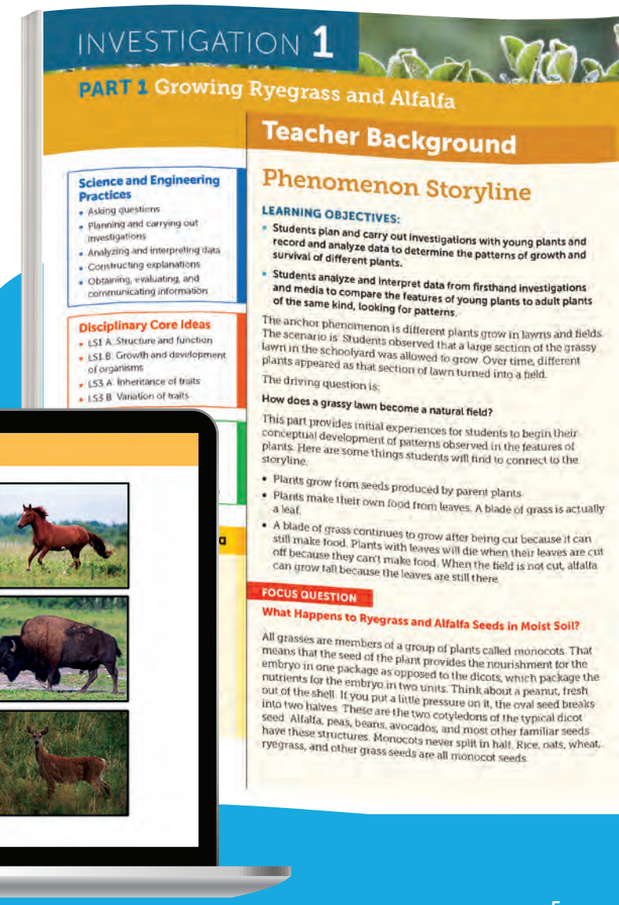
Research-based and field-tested assessments accurately measure student learning and progress. A variety of formative assessment tools provide evidence of students' use of the three dimensions and their knowledge of phenomena.

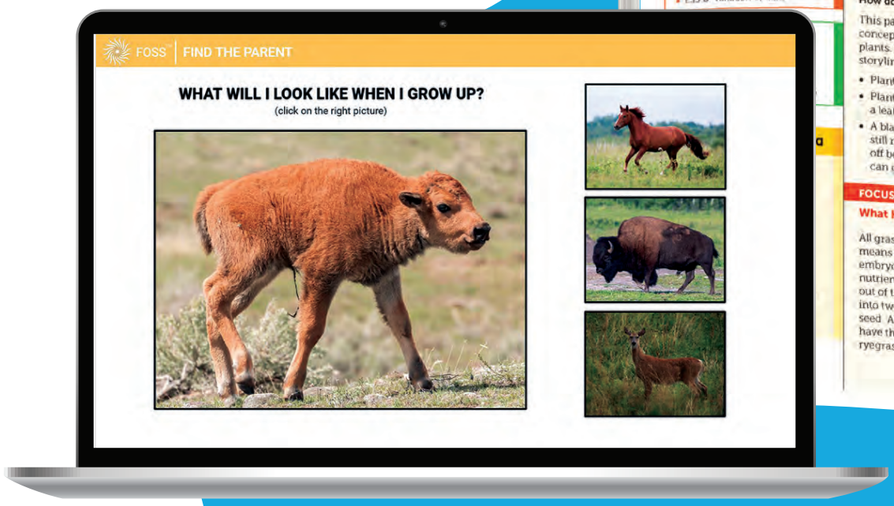
Support for teachers

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 21-51 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

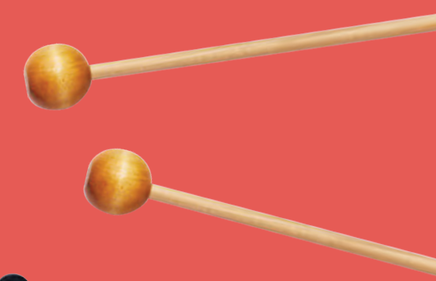
Clear integration of ELA/ELD skills and practices, with ties to standards and resources for engaging multilingual students

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 1 NGSS Performance Expectations	FOSS Plants and Animals Module	
	Investigation(s)	Benchmark Assessment
1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.	**Investigation 3**	• Investigation 1 I-Check • Investigations 2–3 I-Check
1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.	**Investigation 2**	• Investigations 2–3 I-Check
1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.	**Investigation 1** **Investigation 2**	• Investigation 1 I-Check • Investigations 2–3 I-Check
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.	**Investigation 2**	• Investigations 2–3 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 3**	• Investigations 2–3 I-Check



Plants and Animals Investigations

Investigation 1: Young Plants

Part 1: Growing Ryegrass and Alfalfa
Part 2: Growing Wheat

Investigation 2: Terrarium Habitats

Part 1: Observing Terrariums
Part 2: Animals and Their Young

Investigation 3: Learning from Nature

Part 1: Using Nature to Problem-Solve

Plants and Animals

▶ Start here to begin your review of the Grade 1 Plants and Animals Investigations Guide.

