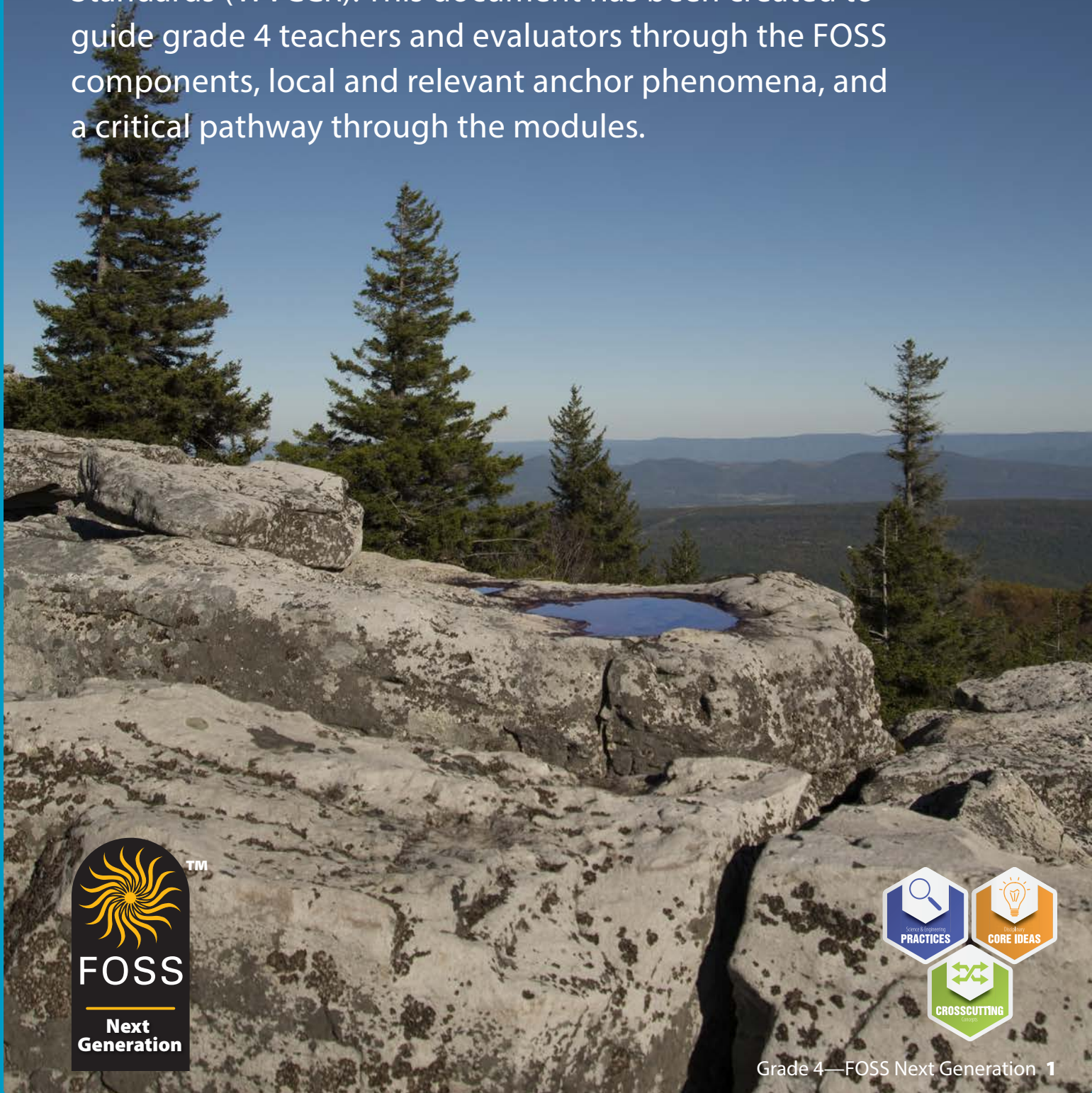




# West Virginia Science Grade 4 Overview

FOSS Next Generation is the most engaging K-8 science program for the College- and Career-Readiness Standards (WVCCR). This document has been created to guide grade 4 teachers and evaluators through the FOSS components, local and relevant anchor phenomena, and a critical pathway through the modules.



# Navigation Guide

## How to Review FOSS

### Teacher Editions

The **Investigations Guide** is a spiral-bound guide containing the active investigations. FOSS lesson plans include:

- Materials used in the current steps
- Key three-dimensional highlights
- Embedded assessment “What to Look For”
- Sense-making discussions
- Strategies to support English learners
- Vocabulary review
- Teaching notes to facilitate instruction


**INVESTIGATION 1 — Energy and Circuits**

**FOCUS QUESTION**  
What is needed to light a bulb?


**TEACHING NOTE**  
The focus question in each part engages students with the phenomenon to investigate.

**Materials for Step 2**

- Flashlight with no batteries
- D-cells



**TEACHING NOTE**  
Start the word wall with the new vocabulary.



**Part 1: Lighting a Bulb**

Your challenge is to find out how to get electrical energy from this source, the D-cell, to a lightbulb.

**1. Introduce the flashlight**  
Hold up a bulb. Tell students: This is the **lightbulb** we will use. It is the kind of lightbulb you might find in an older flashlight. Let's start by observing it for a minute.

Have Getters get two lightbulbs for their groups. Ask students to pair up and observe the lightbulb closely. After a minute, call on students to share what they observed and what they know about using bulbs.

