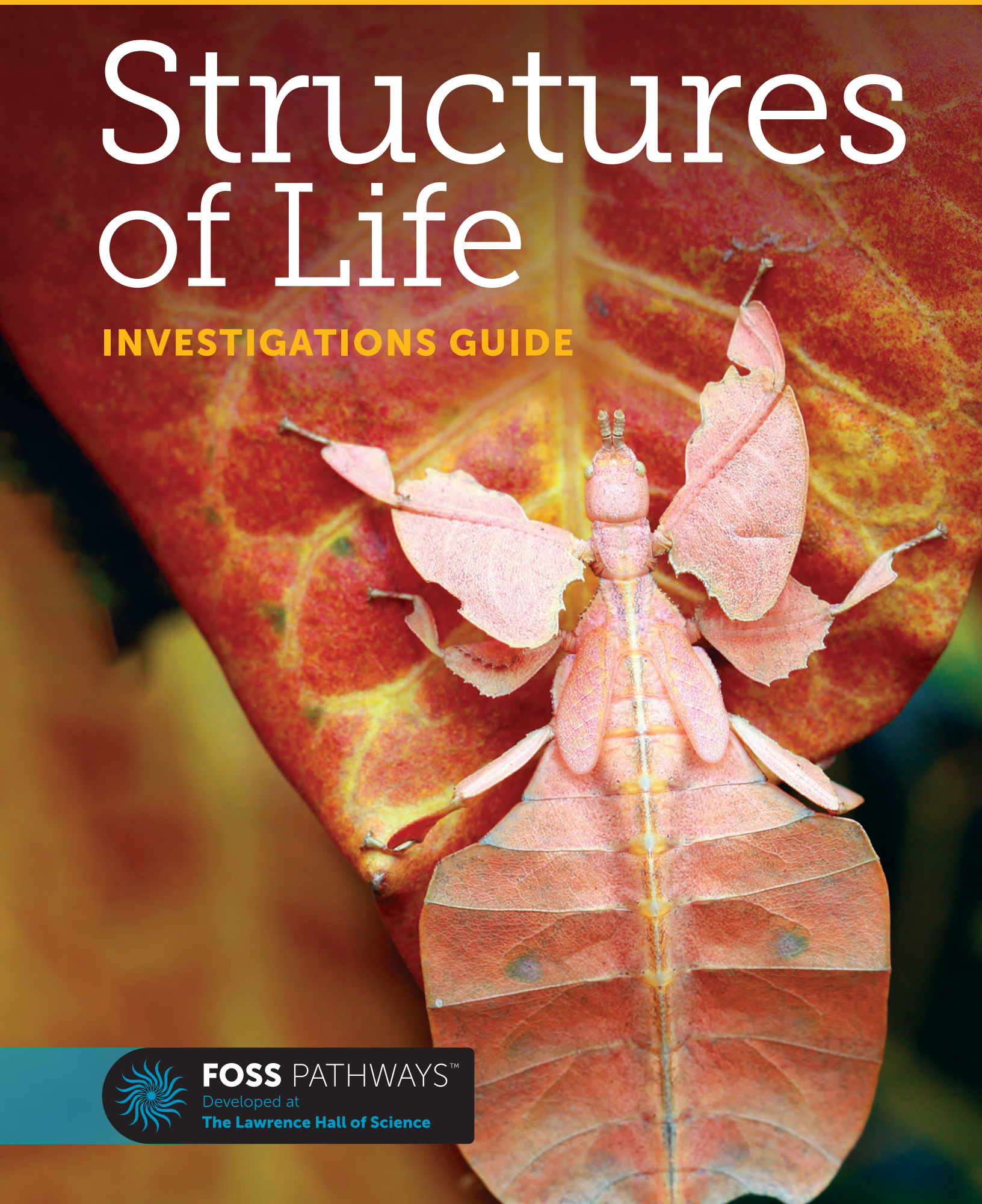
SAMPLER

Structures of Life

INVESTIGATIONS GUIDE



FOSS PATHWAYS™
Developed at
The Lawrence Hall of Science

PreK–5 science that meets the challenge of our time

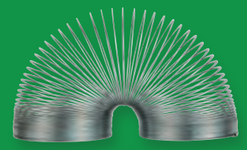
Welcome to new FOSS® Pathways™. Now as never before, the world needs scientific thinkers—to view the world thoughtfully, approach challenges analytically, and embrace opportunities enthusiastically. For educators to help unlock this potential in their students, they need powerful tools that work for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