Introduction

This module engages students with young plants and animals (offspring) and the structures and behaviors that help them grow and survive into adulthood. Students observe and describe changes that occur as young plants grow, and design terrariums (habitat systems) that provide for the needs of both plants and animals living together.

Students explore the phenomenon of variation in the same kind of organism, including variation between young and adults. They learn about the behaviors of parents to help their offspring survive. And they explore structure and function relationships as they compare different kinds of animal and plant structures. They use their understanding of structure and function to invent solutions to human problems.

- Anchor phenomenon 1—Grassy lawn changing into a field
- Problem to solve 2—Rescued injured duckling
- Problem to solve 3—Design a way to work on a roof safely

Throughout the **Plants and Animals Module**, students engage in science and engineering practices by collecting and interpreting data to build explanations and designing and using tools to answer questions. Students gain experiences that will contribute to the understanding of the crosscutting concepts of patterns; cause and effect; systems and system models; and structure and function.

CONTENTS

The NGSS Performance Expectations bundled in this module include:

Life Sciences
1-LS1-1
1-LS1-2
1-LS3-1

Engineering, Technology, and Applications of Science
K–2 ETS1-1
K–2 ETS1-2

NOTE

The three modules for grade 1 in FOSS Pathways are:

- Changes in the Sky
- Sound and Light
- Plants and Animals

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 Young Plants **Phenomenon 1—Grassy lawn changing into a field:** Students observed that a large section of the grassy lawn in the schoolyard was allowed to grow. Over time, different plants appeared as that section of lawn turned into a field. **Storyline:** Students plant a miniature field in a planter cup of soil—ryegrass seeds and alfalfa seeds. They draw, compare, and record the growth of the two plants over time. Students read that plants need water, air, sunlight, and space to grow. After the two kinds of plants have grown tall, students cut the plants to simulate mowing the field. They observe and make drawings of what happens to the two kinds of plants. Students plant seeds of another grass and an important grain: wheat. The wheat is carefully positioned in transparent straws with pieces of paper towel to provide support and water to the seeds. Students observe what happens to the plants and record changes by drawing and making bar graphs. Students gather information about variation in plants and animals and the ways in which young organisms are like, but not exactly like, their parents.	*How does a grassy lawn become a natural field?* **FOCUS QUESTIONS:** **What happens to ryegrass and alfalfa seeds in moist soil?** **How does a wheat seed grow?**	**LS1.A:** Structure and function **LS1.B:** Growth and development of organisms **LS3.A:** Inheritance of traits **LS3.B:** Variation of traits • Plants produce young plants. Seeds are alive and grow into young plants. Seeds need water to begin growth. • Plants need water, air, nutrients, and space to grow. • Not all young plants grow alike. There are variations in structures that serve the same function. • Some plants die if they are cut near the ground, while others continue to live. • Plants have different structures for growth and survival. Plant roots take in water and nutrients, and leaves make food from sunlight. • Individuals of the same kind look similar but also vary in many ways (variation). • Young animals and plants are very similar to their parents but not exactly like their parents. • Wheat and other cereals that we eat come from seeds called grains.	**Science and Engineering Practices** Asking questions Planning and carrying out investigations Analyzing and interpreting data Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information **Crosscutting Concepts** Patterns Cause and effect Structure and function Scale, proportion, and quantity	**1-LS3-1:** Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
INV. 2 Terrarium Habitats **Problem 2—Rescued injured duckling:** An injured duckling was brought to a local nature center. The nature center cares for injured wild animals and returns them to their natural habitat when they are healthy. **Storyline:** Students build a terrarium with soil and the seeds and plant cuttings from Investigation 1. They construct a map showing the location of the seeds and plants. Students review what plants need to live, and read about what animals need. Students care for the terrarium and record changes they observe over time. They add food, water, shelter, and sow bugs. Students use three sources (a reading, sorting cards, and an online activity) to gather information about how parents care for their young. Parents provide food, shelter, transportation, cleaning, and safety from predators. Examples provide experience with how young are like but not exactly like their parents. The last reading provides information on structures that help animals survive in their habitats that will be useful in Investigation 3.	***What does the nature center need to know and do to be able to return the young duck to its habitat?*** **FOCUS QUESTIONS:** **What does the habitat provide for the plants and animals?** **How do parents help their young to survive?**	**LS1.A:** Structure and function **LS1.B:** Growth and development of organisms **LS3.A:** Inheritance of traits **LS3.B:** Variation of traits • Plants have different parts that help them survive and grow. • Animals use their body parts to meet their needs. • A habitat is a place where plants and animals live. It provides what a plant or animal needs to live. • A terrarium is a model habitat where plants and animals live in soil; it is a system of parts that work together. • Changes take place in a terrarium habitat over time. • Plant and animal habitats have features and behaviors that help them survive. • Adult animals can have young, and the young resemble their parents but are not exactly like them. • In many kinds of animals, parents and their young engage in behaviors that help the young to survive. • Individuals of the same kind look similar but can vary in many ways.	**Science and Engineering Practices** Asking questions Developing and using models Planning and carrying out investigations Constructing explanations Obtaining, evaluating, and communicating information **Crosscutting Concepts** Patterns Systems and system models Structure and function	**1-LS1-2:** Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. **1-LS3-1:** Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