**2. Focus question: What is needed to light a bulb?**  
Tell students that they are going to investigate how to light a bulb. Write or project the focus question on the board.

► What is needed to light a bulb?  
Tell students that there is a D-cell for each pair of students and a supply of wires for the class. Have Getters go to the materials station to get two D-cells and four wires for their groups.

**3. Set up notebooks**  
If this is the first notebook entry in a new notebook, take a few minutes to establish the preliminaries: table of contents, page numbers, and method for attaching notebook sheets to the page (for additional information see the Science Notebooks in Grades 3–5 chapter).

Ask students to open their science notebooks to a new page and record the date. They should then record the focus question prominently near the top of the page.

**4. Monitor student progress**  
Walk among the pairs as they try to light their bulbs. It may be several minutes before every pair has successfully lit the bulb; holding wires to make contacts can be clumsy. Resist the temptation to show students what to do.

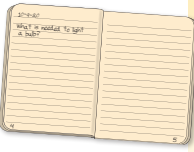
**SCIENCE AND ENGINEERING PRACTICES**  
Planning and carrying out investigations  
Analyzing and interpreting data

**Materials for Step 3**

- Lightbulbs

**Materials for Step 4**

- D-cells
- Wires



### Start your review here:

- **Soils, Rocks, and Landforms:** pp. 1–5, 83–85, 101–109
- **Energy:** pp. 1–7, 97–99, 120–129
- **Environments:** pp. 1–5, 79–81, 100–116

**Teacher Resources** (also online) contains teacher-support chapters on three-dimensional teaching and learning, access and equity, and environmental literacy.

### Student Books

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

- Ask and answer questions
- Use evidence to support their ideas
- Use text to acquire information
- Draw information from multiple sources
- Interpret illustrations to build understanding

**A Better Lightbulb**

Think about Thomas Edison (1847–1931) working on the lightbulb. The filament burnt out too quickly. His team developed a plan to solve this problem. They made hundreds of different prototypes and tested them.

Think about the criteria for a solution to this problem: How do you make an inexpensive lightbulb that lasts a long time and uses little energy? Edison and his team found a good solution. Ever since, engineers have been designing light sources that meet new criteria.

What would the criteria be for a portable lighting system used in places without electricity? What would the constraints be?




Computer engineers work on designing new computer systems.

**Engineering a Solar Lighting System**

In 2008, Dr. Laura Stachel was in northern Nigeria. There she observed emergency care at a state hospital. She realized that lack of reliable electricity was a huge problem. Because of frequent blackouts, midwives and doctors struggled to diagnose and treat women with pregnancy problems. Emergency surgeries were interrupted. Dr. Stachel worked with her husband, Hal Aronson, a solar energy educator in Berkeley, California, to solve the problem. They created a solar system to provide electricity for important parts of the hospital. Other health workers in the area began to ask for solar lighting for their clinics, too. Mr. Aronson and Dr. Stachel formed a nonprofit company, We Care Solar. Mr. Aronson designed the We Care Solar Suitcase. This solar system is easy to move, easy to install, durable, and inexpensive to maintain. Mr. Aronson sat down with FOSS to talk about how he engineered this device.

**Q:** Can you describe the problem that you set out to solve?

**A:** The primary problem is the lack of good-quality light, or any light at all. Good-quality light is needed to properly treat sick people. For example, doctors need to see where a mother is bleeding to be able to stop the bleeding.



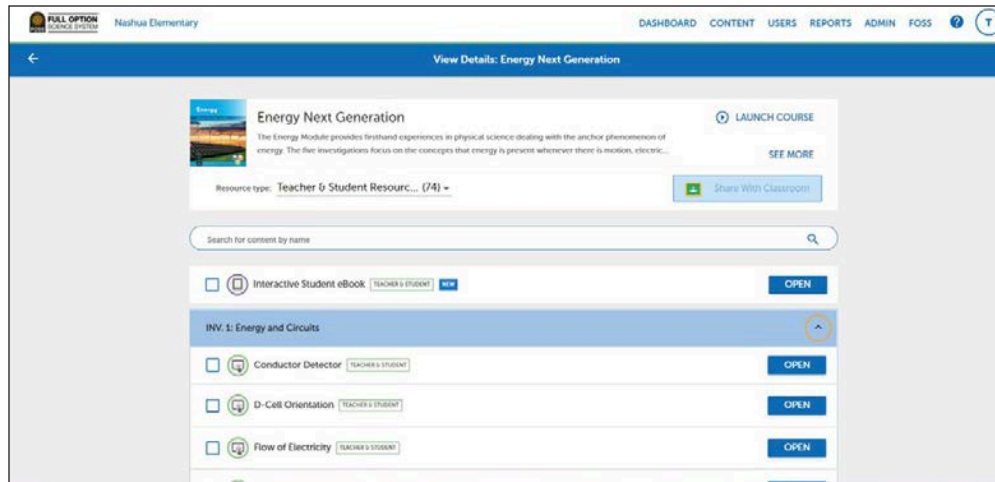
Mr. Aronson and Dr. Stachel

Also available in Spanish and as interactive eBooks.

# FOSSweb on ThinkLink

## Technology for Learning Anywhere

FOSSweb digital resources are located on ThinkLink, School Specialty's new cloud-based curriculum platform.