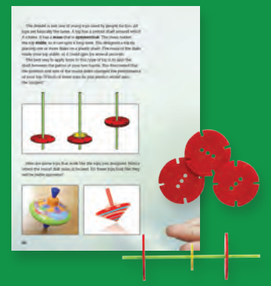
The Full Option Science System™ (FOSS) was conceived to enlist students not as passive recipients of information, but as active investigators of phenomena. That principle has proven its worth for 150,000 teachers and 4 million students across all 50 states, building a legacy of student engagement and test-score improvement. Now FOSS takes science education another significant step forward, with FOSS Pathways. This new PreK–5 core curriculum:

Aligns with today's national science standards and is adaptable to meet state and local requirements

Incorporates the digital tools for a flexible multimedia experience



Lends flexibility to teach in the class time allotted for science



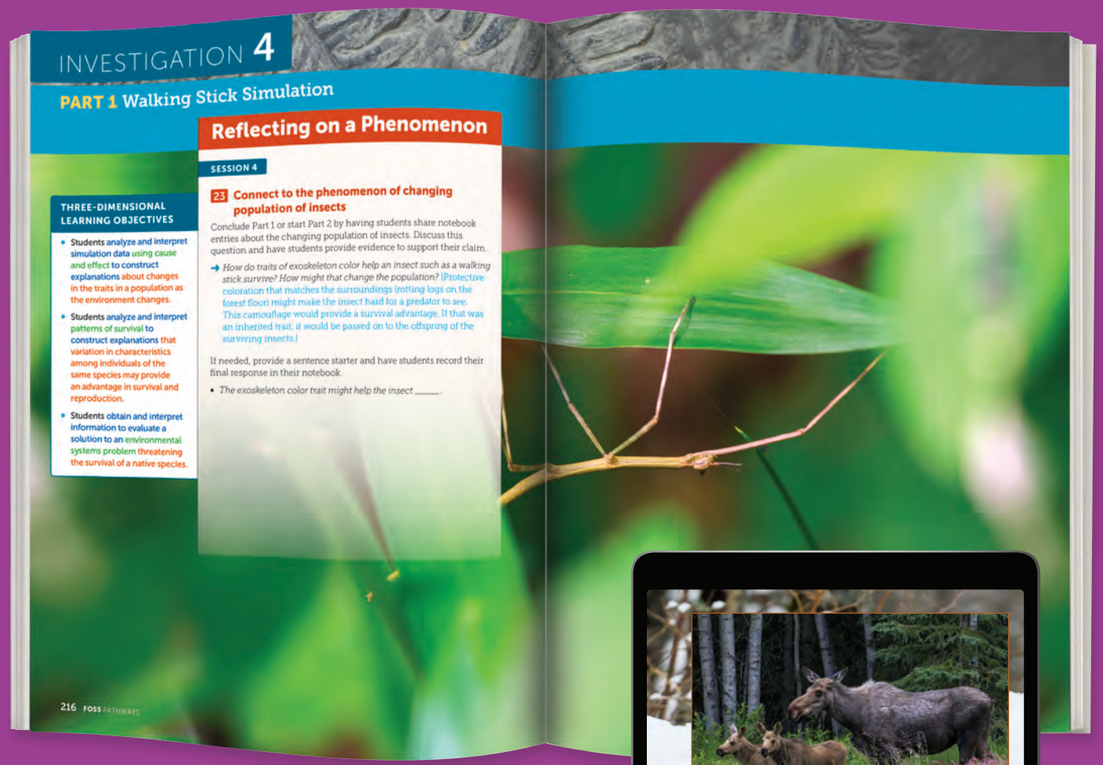
Teaches through a multimodal approach to resonate with every student