Module Matrix
At a Glance CONTINUED

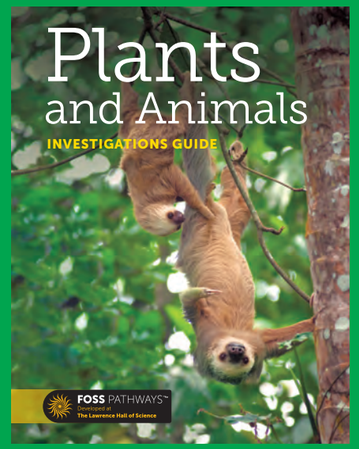
Phenomenon and Storyline	Driving Question and Focus Questions	Content and Disciplinary Core Ideas	Practices and Crosscutting Concepts	NGSS PEs
INV. 3 Learning from Nature **Problem 3—Design a way to work on a roof safely:** A class of first graders notices a hole in the roof of their play structure. They ask Jordan, the school custodian, to fix it. The teacher challenges the class to learn from the structures of plants and animals and recommend how Jordan could safely get to the top of the play structure to do the work on a hot day while carrying the necessary tools. **Storyline:** Students are presented with a complex engineering challenge of helping a person work safely on a play structure roof. Students define the various parts of the problem involved in this work. They read about how scientists and engineers study animal behavior and structures and apply what they learn to solve human problems (moving in water; climbing trees and poles; keeping warm in cold water or air). From media, they obtain, evaluate, and communicate information about structures that plants and animals have to survive. Students use the engineering process to apply their understanding of structures of plants or animals to develop their own design ideas. Students learn to engineer from nature.	***What can be done to make working on the play structure roof safe?*** **FOCUS QUESTION:** **What can engineers learn from nature to help them solve problems?**	**LS1.A:** Structure and function **ETS1.A:** Defining and delimiting engineering problems **ETS1.B:** Developing possible solutions • Engineers learn from nature in order to solve human problems. Many products have been designed by people by applying knowledge of nature (biomimicry). • Plant and animal habitats have structures and behaviors that help them survive. These features help animals to move on land and in water, find shelter, and protect themselves and young from danger. Plant structures help them get water and use light to make food to grow and reproduce. • Asking questions and gathering information are helpful in thinking about a problem in order to plan a solution. • Drawings can show the design of an object or tool that will solve the problem.	**Science and Engineering Practices** Asking questions and defining problems Developing and using models Analyzing and interpreting data Constructing explanations and designing solutions Obtaining, evaluating, and communicating information **Crosscutting Concepts** Structure and function Systems and system models	**1-LS1-1:** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. **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.

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:

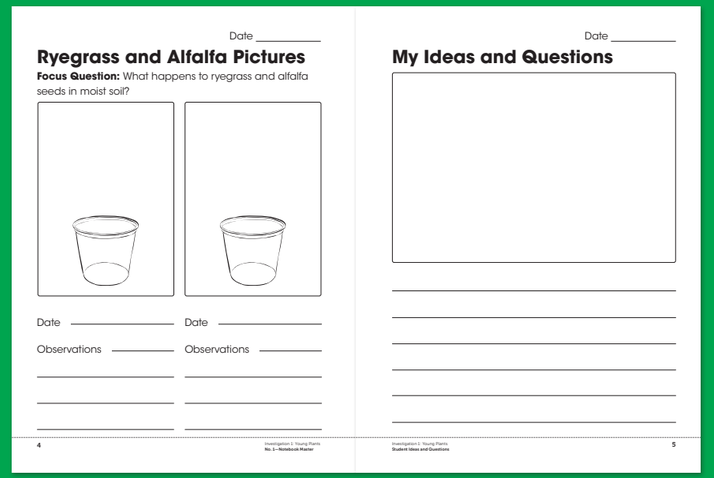
- Use text to obtain, evaluate, and communicate information
- Use evidence to support their ideas during sense-making discussions and focus question responses
- Integrate information from multiple sources
- Interpret graphs, diagrams, and photographs to build understanding

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.