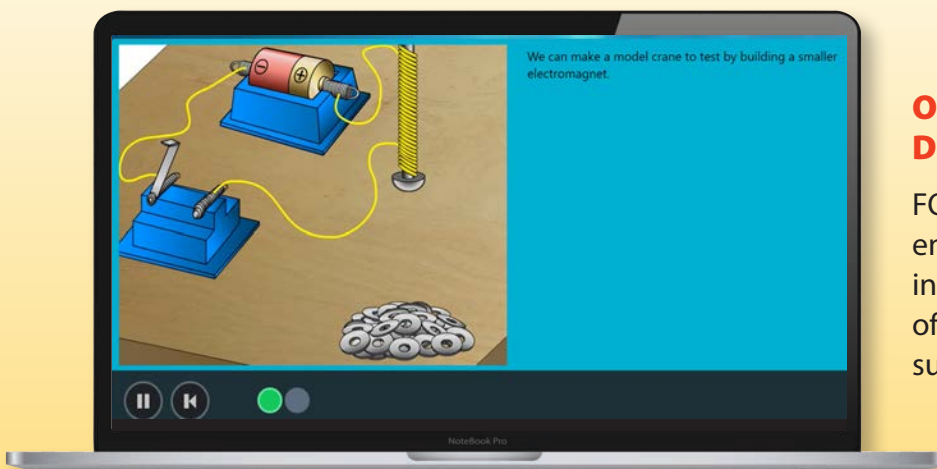
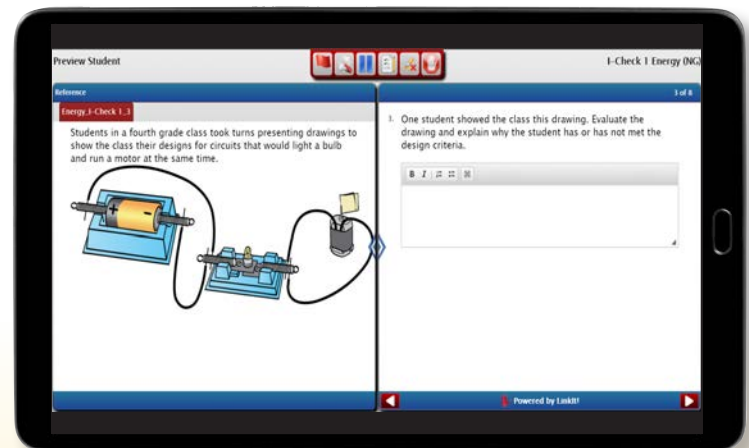


### Access:

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

### 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 instructional next steps.



### Online Activities for Differentiating Instruction

FOSSweb digital resources provide engaging, interactive virtual investigations and tutorials that offer additional content and skill support for students.

# FOSS Modules—Grade 4

	Module Phenomenon and Driving Question	Module Overview /Bundled Performance Expectations	
FOSS Module	<p><b>Soils, Rocks, and Landforms Module</b>  <b>Anchor phenomenon:</b>  <i>Earth's landscape—the shape and the composition of landforms</i>  <b>Module driving questions:</b></p> <ul style="list-style-type: none"> <li>• What are Earth's land surfaces made of?</li> <li>• Why are landforms not the same everywhere?</li> </ul>	 <p>4 investigations  <b>Critical Pathway:</b>            32 sessions**</p>	<p>Students have firsthand experiences with soils and rocks, and modeling experiences using tools such as topographic maps and stream tables. Students come to understand that weathering by water, ice, wind, living organisms, and gravity breaks rocks into smaller pieces, erosion transports earth materials to new locations, and deposition is the result of that transport process that builds new land. Students conduct controlled experiments to determine the impact of changing the variables of slope and amount of water in stream tables. Students interpret data from diagrams and visual representations to build explanations from evidence and make predictions of future events.</p> <p><b>Earth Sciences:</b> S.4.10, S.4.12, S.4.13, S.5.11, S.5.12  <b>ETAS:</b> S.4.14, S.4.15</p>
FOSS Module	<p><b>Energy Module</b>  <b>Anchor phenomenon:</b>  <i>Energy—motion, electric current, sound, light, or heat</i>  <b>Module driving question:</b></p> <ul style="list-style-type: none"> <li>• How does energy transfer between systems?</li> </ul>	 <p>5 investigations  <b>Critical Pathway:</b>            31 sessions</p>	<p>Students investigate electricity and magnetism as related effects and engage in engineering design while learning useful applications of electromagnetism in everyday life. They conduct controlled experiments to determine how to make an electromagnet stronger. They investigate how the amount of energy transfer changes when balls of different masses hit a stationary object. They explore energy transfer through waves that results in sound and motion. They gather information about fuels derived from natural resources that affect the environment, and explore alternative sources of energy that use renewal resources.</p> <p><b>Physical Sciences:</b> S.3.3*, S.4.1, S.4.2, S.4.3, S.4.4, S.4.5, S.4.6, S.4.7  <b>ETAS:</b> S.4.14, S.4.15, S.4.16</p>
FOSS Module	<p><b>Environments Module</b>  <b>Anchor phenomenon:</b>  <i>Animals and plants interact with their environment and with each other</i>  <b>Module driving question:</b></p> <ul style="list-style-type: none"> <li>• How do the structures of terrestrial organisms function to support the survival of the organisms in that environment?</li> </ul>	 <p>4 investigations  <b>Critical Pathway:</b>            32 sessions</p>	<p>The study of the structures and behaviors of organisms and the relationships between one organism and its environment builds knowledge of limits—important because humans can change environments. Students design investigations to study preferred environments, range of tolerance, and optimum conditions for growth and survival of terrestrial organisms, and aquatic organisms. They conduct controlled experiments to determine the range of tolerance for early growth of seeds and hatching of brine shrimp, and use these data to develop and use models to understand the impact of changes to the environment. Students explore how animals use their sense of hearing and develop models for detecting and interpreting sound.</p> <p><b>Life Sciences:</b> S.4.8, S.4.9, S.3.8*, S.3.12*  <b>Earth Sciences:</b> S.5.8</p>

\* These PEs are addressed in grade 3 and extended in grade 4 or are foundational for grade 5.