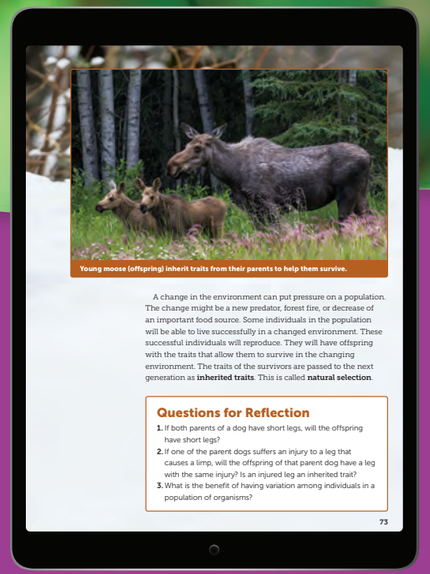
Engages students through coherent phenomenon storylines that are local and relevant

Provides unmatched educative 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

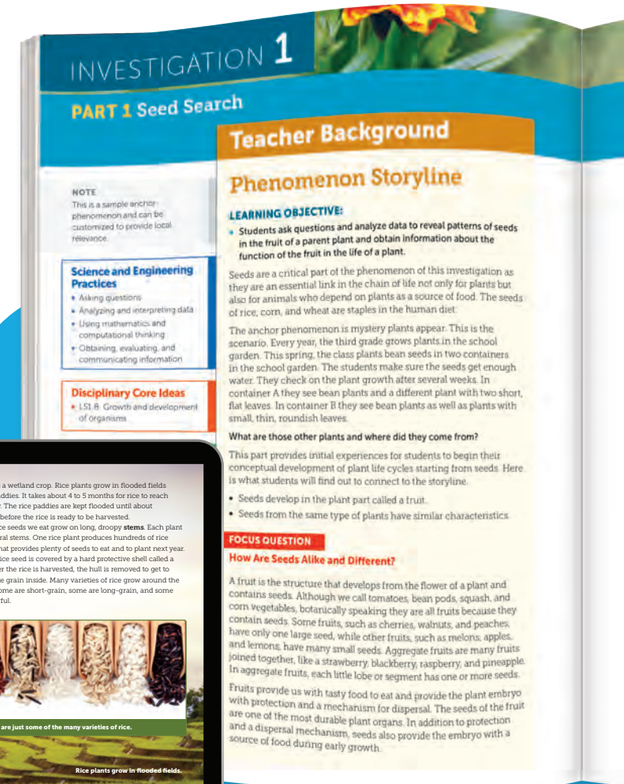
Research-based and field-tested assessments accurately measure student learning and progress. A variety of formative assessment tools provide evidence of students' use of the three dimensions and their knowledge of phenomena.

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 9-21 and 23-49 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 3 NGSS Performance Expectations	FOSS Structures of Life	
	Investigation(s)	Benchmark Assessment
3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	**Investigation 1** **Investigation 2**	• Investigations 1–2 I-Check • Survey/Posttest
3-LS2-1: Construct an argument that some animals form groups that help members survive.	**Investigation 3**	• Investigation 3 I-Check • Survey/Posttest
3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	**Investigation 2** **Investigation 3**	• Investigations 1–2 I-Check • Investigation 3 I-Check • Survey/Posttest
3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.	**Investigation 2**	• Investigations 1–2 I-Check • Survey/Posttest
3-LS4-1: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.	**Investigation 4**	• Survey/Posttest
3-LS4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	**Investigation 3**	• Investigation 3 I-Check • Survey/Posttest
3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	**Investigation 3**	• Investigation 3 I-Check • Survey/Posttest
3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	**Investigation 4**	• Survey/Posttest

Structures of Life Investigations

Investigation 1: Starting from Seed

Part 1: Seed Search
Part 2: The Sprouting Seed
Part 3: Seed Soak

Investigation 2: Growing Further

Part 1: Germination and Growth
Part 2: Life Cycle of the Bean

Investigation 3: Animal Characteristics

Part 1: Hisser Structures
Part 2: Characteristics and Adaptations
Part 3: Group Behavior for Survival

