

INTRODUCTION

Earth is the third planet from the Sun. It travels around the Sun in a nearly circular orbit at a distance of about 150 million kilometers. Earth is water rich, with 71% of the planet’s surface covered with water. It is surrounded by a shallow atmosphere of nitrogen (78%) and oxygen (21%), and small amounts of a lot of other gases.

The anchor phenomena students investigate in the **Earth and Sun Module** are the patterns observed in the sky over a day, a month, a year, and more, and their effect on Earth. The driving question for the module is how do Earth’s geosphere, hydrosphere, atmosphere, and biosphere interact to create a sustainable environment for life?

The constant renewal of water on Earth’s land surfaces by the activities in the atmosphere is one of the defining characteristics of Earth, the water planet. The **Earth and Sun Module** provides students with experiences to explore the properties of the atmosphere, energy transfer from the Sun to Earth, and the dynamics of weather and water cycling in Earth’s atmosphere. Other experiences help students to develop and use models to understand Earth’s place in the solar system, and the interactions of Earth, the Sun, and the Moon to reveal predictable patterns—daily length and direction of shadows, day and night, and the seasonal appearance of stars in the night sky. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; and energy and matter.

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The NGSS performance expectations bundled in this module include

Earth Sciences

- 5-ESS1-1
- 5-ESS1-2
- 5-ESS2-1
- 5-ESS2-2
- 5-ESS3-1

Physical Sciences

- 5-PS1-1
- 5-PS2-1

Engineering, Technology, and Applications of Science

- 3–5-ETS1-2
- 3–5-ETS1-3

► NOTE

The three modules for grade 5 in FOSS Next Generation are

Mixtures and Solutions

Earth and Sun

Living Systems



Module Summary

Guiding and Focus Questions for Phenomena

Inv. 1: The Sun

Students observe the phenomenon of outdoor shadows. They trace their shadows in the morning and afternoon. They use this information to monitor the position of the Sun as it moves across the sky. After using a compass to orient a Sun tracker, students make hourly records of the position of the shadow cast by a golf tee. Back in the classroom, students use flashlights to reproduce the shadow movements to model how the Sun's position in the sky changes during the day. Students imagine an observer on Earth (their head) and position themselves around a lamp to observe day and night. They discover that rotation of Earth produces day and night. Students put the observed daily movement of the Sun phenomenon together with the phenomenon of day and night and use another model to resolve explanations for both phenomena.

How can we predict events based on shadows?
What do shadows tell us about daily patterns involving the Earth/Sun system?

How and why does your shadow change during the day?

What is the relationship between the position of the Sun and the length and direction of shadows?

What causes day and night?

Inv. 2: Planetary Systems

Students investigate the phenomena of objects giving off light and others reflecting light in the sky. They take a field trip to the schoolyard to look for the Moon. The class starts a Moon calendar, on which they record the Moon's appearance every day for a month and analyze their observations to discover the sequence of changes. Students grapple with the size and distance relationships among the Moon, Earth, and the Sun, and build a model of the Earth/Moon/Sun system.

Based on previous knowledge, information on solar system cards, and information provided by the teacher, students organize a model of the solar system. Gravity is introduced as the force that pulls on planets, changing their direction of travel to produce circular orbits. Students are introduced to constellations as patterns of stars. They simulate Earth's rotation to observe the appearance of stars rising in the east and setting in the west. Students observe a demonstration of why different stars are visible in different seasons.

What objects do we observe in our solar system and how do they move in relation to each other?
What do we see outside our system?

How can you explain why we see some natural objects only in the night sky, some only in the day sky, and some at both times?

How would you describe the size of and distance between Earth, the Moon, and the Sun?

How does the shape of the Moon change over 4 weeks?

How do the parts of the solar system interact?

Why do stars appear to move across the night sky?