\*\* A session is 45 minutes.

The Core Topics of Science	The Practices of Scientists and Engineers	Science Connecting Concepts
<p>Earth's Systems: Processes that Shape the Earth            Earth's Systems            Engineering Design</p>	<ul style="list-style-type: none"> <li>• Asking questions and defining problems</li> <li>• Developing and using models</li> <li>• Planning and carrying out investigations</li> <li>• Analyzing and interpreting data</li> <li>• Using mathematics and computational thinking</li> <li>• Constructing explanations and designing solutions</li> <li>• Engaging in argument from evidence</li> <li>• Obtaining, evaluating, and communicating information</li> </ul>	<ul style="list-style-type: none"> <li>• Patterns</li> <li>• Cause and effect</li> <li>• Scale, proportion, and quantity</li> <li>• Systems and system models</li> <li>• Structure and function</li> <li>• Stability and change</li> </ul>
<p>Energy            Waves: Waves and Information            Forces and Interactions            Engineering Design</p>	<ul style="list-style-type: none"> <li>• Asking questions and defining problems</li> <li>• Developing and using models</li> <li>• Planning and carrying out investigations</li> <li>• Analyzing and interpreting data</li> <li>• Using mathematics and computational thinking</li> <li>• Constructing explanations and designing solutions</li> <li>• Engaging in argument from evidence</li> <li>• Obtaining, evaluating, and communicating information</li> </ul>	<ul style="list-style-type: none"> <li>• Patterns</li> <li>• Cause and effect</li> <li>• Systems and system models</li> <li>• Energy and matter</li> </ul>
<p>Structure, Function, and Information Processing            Earth's Systems: Processes that Shape the Earth            Inheritance and Variation of Traits:            Life Cycles and Traits            Interdependent Relationships in Ecosystems            Earth's Systems</p>	<ul style="list-style-type: none"> <li>• Asking questions and defining problems</li> <li>• Developing and using models</li> <li>• Planning and carrying out investigations</li> <li>• Analyzing and interpreting data</li> <li>• Using mathematics and computational thinking</li> <li>• Constructing explanations and designing solutions</li> <li>• Engaging in argument from evidence</li> <li>• Obtaining, evaluating, and communicating information</li> </ul>	<ul style="list-style-type: none"> <li>• Patterns</li> <li>• Cause and effect</li> <li>• Scale, proportion, and quantity</li> <li>• Systems and system models</li> <li>• Energy and matter</li> </ul>

# FOSS Phenomena Storylines

## Soils, Rocks, and Landforms Applications of Science

### ANCHOR PHENOMENON 1 INVESTIGATIONS 1–2

On a walk around the schoolyard, students discover some changes at the edge of the playground. They observe a new pile of sand and “dirt” near the bottom of the small hill. **How do new, small landforms form in our schoolyard?**

#### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Earth’s Systems: Processes that Shape the Earth

Patterns; Cause and Effect; Systems and System Models; Stability and Change

Developing and Using Models; Constructing Explanations; Engaging in Argument from Evidence

#### WVCCR PERFORMANCE EXPECTATION

**S.4.12**

#### STORYLINE

On a walk around the schoolyard, students discover some changes at the edge of the playground, a new pile of sand and “dirt” near the bottom of a small hill. To figure out how the pile formed, students plan and conduct tests to determine the effects of different types of weathering on different materials, such as the rocks found near playgrounds. They use a stream table to model and construct explanations of erosion and deposition of earth materials. Finally, they engage in argument from evidence to determine where the sand and “dirt” came from and how it was deposited there.

# ANCHOR PHENOMENON 2

## INVESTIGATION 2 (PART 4)

Some students are exploring samples of sedimentary rocks and discover fossils. **How do fossils get in rocks and what can they tell us about the past?**

### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Earth's Systems: Processes that Shape the Earth

Cause and Effect; Stability and Change

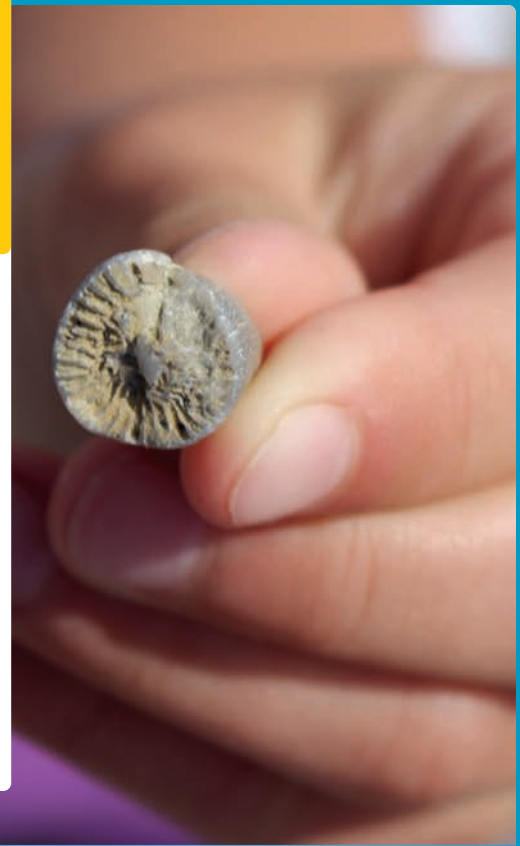
Developing and Using Models; Constructing Explanations