Investigation 4: Change over Time

Part 1: Walking Stick Simulation
Part 2: Environments Past and Present

Structures of Life

Start here to begin your review of the Grade 3 Structures of Life Investigations Guide

Introduction

In this module, students experience that organisms exhibit a variety of strategies for life, have a variety of structures and behaviors, have varied but predictable life cycles, and reproduce by passing inherited characteristics to offspring. Students explore how individual organisms have variations in their traits that may provide an advantage in surviving in a particular environment and how our knowledge of animals that survived in past environments is inferred by studying fossil characteristics.

Students engage with the ideas in the **Structures of Life Module** through five anchor phenomena:

- Anchor phenomenon 1—mystery plants appear
- Anchor phenomenon 2—some bean plants look different
- Anchor phenomenon 3—critters on the loose
- Anchor phenomenon 4—changing population of insects
- Anchor phenomenon 5—uncovering unexpected organisms

Students observe, compare, categorize, and care for organisms. Students engage in science and engineering practices to investigate the structures and behaviors of organisms and learn how the structures function in growth, survival, and reproduction. Students look at the interactions between organisms of the same kind, among organisms of different kinds, and between the environment and populations of organisms over time. Students focus on these crosscutting concepts to develop understandings about organisms and population survival—patterns; cause and effect; scale, proportion, and quantity; systems and system models; and structure and function.

CONTENTS

The NGSS Performance Expectations bundled in this module include:

Life Sciences
3-LS1-1
3-LS2-1
3-LS3-1
3-LS3-2
3-LS4-1
3-LS4-2
3-LS4-3
3-LS4-4

NOTE

The three modules for grade 3 in FOSS Pathways are:

- Water and Climate
- Motion
- Structures of Life

Structures of Life
At a Glance

Phenomenon and Storyline	Driving Question and Focus Questions	Content and Disciplinary Core Ideas	Practices and Crosscutting Concepts	NGSS PEs
INV. 1 Starting from Seed **Phenomenon 1—Mystery plants appear:** Students observe mystery plants growing in the school garden plot where they planted only bean seeds. **Storyline:** Students plan and carry out investigations about cause-and-effect relationships with water and seeds to figure out where plants come from and how they change. Students monitor and record daily changes in seeds. Their data show that in the presence of water, seeds germinate. They construct explanations based on evidence about similarities and differences in the growth of different kinds of seeds. Finally, students engage in argument about whether or not seeds are alive using evidence from their firsthand investigations.	***What are those other plants and where did they come from?*** **FOCUS QUESTIONS:** **How are seeds alike and different?** **What effect does water have on seeds?** **What are the parts of a seed?**	**LS1.B:** Growth and development of organisms • Seeds develop in the plant part called a fruit. • Different kinds of fruits have different kinds and numbers of seeds. • Seeds have a variety of characteristics. • Seeds undergo developmental changes in the presence of water. • A seed is an organism, a living thing. • A seed contains the plant embryo and a supply of food. • A seed grows into a new plant (reproduction).	**Science and Engineering Practices** Asking questions Planning and carrying out investigations Analyzing and interpreting data Using mathematics and computational thinking Engaging in argument from evidence Obtaining, evaluating, and communicating information **Crosscutting Concepts** Patterns Cause and effect Structure and function	**3-LS1-1:** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
INV. 2 Growing Further This investigation presents two linked anchor phenomena dealing with the life cycle of plants: inherited traits and environmental effects on traits. **Revisit phenomenon 1—Mystery plants appear:** Based on the germination patterns, students identify the mystery plants in the school bean garden as peas and sunflowers. Later, after observing the life cycle of the bean plant, students infer that plants grown the previous year in the garden containers were the source of seeds for the mystery plants. **Phenomenon 2—Some bean plants look different:** The bean plants in the two school garden containers have been growing for a number of weeks, but the plants in the two locations look different. **Storyline:** Students analyze and interpret the stages in the bean plant's life cycle based on firsthand experience growing the plants in hydroponic containers in the classroom and observing differences in the individual plants. They obtain and evaluate data to construct explanations about the effect of the environment on plant characteristics. They determine that an environmental factor—the amount of sunlight—causes the difference in the plant characteristics.	***What causes the bean plants to look different in the two containers?*** **FOCUS QUESTIONS:** **What structures does a seedling have to help it grow and survive?** **What is the sequence of the bean plant's life cycle?**	**LS1.A:** Structure and function **LS1.B:** Growth and development of organisms **LS3.A:** Inheritance of traits **LS3.B:** Variation of traits • Germination is the onset of a seed's growth. • Plants need water, light, air, space, and nutrients to grow. • Each kind of organism has inherited characteristics. • Roots are plant structures that serve several functions. One function is to take up water and nutrients so they can be transported to other parts of the plant. • The plant life cycle is the sequence of stages during which a seed grows into an adult (mature) plant and produces seeds, which in turn produce new plants of the same kind. • The fruit of a plant develops from a flower. • Plants and animals have unique and diverse life cycles. Each kind of organism has inherited characteristics. • Some characteristics are the result of the environment.	**Science and Engineering Practices** Developing and using models 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	**3-LS1-1:** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. **3-LS3-1:** Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. **3-LS3-2:** Use evidence to support the explanation that traits can be influenced by the environment.