Content Related to Disciplinary Core Ideas	Reading/Technology	Assessment
<ul style="list-style-type: none"> Shadows are the dark areas that result when light is blocked. Shadows change during the day because the position of the Sun changes in the sky. The length and direction of a shadow depends on the Sun's position in the sky. Day is the half of Earth's surface being illuminated by sunlight; night is the half of Earth's surface in its own shadow. The cyclical change between day and night is the result of Earth's rotating around the stationary Sun, Earth's star. 	<p>Science Resources Book "Changing Shadows" "Sunrise and Sunset"</p> <p>Online Activities "Shadow Tracker" "Tutorial: Sun Tracking" "Seasons"</p>	<p>Embedded Assessment Science notebook entries Response sheet</p> <p>Benchmark Assessment Survey Investigation 1 I-Check</p> <p>NGSS Performance Expectations 5-ESS1-2</p>
<ul style="list-style-type: none"> The solar system includes the Sun, a star, and the objects that orbit it, including Earth, the Moon, seven other planets, their satellites, and smaller objects. The Moon is much smaller than Earth and orbits at a distance equal to about 30 Earth diameters. The Sun is 12,000 Earth diameters away from Earth and is more than 100 times larger than Earth. Gravity is a pulling force between two masses; it is the force that pulls things toward the center of Earth. The pulling force of gravity keeps the planets and other objects in orbit by continuously changing their direction of travel. A great deal of light travels through space to Earth from the Sun and from distant stars. Stars are at different distances from Earth. The Sun is the closest star to Earth, so it appears brighter and larger. The side of Earth facing the Sun is always in daylight; the side facing away from the Sun is always in darkness. Because of the brightness of the Sun, we can only see stars outside our solar system when we are on the dark half of Earth (at night). 	<p>Science Resources Book "The Night Sky" "Looking through Telescopes" "Comparing the Size of Earth and the Moon" "Apollo 11 Space Mission" "How Did Earth's Moon Form?" "Exploring the Solar System" "Planets of the Solar System" "Why Doesn't Earth Fly Off into Space?" "Stargazing" "Star Scientists" "Our Galaxy"</p> <p>Videos All about the Moon The Planets and the Solar System All about Stars</p> <p>Online Activities "Lunar Calendar" "Star Maps" "Stellar Motions"</p>	<p>Embedded Assessment Science notebook entries Performance assessment Response sheet</p> <p>Benchmark Assessment Investigation 2 I-Check</p> <p>NGSS Performance Expectations 5-PS2-1 5-ESS1-1 5-ESS1-2</p>

EARTH AND SUN — Overview

	Module Summary	Guiding and Focus Questions for Phenomena
Inv. 3: Earth's Atmosphere	<p>Students investigate the phenomenon that air surrounds us—Earth's atmosphere. They explore air by working with syringes and tubes to discover that air takes up space and is compressible. They are introduced to the atmosphere as a mixture of gases with properties that change with altitude above Earth's surface. They review local weather reports and determine the variables that combine to produce the weather. They use a weather station to monitor the weather and look for patterns.</p>	<p><i>What is Earth's atmosphere and what does it have to do with weather?</i></p> <p>What is air?</p> <p>What is Earth's atmosphere?</p> <p>How do meteorologists measure and record weather variables?</p>
Inv. 4: Heating Earth	<p>Students investigate the phenomenon of energy transfer on Earth. They investigate uneven heating by recording and graphing temperature changes when two earth materials absorb solar energy. They observe examples of energy transfer by radiation and conduction and discuss mechanisms of energy transfer to and from the air. Students observe convection currents in water as a model of what happens in air. They test different designs for solar water heaters. Students consider how the atmosphere, hydrosphere, and geosphere interact.</p>	<p><i>How does Earth's atmosphere heat up?</i></p> <p>What is the effect of sunlight on earth materials?</p> <p>How does energy transfer to the air?</p> <p>What happens when a volume of fluid is warmed at the bottom?</p> <p>What is the best design for a solar water heater?</p>
Inv. 5: Water Planet	<p>Students turn to the phenomenon of water on Earth. They consider why Earth is called the water planet. They investigate systems to observe condensation on cold surfaces and determine the components of the water cycle. Students explore the conditions that promote evaporation. They simulate the travels of a drop of water through the water cycle to explore the complexities of the process. Students are introduced to world climate regions and global climate change. This brings students back to the driving question for the module—how do Earth's hydrosphere, geosphere, atmosphere, and biosphere interact to create a sustainable environment for all life?</p>	<p><i>How is water distributed over Earth's surface and atmosphere, how does it move, and what is the effect on Earth?</i></p> <p>What causes condensation to form?</p> <p>How does water vapor get into the air?</p> <p>What is the water cycle?</p> <p>What is the difference between weather and climate?</p>