Date _____

Ryegrass and Alfalfa Pictures

Focus Question: What happens to ryegrass and alfalfa seeds in moist soil?

Date _____ Date _____

Observations _____ Observations _____

4 Investigation 2: Young Plants No. 3—Notebook Master

Date _____

My Ideas and Questions

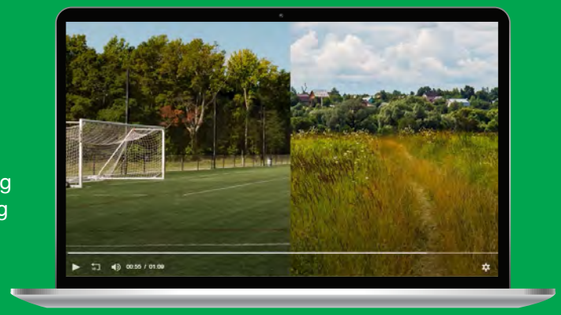
5 Investigation 2: Young Plants Student Ideas and Questions

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

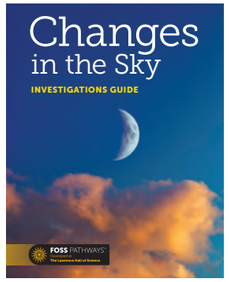
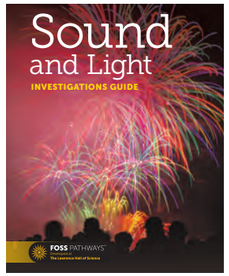
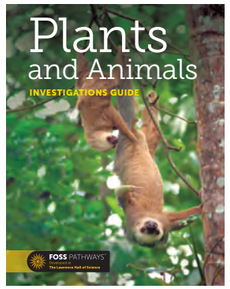
Keep your students engaged while teaching literacy skills with interactive *FOSS Science Resources* eBooks. The eBooks include integrated audio with text syncing and links to online activities and videos that bring the photos to life.

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 1

FOSS Module	Module Overview/Bundled Performance Expectations	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
 Earth Science	In the Changes in the Sky Module, students turn their focus upward to explore that some objects in the sky change position in predictable ways. They make observations and record data about sunrise and sunset at different times of year to relate the amount of daylight to the seasons. They use observations of the Sun, Moon, and stars to describe patterns that can be predicted and discover that the Moon can be seen in the day and night skies. **NGSS PEs:** **Earth Sciences:** **1-ESS1-1** **1-ESS1-2**	**ESS1.A:** The universe and its stars **ESS1.B:** Earth and the solar system	• Asking questions • Planning and carrying out investigations • Analyzing and interpreting data • Using mathematics and computational thinking • Constructing explanations • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Stability and change
 Physical Science	The Sound and Light Module provides students with experiences to explore how to change sound volume and develop simple models for how a sound travels from a source to a receiver. With light, students find out what happens when materials with different properties are placed in a beam of light and explore how to create and change shadows and reflections. Students explore how to use sound and light devices to communicate information and compare the ways in which animals use their senses to gather information about their environment. **NGSS PEs:** **Physical Sciences:** **1-PS4-1** **1-PS4-2** **1-PS4-3** **1-PS4-4** **ETAS:** **K-2-ETS1-1** **K-2-ETS1-2** **K-2-ETS1-3**	**PS4.A:** Wave properties **PS4.B:** Electromagnetic radiation **PS4.C:** Information technologies and instrumentation **ETS1.A:** Defining and delimiting engineering problems **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 • Systems and system models • Structure and function
 Life Science	The Plants and Animals Module provides experiences with young plants and animals and the structures and behaviors that help them grow and survive in their habitat. Students explore structure and function relationships in nature and use that knowledge to develop models. They learn about the behaviors of animal parents to support their offspring. **NGSS PEs:** **Life Sciences:** **1-LS1-1** **1-LS1-2** **1-LS3-1** **ETAS:** **K-2-ETS1-2**	**LS1.A:** Structure and function **LS1.B:** Growth and development of organisms **LS3.A:** Inheritance of traits **LS3.B:** Variation of trait **ETS1.A:** Defining and delimiting engineering problems **ETS1.B:** Developing possible solutions	• 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 • Systems and system models • 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 Plants and Animals 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.

Developed at:
The Lawrence Hall of Science
UNIVERSITY OF CALIFORNIA, BERKELEY

Published & distributed by:
Delta Education
School Specialty