Structures of Life
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 Animal Characteristics **Phenomenon 3—Critters on the loose:** Students find a large insect in the hallway near the science discovery room. When the teacher collects the organism, it hisses and moves. **Storyline:** Students have firsthand experiences investigating one species of insect (hissers), establishing a classroom habitat with several individuals, and observing the structures and behavior of the hissers over time. Students obtain and evaluate information about the characteristics that allow other types of animals and their offspring to survive in specific environments. Students analyze and interpret information about the structures and behaviors of organisms as individuals and in social groups.	***How did this animal get into the hallway and what does it need to survive?*** **FOCUS QUESTIONS:** **What are the structures of a hisser?** **How do hisser structures and behaviors help them survive?** **How does living in a group help animals survive in their environment?**	**LS1.A:** Structure and function **LS1.B:** Growth and development of organisms **LS2.D:** Social interactions and group behavior **LS3.A:** Inheritance of traits **LS3.B:** Variation of traits **LS4.C:** Adaptation • Hissers have observable structures that serve various functions in growth, survival, and reproduction. • Hissers have particular requirements for life, including warm temperature, water, food, and a protected space. • Characteristics of animals (structures and behaviors) that help them survive are adaptations. • Each kind of organism has inherited characteristics. Other characteristics are the result of the environment. • Not all organisms of the same type look alike. • Some organisms live in social groups, which help them find food and protect themselves from predators. • Diversity of organisms is related to the diversity of environments.	**Science and Engineering Practices** Asking questions Analyzing and interpreting data Constructing explanations Obtaining, evaluating, and communicating information **Crosscutting Concepts** Cause and effect Systems and system models Structure and function	**3-LS1-1:** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. **3-LS2-1:** Construct an argument that some animals form groups that help members survive. **3-LS3-1:** Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. **3-LS4-3:** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Structures of Life
At a Glance CONTINUED