### WVCCR PERFORMANCE EXPECTATION

**S.4.10**

#### STORYLINE

Students are exploring samples of sedimentary rocks from basins and discovered fossils. To figure out how fossils got in the rocks, they use multimedia and text to obtain, evaluate, and communicate information about how fossils provide evidence of life and landscapes from the past. They demonstrate and use models of fossil formation to understand the process. Finally, they construct an explanation that organisms trapped in sediments become fossils.



# ANCHOR PHENOMENON 3

## INVESTIGATION 3

Two students compare maps of the same mountain location. One is dated before May 1980, and the other is dated after May 18, 1980. The students note some differences. What changed? **What could have caused the change to the mountain? How can engineers prepare for these types of changes?**

### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Earth's Systems: Processes that Shape the Earth; Earth's Systems; Engineering Design

Cause and Effect; Scale, Proportion, and Quantity; Stability and Change

Planning and Carrying Out Investigations; Using Mathematics and Computational Thinking

### WVCCR PERFORMANCE EXPECTATIONS

**S.4.13, S.5.12, S.4.15**

#### STORYLINE

Students make observations of two maps of one famous mountain. One was taken before May 1980, and the other was taken after May 18, 1980. To figure out why the maps are different, students collect and analyze data to determine scale and change to a volcano after an eruption. They develop a model and explain the effect of natural hazards on the surface of Earth and what happened to Mt. St. Helens. Finally, they develop possible solutions to monitor and prepare for natural hazards.



# FOSS Phenomena Storylines

Energy

Applications of Science

## ANCHOR PHENOMENON 1

### INVESTIGATIONS 1–3

A magician performed a trick by asking a small child to come on stage and lift a wooden box. The child did it easily. The magician secretly flipped a switch and then asked an adult to lift the same box. The adult tried and tried but could not lift the box. **How can a child lift a box that an adult cannot during a magic trick?**

#### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Energy; Waves: Waves and Information; Engineering Design

Cause and Effect; Systems and System Models; Energy and Matter

Planning and Carrying Out Investigations; Developing and Using Models; Constructing Explanations; Engaging in Argument from Evidence

#### WVCCR PERFORMANCE EXPECTATIONS

**S.4.2, S.4.4, S.4.6, S.4.14, S.4.15, S.4.16**

#### STORYLINE

Students plan and carry out investigations examining cause-and-effect relationships with magnets and circuits separately to explain the force of attraction and the function of electricity in the magician's circuit. They engage in argumentation while developing a model of magnetic fields around an electric current and how the magnetic field can be strengthened. Finally, they construct an explanation of electromagnetism to explain the magician's trick.



## ANCHOR PHENOMENON 2

### INVESTIGATION 4

Two children are bowling. The older one uses a 12-pound ball and rolls the ball very quickly toward the 10 pins. The ball knocks down 9 pins. The younger child uses an 8-pound ball and rolls the ball slowly down the alley. Even though both balls were aimed the same, the 8-pound ball only knocks down 5 pins.

**How does mass and speed affect the number of bowling pins that fall?**

#### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Energy

Patterns; Cause and Effect; Systems and System Models; Energy and Matter

Planning and Carrying Out Investigations; Analyzing and Interpreting Data; Constructing Explanations

#### WVCCR PERFORMANCE EXPECTATIONS

**S.4.1, S.4.2, S.4.3, S.4.4**

#### STORYLINE

Students plan and carry out investigations with steel balls and ramps to collect data about mass, starting position, speed, and energy transfer. Next, they analyze the data to determine the patterns and cause-and-effect relationships. Then, they construct explanations based on evidence about different amounts of energy transfer when bowling or other collisions. Finally, students explain why mass and speed affect the number of pins that fall in bowling.



## ANCHOR PHENOMENON 3

### INVESTIGATION 5

A town installed parking meters powered by solar panels in a local park. The systems were installed properly, but not all of the parking meters are working well. **What's wrong with the solar-powered parking meters at the park?**

#### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Energy; Waves: Waves and Information; Engineering Design

Cause and Effect; Systems and System Models

Asking Questions and Defining Problems; Analyzing and Interpreting Data; Constructing Explanations and Designing Solution

#### WVCCR PERFORMANCE EXPECTATIONS

**S.4.2, S.4.4, S.4.5, S.4.7, S.4.14, S.4.15, S.4.16**

#### STORYLINE

Students identify possible reasons that not all parking meters are working. They design solutions by applying scientific ideas about waves and circuits to solve problems. They construct circuits with materials to test their ideas. They construct an explanation that includes a solution to the problem.