Content Related to Disciplinary Core Ideas	Reading/Technology	Assessment
<ul style="list-style-type: none"> • Air is a mixture of gases held by gravity near Earth's surface. Air is made of particles too small to see. • Air has mass, takes up space, and is compressible. • Most of Earth's air resides in the troposphere, the layer of the atmosphere closest to Earth's surface. • Weather happens in the troposphere. • Weather is the condition of Earth's atmosphere at a given time in a given place. • Meteorology is the science of weather, and meteorologists are the scientists who study Earth's weather. • Weather is described in terms of several variables. 	<p>Science Resources Book "What Is Air?" "Earth's Atmosphere" "Weather Instruments"</p> <p>Videos <i>Ball on a Scale</i> <i>Fizz Keeper Experiment</i> <i>Soda Can Experiment</i> <i>Earth's Atmosphere</i></p> <p>Online Activities "Tutorial: Air and Atmosphere" "Weather Grapher"</p>	<p>Embedded Assessment Performance assessment Science notebook entries</p> <p>Benchmark Assessment <i>Investigation 3 I-Check</i></p> <p>NGSS Performance Expectations 5-PS1-1 5-ESS2-1</p>
<ul style="list-style-type: none"> • The Sun is the major source of energy that heats Earth. • The different energy-transferring properties of earth materials (soil and water) can lead to uneven heating of Earth's surface. • The atmosphere is heated by conduction between Earth's surfaces and air particles as a result of contact, and by absorption of energy radiated directly from the Sun and reradiated from Earth's surfaces. • Convection is the circulation of fluid (liquid or gas) that results in energy transfer. Convection currents are driven by uneven heating of Earth's surface. • A solar water heater is a system that uses solar energy to heat water. • People can protect Earth's resources and environments by using alternative energy sources. 	<p>Science Resources Book "Uneven Heating" "Heating the Air" "Wind and Convection" "Wind Power" "Solar Technology"</p> <p>Videos <i>Aluminum and Steel Strips</i> <i>Convection</i></p> <p>Online Activities "Tutorial: Radiation" "Virtual Investigation: Uneven Heating" "Particles in Solids, Liquids, and Gases" "Energy Transfer"</p>	<p>Embedded Assessment Science notebook entries Response sheet Performance assessment</p> <p>Benchmark Assessment <i>Investigation 4 I-Check</i></p> <p>NGSS Performance Expectations 5-PS1-1 5-ESS2-1 5-ESS3-1 3-5-ETS1-2 3-5-ETS1-3</p>
<ul style="list-style-type: none"> • Evaporation and condensation contribute to the movement of water through the water cycle, redistributing water over Earth's surface. • As temperature increases, the rate of evaporation increases. • Most of Earth's water (97%) is salt water in the ocean; Earth's fresh water is found in the atmosphere, lakes and rivers, soil, ground ice, ground water, and glaciers. • The Sun's energy drives weather. • Climate is the average or typical weather that can be expected to occur in a region of Earth's surface. Earth's climate is changing. 	<p>Science Resources Book "Condensation" "Where Is Earth's Water?" "The Water Cycle" "Severe Weather" "Earth's Climates" "Global Climate Change"</p> <p>Videos <i>Water Cycle</i> <i>Climate and Seasons</i></p> <p>Online Activities "Water-Cycle Game" "Climate Regions Map"</p>	<p>Embedded Assessment Performance assessment Response sheet Science notebook entries</p> <p>Benchmark Assessment <i>Posttest</i></p> <p>NGSS Performance Expectations 5-PS1-1 5-ESS2-1 5-ESS2-2 5-ESS3-1</p>

FOSS COMPONENTS

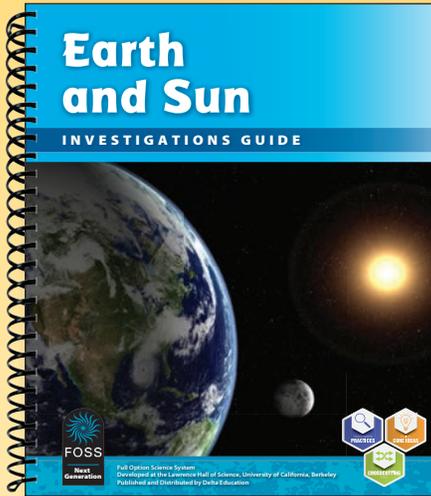
Teacher Toolkit for Each Module

The FOSS Next Generation Program has three modules for grade 5—**Mixtures and Solutions**, **Living Systems**, and **Earth and Sun**.