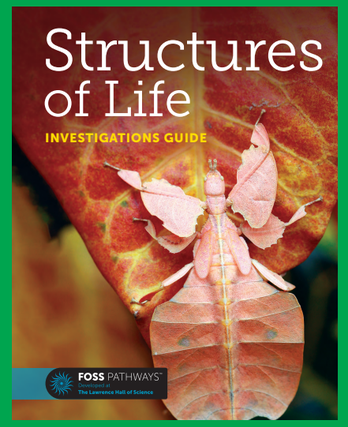
Phenomenon and Storyline	Driving Question and Focus Questions	Content and Disciplinary Core Ideas	Practices and Crosscutting Concepts	NGSS PEs
INV. 4 Change over Time **Phenomenon 4—Changing population of insects:** Some students find walking sticks living in bamboo. Students observe that this species comes in three colors. However, over a few generations, one color begins to outnumber the others. **Storyline:** Students use a computer simulation to carry out an investigation to find out how variation of traits in a species might affect survival of individuals in the population in different environments. Students obtain information about a community's effort to restore a watershed habitat for an endangered native population of shrimp. **Phenomenon 5—Uncovering unexpected organisms:** Recently a group of college students was looking for fragments of dinosaur bones during a field trip in South Dakota. Instead of small pieces, they unearthed a huge triceratops skull. **Storyline:** Students go on virtual digs in three U.S. locations, collect data, and develop evidence to support a claim about the fossils uncovered. Students look at change in environments over long periods of time.	***What is causing the change in the number of each color of walking stick in this environment?*** **FOCUS QUESTION:** **How does variation in traits among individuals of a species affect survival of the species?** ***What do fossils tell us about organisms in the past and their environments?*** **Focus question and driving question are the same.**	**LS2.C:** Ecosystem dynamics, functioning, and resilience **LS3.B:** Variation of traits **LS4.A:** Evidence of common ancestry and diversity **LS4.B:** Natural selection **LS4.C:** Adaptation **LS4.D:** Biodiversity and humans • Different organisms can live in different environments; organisms have adaptations that allow them to survive in that environment. • Differences in characteristics (variation in traits) between individuals of the same species may provide an advantage in survival and reproduction. • When the environment changes, some organisms survive and reproduce; others move to new locations; some die. • Fossils provide important evidence about extinct organisms and past environments. • Some organisms that once lived on Earth are now extinct. Some organisms that are extinct have modern counterparts. • People design solutions to problems that occur when the environment changes.	**Science and Engineering Practices** Planning and carrying out investigations Developing and using models Analyzing and interpreting data Using mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information **Crosscutting Concepts** Patterns Cause and effect Systems and system models Scale, proportion, and quantity	**3-LS3-1:** Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in groups of similar organisms. **3-LS4-1:** Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. **3-LS4-2:** Use evidence to explain how variation in characteristics among individuals of the same species provides advantages in surviving, finding mates, and reproducing. **3-LS4-3:** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. **3-LS4-4:** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

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

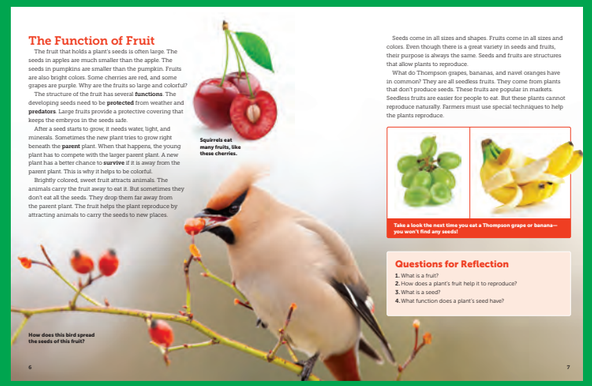


Science Resources Student Book

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.



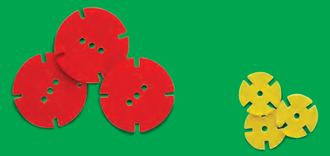
▶ Images on this page include actual components, resources and/or materials provided in FOSS kits.

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 32 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.



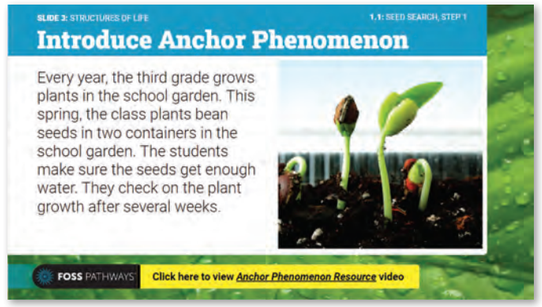
FOSSweb on ThinkLink

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.