# FOSS Phenomena Storylines

Environments

Applications of Science

## ANCHOR PHENOMENON 1 INVESTIGATIONS 1–2

A student moves a flowerpot sitting on the soil from one spot to another in the garden. As the pot is lifted, the student is surprised by something moving under the pot. The student observes a variety of different critters crawling around. Some of the critters are isopods. The student couldn't find any other isopods nearby except under the flowerpot. **Why are the isopods under the flowerpot but not in other places? How can isopods survive there?**

### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Structure, Function, and Information Processing

Cause and Effect; Systems and System Models; Structure and Function

Planning and Carrying Out Investigations; Analyzing and Interpreting Data; Constructing Explanations; Obtaining, Evaluating, and Communicating Information

### WVCCR PERFORMANCE EXPECTATIONS

S.4.8, S.4.9

### STORYLINE

Students plan and carry out investigations with isopods, testing the effects of changing variables, such as moisture and light, in an environmental system. They analyze and interpret data from the investigations to determine preferences for environmental conditions. Next, they obtain, evaluate, and communicate information about isopods' structures and functions to construct explanations about their survival, growth, and behavior. Finally, they design a habitat for the isopods.



## ANCHOR PHENOMENON 2

### INVESTIGATION 2

A fourth-grade student is startled late one night while sleeping by the sound of an owl hooting. The student's family said that owls are active at night and hunt for prey. The student wonders how animals can hunt at night when they don't have light to see. **How are owls able to locate small animals to eat and capture them in the dark?**

#### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Structure, Function, and Information Processing

Cause and Effect; Systems and System Models

Planning and Carrying Out Investigations; Analyzing and Interpreting Data;  
Constructing Explanations; Obtaining, Evaluating, and Communicating Information

#### WVCCR PERFORMANCE EXPECTATIONS

**S.4.8, S.4.9**

#### STORYLINE

Students plan and conduct investigations in the schoolyard and pretend to be animals who have poor vision or are active at night. The animals communicate with one unique sound and try to find others of their kind before being "captured" by a predator. Then, they analyze and interpret the collected data to determine structures that help organisms survive. They obtain, evaluate, and communicate information in order to construct explanations about various ways animals receive, process, and respond to sensory information gathered from their environment.



## ANCHOR PHENOMENON 3

### INVESTIGATIONS 3–4

Dr. Salina Bryan has been studying a population of brine shrimp that live in Mono Lake, a large salt lake. The size of the brine shrimp population and the amount of water in the lake has been decreasing in the last few years. **What is happening to cause the decrease in the number of brine shrimp, and what is the effect on the ecosystem?**

#### CONNECTIONS TO COLLEGE- AND CAREER-READINESS STANDARDS

Structure, Function, and Information Processing

Cause and Effect; Systems and System Models; Structure and Function

Planning and Carrying Out Investigations; Analyzing and Interpreting Data;  
Constructing Explanations

#### WVCCR PERFORMANCE EXPECTATION

**S.4.8**

#### STORYLINE

Students plan and conduct investigations with brine shrimp and plants to collect data about the effects of changing variables on organisms. They analyze and interpret the data to serve as evidence for cause-and-effect relationships about brine shrimp survival. Finally, they construct explanations about how the organisms' structures and functions enable them to survive or not to survive when the natural system changes.



# Critical Pathway

## West Virginia Science

Today, many elementary educators face the reality that time for science instruction is limited. The FOSS developers have determined a Critical Pathway through each module that is faithful to the standards in the time you have to teach with the flexibility to expand or differentiate instruction. There are 95 total sessions for grade 4.


### SOILS, ROCKS, AND LANDFORMS


SESSION	INV./PART	CRITICAL PATHWAY	IG PAGES
1	Inv 1.1	Soil Composition, Steps 1–4 (including Survey)	101–102
2	Inv 1.1	Soil Composition, Steps 5–12	102–104
3	Inv 1.1	Soil Composition, Steps 13–19, 22	105–06, 109
	Inv 1.1	Soil Composition, Steps 20–21—“Reading, What Is Soil?”	107–108
4	Inv. 1.2	Physical Weathering, Steps 1–10	113–116
5	Inv. 1.2	Physical Weathering, Steps 11–15	116–119
6	Inv 1.3	Chemical Weathering, Steps 1–10	123–125
7	Inv 1.3	Chemical Weathering, Steps 11–14	125–126
8	Inv 1.3	Chemical Weathering, Steps 15–17	127–128
	Inv 1.3	Chemical Weathering, Steps 18–20—Reading, “Weathering”	129–130
9	Inv 1.3	Chemical Weathering, Steps 21–24	130–133
	Inv 1.4	Schoolyard Soils, Steps 1–16—Focus on Environmental Literacy	137–141
10	Inv 1.4	Review Step 17 (use readings, “What Is Soil?” and “Weathering”)	142
11	Inv 1.4	I-Check 1, Step 18 (Later plan self-assessment)	143
12	Inv 2.1	Erosion and Deposition, Steps 1–7	162–164
13	Inv 2.1	Erosion and Deposition, Steps 8–17	164–167
14	Inv 2.1	Erosion and Deposition, Steps 18–21	168–169
15	Inv. 2.2	Stream-Table Investigations, Steps 1–8	173–175
16	Inv 2.2	Stream-Table Investigations, Steps 9–17	176–178
	Inv 2.2	Stream-Table Investigations, Steps 18–26—Designing Investigations	179–181
	Inv 2.2	Stream-Table Investigations, Steps 27–29—Video and Online Activity	181–182
17	Inv 2.3	Schoolyard Erosion and Deposition, Steps 1–13	186–189
18	Inv 2.4	Fossil Evidence, Steps 1–6	193–194
	Inv 2.4	Fossil Evidence, Steps 7–12—Modeling fossil formation	195–197


CONTACT YOUR SALES REPRESENTATIVE IF YOUR DISTRICT NEEDS A CUSTOMIZED CRITICAL PATHWAY.