Each module comes with a *Teacher Toolkit* for that module. The *Teacher Toolkit* is the most important part of the FOSS Program. It is here that all the wisdom and experience contributed by hundreds of educators has been assembled. Everything we know about the content of the module, how to teach the subject, and the resources that will assist the effort are presented here. Each toolkit has three parts.

Investigations Guide. This spiral-bound document contains these chapters.

- Overview
- Framework and NGSS
- Materials
- Technology
- Investigations (five in this module)
- Assessment



INVESTIGATION 1 — The Sun

SCIENCE AND ENGINEERING PRACTICES
Developing and using models
Obtaining, evaluating, and communicating information

ELA CONNECTION
These suggested strategies address the Common Core State Standards for ELA.
RI 3: Explain the relationships or interactions between two concepts.
W 2: Write informative/explanatory texts.

SCIENCE AND ENGINEERING PRACTICES
Constructing explanations

CROSSCUTTING CONCEPTS
Cause and effect

ELA CONNECTION
This suggested strategy addresses the Common Core State Standards for ELA.
W 9: Draw evidence from informational texts.

POSSIBLE BREAKPOINT

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Full Option Science System

Part 3: Day and Night

SCIENCE AND ENGINEERING PRACTICES
Asking questions
Analyzing and interpreting data
Using mathematics and computational thinking
Constructing explanations

**Daylight in Berkeley, CA
21st Day of Each Month**

Month of the year	J	F	M	A	M	J	J	A	S	O	N	D
Hours of daylight	10	11	12	13	14	15	16	15	14	13	12	11

CROSSCUTTING CONCEPTS
Patterns

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Earth and Sun Module—FOSS Next Generation

FOSS Science Resources book. One copy of the student book of readings is included in the *Teacher Toolkit*.

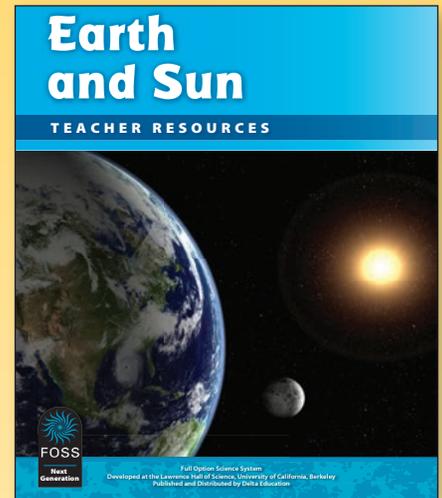
Teacher Resources. These chapters can be downloaded from FOSSweb and are also in the bound *Teacher Resources* book.

- FOSS Program Goals
- Planning Guide—Grade 5
- Science and Engineering Practices—Grade 5
- Crosscutting Concepts—Grade 5
- Sense-Making Discussions for Three-Dimensional Learning—Grade 5
- Access and Equity
- Science Notebooks in Grades 3–5
- Science-Centered Language Development
- FOSS and Common Core ELA—Grade 5
- FOSS and Common Core Math—Grade 5
- Taking FOSS Outdoors
- Science Notebook Masters
- Teacher Masters
- Assessment Masters

Equipment for Each Module or Grade Level

The FOSS Program provides the materials needed for the investigations, in sturdy, front-opening drawer-and-sleeve cabinets. Inside, you will find high-quality materials packaged for a class of 32 students. Consumable materials are supplied for three uses before you need to resupply. Teachers may be asked to supply small quantities of common classroom materials.

Delta Education can assist you with materials management strategies for schools, districts, and regional consortia.



Heating Earth Materials Data

	Elapsed time (minutes)	Soil temperature (°C)	Water temperature (°C)
Materials in sunshine	0		
	3		
	6		
	9		
	12		
Materials in shade	15		
	18		
	21		
	24		
	27		
	30		

At 15 minutes, record and move to shade

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Can be duplicated for classroom or workshop use.