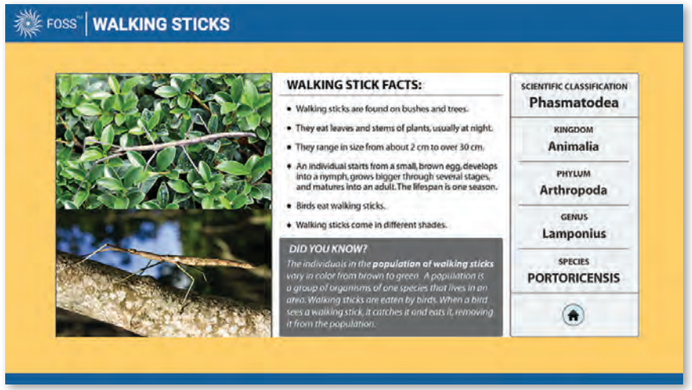
Streaming Videos

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

SCAN HERE FOR A TOUR OF FOSSWEB!

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

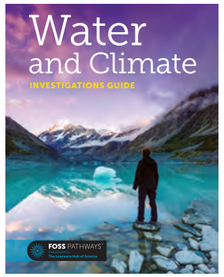
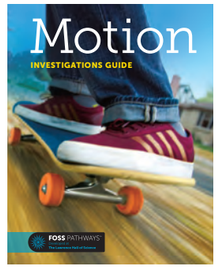
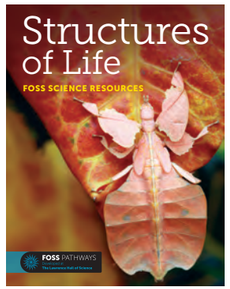
Keep your students engaged while teaching literacy skills with interactive *FOSS Science Resources* eBooks. The eBooks include integrated audio with text syncing and links to online activities and videos that bring the photos to life.

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 3

FOSS Module	Module Overview/Bundled Performance Expectations	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
 Earth Science	In the Water and Climate Module, students engage in science and engineering practices as they investigate the role of water in weather and how weather conditions change around the world and throughout the year while exploring the crosscutting concepts of patterns; cause and effect; and scale, proportion, and quantity. They are introduced to the nature of science, how science affects everyday life, and the influence of engineering, technology, and science on society and the natural world. **NGSS PEs:** **Earth and Space Sciences:** **3-ESS2-1** **3-ESS2-2** **3-ESS3-1**	**ESS2.D:** Weather and climate **ESS3.B:** Natural hazards **ESS2.C:** The roles of water in Earth's surface processes	• Asking questions • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Scale, proportion, and quantity
 Physical Science	In the Motion Module, students engage in science and engineering practices as they investigate phenomena and collect data to answer questions about the effects of magnetic force and the force of gravity on objects. Students explore the crosscutting concepts of patterns; cause and effect; and systems and system models as they define problems in order to develop solutions. Students reflect on their own use of science and engineering practices and find out how others use these practices in their careers. **NGSS PEs:** **Physical Sciences:** **3-PS2-1** **3-PS2-2** **3-PS2-3** **3-PS2-4** **ETAS:** **3-5 ETS1-1** **3-5 ETS1-2** **3-5 ETS1-3**	**PS2.A:** Forces and motion **PS2.B:** Types of interactions **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 • Using mathematics and computational thinking • Constructing explanations and designing solutions • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Systems and system models
 Life Science	In the Structures of Life Module, students observe, compare, categorize, and care for organisms. Students engage in science and engineering practices to investigate the structures and behaviors of organisms and learn how the structures function in growth, survival, and reproduction. Students look at the interactions between organisms of the same kind, among organisms of different kinds, and between the environment and populations of organisms over time. Students focus on these crosscutting concepts to develop understandings about organisms and population survival—patterns; cause and effect; scale, proportion, and quantity; systems and system models; and structure and function. **NGSS PEs:** **Life Sciences:** **3-LS1-1** **3-LS2-1** **3-LS3-1** **3-LS3-2** **3-LS4-1** **3-LS4-2** **3-LS4-3** **3-LS4-4**	**LS1.A:** Structure and function **LS1.B:** Growth and development of organisms **LS2.D:** Social interactions and group behaviors **LS3.A:** Inheritance of traits **LS3.B:** Variation of traits **LS4.C:** Adaptation	• Asking questions • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Using mathematics and computational thinking • Constructing explanations • Engaging in argument from evidence • 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 Structures of Life 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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