## SOILS, ROCKS, AND LANDFORMS (continued)

SESSION	INV./PART	CRITICAL PATHWAY	IG PAGES
	Inv 2.4	Fossil Evidence, Steps 16–22—Reading, “Fossils Tell a Story”	198–200
19	Inv 2.4	Fossil Evidence, Steps 13–15, <b>Review Step 23</b>	196, 201
20	Inv 2.4	<b>I-Check 2, Step 24 (Later plan self-assessment)</b>	202
21	Inv 3.1	Making a Topographic Map, Steps 1–7	221–223
22	Inv 3.1	Making a Topographic Map, Steps 8–20	223–226
23	Inv 3.1	Making a Topographic Map, Steps 21–24	227–228
24	Inv 3.2	Drawing a Profile, Steps 1–12	232–237
25	Inv 3.2	Drawing a Profile, Steps 13–15	238–239
	Inv 3.2	<i>Drawing a Profile, Steps 16–19—Media: video and online activity</i>	239–240
26	Inv 3.3	Mount St. Helens Case Study, Steps 1–14	244–249
27	Inv 3.4	Rapid Changes, Steps 1–9, 13	253–55, 257
	Inv 3.4	Rapid Changes, Steps 10–12—Reading, “It Happened So Fast”	256
28	Inv 3.4	Rapid Changes, <b>Review Step 14</b>	258
29	Inv 3.4	<b>I-Check 3, Step 15</b>	259
30	Inv 4.1	Intro to Natural Resources, Steps 1–2 ( <b>self-assessment</b> )	276–277
31	Inv 4.1	Introduction to Natural Resources, Steps 3–9	278–280
	Inv 4.1	<i>Introduction to Natural Resources, Steps 10–16—Readings, Media</i>	281–283
	Inv 4.2	<i>Making Concrete, Steps 1–8—Focus on Engineering</i>	287–288
	Inv 4.2	<i>Making Concrete, Steps 9–16—Reading and discussion</i>	289–291
	Inv 4.3	<i>Earth Materials in Use, Steps 1–11—Focus on Environmental Literacy</i>	295–298
	Inv 4.3	<i>Earth Materials in Use, Steps 12–16—Readings</i>	299–300
	Inv 4.3	<i>Earth Materials in Use, Steps 17–18—Review of Investigation 4</i>	301
32	Inv 4.3	<b>Posttest, Step 19</b>	302

 Investigation sessions, with references to the pages and step numbers in the *Guide*

 Optional short sessions within a critical pathway part


 Entire parts of the investigation that are not included in this critical pathway; these activities provide additional opportunities to deepen the learning experience


# ENERGY


SESSION	INV./PART	CRITICAL PATHWAY	IG PAGES
1	Inv 1.1	Lighting a Bulb, Steps 1–10	120–123
2	Inv 1.1	Lighting a Bulb, Steps 11–17	123–126
	Inv 1.1	<i>Lighting a Bulb, Steps 18–21—Focus on Online and Readings</i>	126–128
3	Inv 1.1	Lighting a Bulb, Steps 22–23	129
4	Inv 1.2	Conductors and Circuits, Steps 1–14; 18–22	136–142
	Inv 1.2	<i>Conductors and Circuits, Steps 15–17—Focus on Engineering</i>	140–141
5	Inv 1.2	Conductors and Circuits, Steps 23–28 Note: Step 23, Online Activity, Tutorial-Simple Circuits only	143–147
	Inv 1.3	<i>Series and Parallel Circuits, Steps 1–32—Focus on Engineering</i>	150–159
	Inv 1.4	<i>Solving the String of Lights Problem, Steps 1–19—Engineering</i>	163–170
6	Inv 2.1	Magnets and Materials, Steps 1–19, 27	190–194, 196
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## ENERGY (continued)

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19	Inv 4.3	Collisions, Steps 1–9	310–313
20	Inv 4.3	Collisions, Steps 10–16	313–315
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21	Inv 4.3	Collisions, Steps 23–25 Step 26, (Video, Ch 1–5 only, 8 min) Review Step 27	318–320 321–322
22	Inv 4.3	<i>I-Check 4, Step 28 (Later plan self-assessment)</i>	322
23	Inv 5.1	5.1 Forms of Waves, Steps 1–6	345–346
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28	Inv 5.2	Light Travels, Steps 21–24	367–368
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31	Inv 5.3	Posttest, Step 28	385

 Investigation sessions, with references to the pages and step numbers in the *Guide*

 Optional short sessions within a critical pathway part

 Entire parts of the investigation that are not included in this critical pathway; these activities provide additional opportunities to deepen the learning experience

# ENVIRONMENTS

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4	Inv 1.1	Observing Mealworms, Steps 23–25	110
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8	Inv 1.2	Designing an Isopod Environment, Steps 27–29, 34	126, 128
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10	Inv 1.3	Leaf-Litter Critters, Steps 1–11	134–137
11	Inv. 1.3	Leaf-Litter Critters, Step 12–13	137–139
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12	Inv 1.3	Leaf-Litter Critters, Step 18, Video Ch 1–8; Step 19, <b>Review 20–21</b>	142–146
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15 *	Inv 2.1	Designing an Aquarium, Steps 12–15, 18 *, 19–25	169–174
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\*Indicates the need to allow for growth time