Earth and Sun Module
Investigation 4: Heating Earth
No. 16—Notebook Master





FOSS Science Resources Books

FOSS Science Resources: Earth and Sun is a book of original readings developed to accompany this module. The readings are referred to as articles in *Investigations Guide*. Students read the articles in the book as they progress through the module. The articles cover specific concepts, usually after the concepts have been introduced in the active investigation.

The articles in *Science Resources* and the discussion questions provided in *Investigations Guide* help students make connections to the science concepts introduced and explored during the active investigations. Concept development is most effective when students are allowed to experience organisms, objects, and phenomena firsthand before engaging the concepts in text. The text and illustrations help make connections between what students experience concretely and the ideas that explain their observations.

The Night Sky

What do you see when you look up at the sky? During the day, you see the Sun. Sometimes you can see the **Moon**. You might see **clouds**. If you watch long enough, you will see something fly by, such as a bird or an airplane.

At night, you can see different things in the sky. When the Moon is up, it is the brightest object in the night sky. The Moon might look like a thin sliver. That's called a **crescent Moon**. Or it might be big and round. That's called a **full Moon**.

When you see the Moon in the west, it will set soon. When you see the Moon in the east, it is rising. It is easy to **predict** the time of day or night the Sun will rise and set. It is much harder to predict the time of day or night the Moon will rise and set.



A full Moon over New York City

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A crescent Moon



The Moon during the day



On a clear night, you can see about 2,000 stars in the sky.

Stars

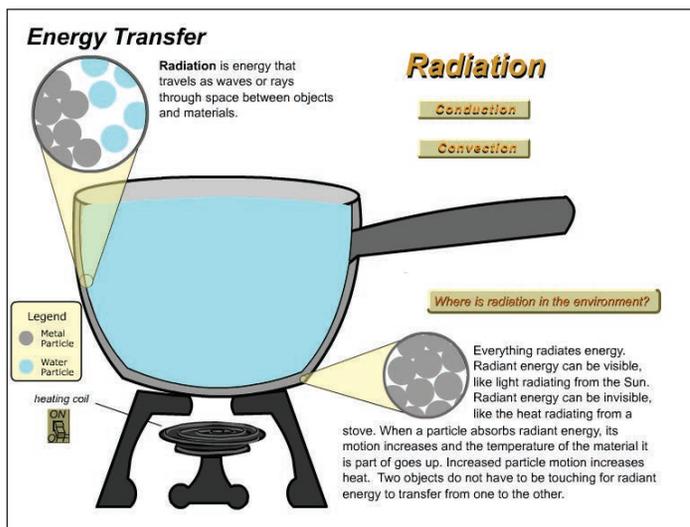
When it is clear, you can see **stars** in the night sky. Night is the only time you can see stars. Well, almost the only time. There is one star we can see in the daytime. It's the Sun. The Sun shines so brightly that it is impossible to see the other stars. But after the Sun sets, we can see that the sky is full of stars. It looks like there are millions of stars in the sky on a clear night. But actually you can see only about 2,000 stars with your **unaided eyes**.

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Technology

The FOSS website opens new horizons for educators, students, and families, in the classroom or at home. Each module has digital resources for students and families—interactive simulations, virtual investigations, and online activities. For teachers, FOSSweb provides online teacher *Investigations Guides*; grade-level planning guides (with connections to ELA and math); materials management strategies; science teaching and professional development tools; contact information for the FOSS Program developers; and technical support. In addition, FOSSweb provides digital access to PDF versions of the *Teacher Resources* component of the *Teacher Toolkit*, digital-only instructional resources that supplement the print and kit materials, and access to FOSSmap, the online assessment and reporting system for grades 3–8.

With an educator account, you can customize your homepage, set up easy access to the digital components of the modules you teach, and create class pages for your students with access to tutorials and online assessments.



Ongoing Professional Learning

The Lawrence Hall of Science and Delta Education strive to develop long-term partnerships with districts and teachers through thoughtful planning, effective implementation, and ongoing teacher support. FOSS has a strong network of consultants who have rich and experienced backgrounds in diverse educational settings using FOSS.

► NOTE

To access all the teacher resources and to set up customized pages for using FOSS, log in to FOSSweb through an educator account. See the Technology chapter in this guide for more specifics.

► NOTE

Look for professional development opportunities and online teaching resources on www.FOSSweb.com.

FOSS INSTRUCTIONAL DESIGN

FOSS is designed around active investigations that provide engagement with science concepts and science and engineering practices. Surrounding and supporting those firsthand investigations are a wide range of experiences that help build student understanding of core science concepts and deepen scientific habits of mind.

The Elements of the FOSS Instructional Design



Each FOSS investigation follows a similar design to provide multiple exposures to science concepts. The design includes these pedagogies.

- Active investigation in collaborative groups: firsthand experiences with phenomena in the natural and designed worlds
- Recording in science notebooks to answer a focus question dealing with the scientific phenomenon under investigation
- Reading informational text in *FOSS Science Resources* books
- Online activities to acquire data or information or to elaborate and extend the investigation
- Outdoor experiences to collect data from the local environment or to apply knowledge
- Assessment to monitor progress and inform student learning

In practice, these components are seamlessly integrated into a curriculum designed to maximize every student's opportunity to learn.

A **learning cycle** employs an instructional model based on a constructivist perspective that calls on students to be actively involved in their own learning. The model systematically describes both teacher and learner behaviors in a coherent approach to science instruction.

A popular model describes a sequence of five phases of intellectual involvement known as the 5Es: engage, explore, explain, elaborate, and evaluate. The body of foundational knowledge that informs contemporary learning-cycle thinking has been incorporated seamlessly and invisibly into the FOSS curriculum design.

Engagement with real-world **phenomena** is at the heart of FOSS. In every part of every investigation, the investigative phenomenon is referenced implicitly in the focus question that guides instruction and frames the intellectual work. The focus question is a prominent part of each lesson and is called out for the teacher and student. The investigation Background for the Teacher section is organized by focus question—the teacher has the opportunity to read and reflect on the phenomenon in each part in preparing for the lesson. Students record the focus question in their science notebooks, and after exploring the phenomenon thoroughly, explain their thinking in words and drawings.

In science, a phenomenon is a natural occurrence, circumstance, or structure that is perceptible by the senses—an observable reality. Scientific phenomena are not necessarily phenomenal (although they may be)—most of the time they are pretty mundane and well within the everyday experience. What FOSS does to enact an effective engagement with the NGSS is thoughtful selection of scientific phenomena for students to investigate.

► NOTE

The anchor phenomena establish the storyline for the module. The investigative phenomena guide each investigation part. Related examples of everyday phenomena are incorporated into the readings, videos, discussions, formative assessments, outdoor experiences, and extensions.



Active Investigation

Active investigation is a master pedagogy. Embedded within active learning are a number of pedagogical elements and practices that keep active investigation vigorous and productive. The enterprise of active investigation includes

- context: sharing prior knowledge, questioning, and planning;
- activity: doing and observing;
- data management: recording, organizing, and processing;
- analysis: discussing and writing explanations.

Context: sharing, questioning, and planning. Active investigation requires focus. The context of an inquiry can be established with a focus question about a phenomenon or challenge from you or, in some cases, from students. (What is air?) At other times, students are asked to plan a method for investigation. This might start with a teacher demonstration or presentation. Then you challenge students to plan an investigation, such as how to design an efficient solar water heater. In either case, the field available for thought and interaction is limited. This clarification of context and purpose results in a more productive investigation.

Activity: doing and observing. In the practice of science, scientists put things together and take things apart, observe systems and interactions, and conduct experiments. This is the core of science—active, firsthand experience with objects, organisms, materials, and systems in the natural world. In FOSS, students engage in the same processes. Students often conduct investigations in collaborative groups of four, with each student taking a role to contribute to the effort.

The active investigations in FOSS are cohesive, and build on each other to lead students to a comprehensive understanding of concepts. Through investigations and readings, students gather meaningful data.

Data management: recording, organizing, and processing. Data accrue from observation, both direct (through the senses) and indirect (mediated by instrumentation). Data are the raw material from which scientific knowledge and meaning are synthesized. During and after work with materials, students record data in their science notebooks. Data recording is the first of several kinds of student writing.