## ENVIRONMENTS (continued)

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17	Inv 2.4	Sound Off, Steps 14–22	209–213
18	Inv 2.4	Sound Off, Steps 23–24, <b>Review Steps 25–26</b>	213–216
19	Inv 2.4	<b>I-Check 2, Step 27; Observe Aquaria, Step 28 (Later plan self assessment)</b>	216
20	Inv 3.1	Setting Up the Experiment, Steps 1–13 (Video The Mono Lake Story, see sidebar page 237)	237–240
21	Inv 3.1	Setting Up the Experiment, Steps 14–17	241–242
22*	Inv 3.2	Determining Range of Tolerance, Steps 1-5 , 15–17* (Note: Steps 10–13 are done in Session 27 below *)	246, 250–1
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23*	Inv 3.2	Determining Range of Tolerance, Steps 10–13*	248–249
24	Inv 3.2	Determining Range of Tolerance, Steps 18–28; 30–31	252–255
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27	Inv 3.4	<b>I-Check 3, Step 21 (Later plan self assessment)</b>	274
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31	Inv 4.3	Plant Adaptations, Steps 1–6, <b>Review Steps 7–9</b>	327–330
32	Inv 4.3	<b>Posttest, Step 10</b>	330

\*Indicates the need to allow for growth time

 Investigation sessions, with references to the pages and step numbers in the Guide

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# Diverse Learning Needs

## Designed for All Learners

### Access and Equity

The FOSS Program has been designed to maximize the science learning opportunities for all students, including those who have traditionally not had access to or have not benefited from equitable science experiences—students with special needs, ethnically diverse learners, English learners, students living in poverty, girls, and advanced and gifted learners. FOSS is rooted in a 30-year tradition of multisensory science education and informed by recent research on UDL and culturally and linguistically responsive teaching and learning. See the **Access and Equity** chapter on FOSSweb for strategies and suggestions.

### English Language Development (ELD)

The FOSS active investigations, science notebooks, *FOSS Science Resources* articles, and formative assessments provide rich contexts in which students develop and exercise thinking and communication in both science and language arts. Students experience the natural world in real and authentic ways and use language to inquire, process information, and communicate their thinking about scientific phenomena.



# Strategies for Effective Learning

## Engaging Students

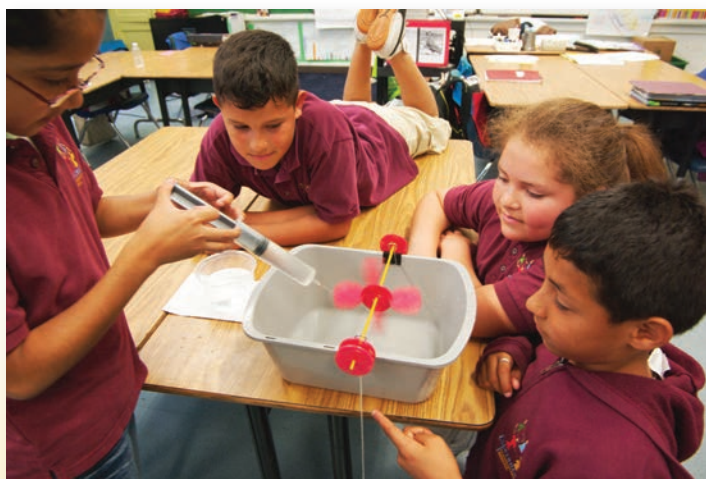
### English Language Art Connections

FOSS leverages the natural connection between science and language arts. Students read articles and think critically to enhance their understanding. Students practice ELA skills as well as scientific thinking by organizing their thoughts in a science notebook.



### Engineering

FOSS provides meaningful engineering design challenges to students across the grade bands. Students take on the role of scientists to problem-solve and then take on the role of engineers to design and innovate.




























### Environmental Literacy

FOSS throws open the classroom door and takes students outdoors to apply scientific principles to natural systems.

### Custom Professional Learning

FOSS can help you build a customized professional learning plan for your district, through its experienced network of consultants to facilitate workshops and sustain the progress of your implementation through ongoing support.

# WEST VIRGINIA FOSS NEXT GENERATION K–8 SCOPE AND SEQUENCE

Grade	Integrated Middle Grades				
6–8	  Heredity and Adaptation*		   Chemical Interactions		
	   Earth History	 Diversity of Life	 Human Systems Interactions*	   Electromagnetic Force*	  Gravity and Kinetic Energy*
	  Planetary Science	   Weather and Water	   Populations and Ecosystems	  Waves*	

\*Half-length courses



Physical Science content



Earth Science content



Life Science content



Engineering content

Grade	Physical Science	Earth Science	Life Science
5	Mixtures and Solutions	Earth and Sun	Living Systems
4	Energy	Soils, Rocks, and Landforms	Environments
3	Motion and Matter	Water and Climate	Structures of Life
2	Solids and Liquids	Pebbles, Sand, and Silt	Insects and Plants
1	Sound and Light	Air and Weather	Plants and Animals
K	Materials and Motion	Trees and Weather	Animals Two by Two
PreK	Observing Nature		