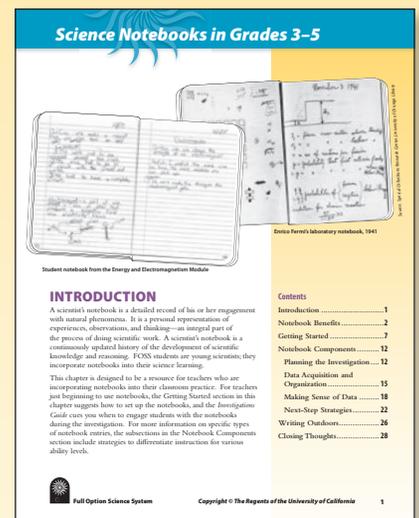
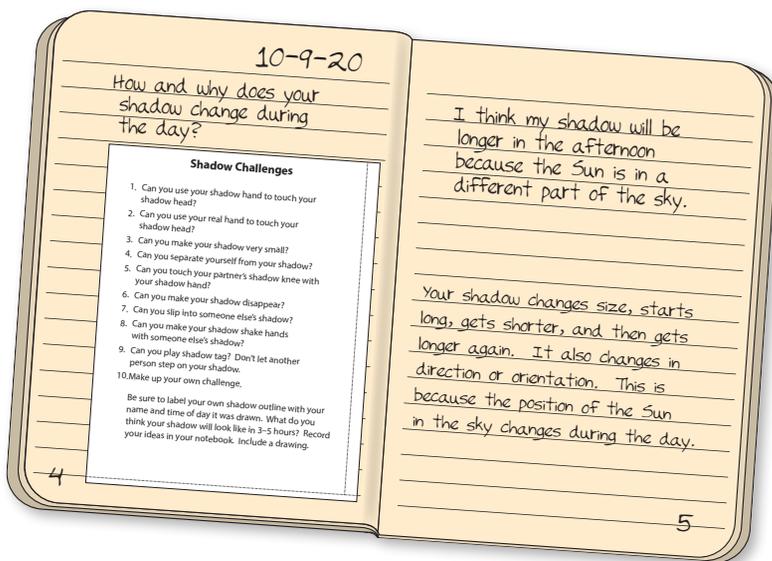
Students then organize data so they will be easier to think about. Tables allow efficient comparison. Organizing data in a sequence (time) or series (size) can reveal patterns. Students process some data into graphs, providing visual display of numerical data. They also organize data and process them in the science notebook.

Analysis: discussing and writing explanations. The most important part of an active investigation is extracting its meaning. This constructive process involves logic, discourse, and prior knowledge. Students share their explanations for phenomena, using evidence generated during the investigation to support their ideas. They conclude the active investigation by writing a summary of their learning as well as questions raised during the activity in their science notebooks.

Science Notebooks

Research and best practice have led FOSS to place more emphasis on the student science notebook. Keeping a notebook helps students organize their observations and data, process their data, and maintain a record of their learning for future reference. The process of writing about their science experiences and communicating their thinking is a powerful learning device for students. The science-notebook entries stand as credible and useful expressions of learning. The artifacts in the notebooks form one of the core exhibitions of the assessment system.

You will find the duplication masters for grades 1–5 presented in notebook format. They are reduced in size (two copies to a standard sheet) for placement (glue or tape) into a bound composition book. Full-sized masters for grades 3–5 that can be filled in electronically and are suitable for display are available on FOSSweb. Student work is entered partly in spaces provided on the notebook sheets and partly on adjacent blank sheets in the composition book. Look to the chapter in *Teacher Resources* called Science Notebooks in Grades 3–5 for more details on how to use notebooks with FOSS.





Reading in FOSS Science Resources

The *FOSS Science Resources* books are primarily devoted to expository articles and biographical sketches. FOSS suggests that the reading be completed during language-arts time to connect to the Common Core State Standards for ELA. When language-arts skills and methods are embedded in content material that relates to the authentic experience students have had during the FOSS active learning sessions, students are interested, and they get more meaning from the text material.

Recommended strategies to engage students in reading, writing, speaking, and listening around the articles in the *FOSS Science Resources* books are included in the flow of Guiding the Investigation. In addition, a library of resources is described in the Science-Centered Language Development chapter in *Teacher Resources*.

The chapter FOSS and the Common Core ELA in *Teacher Resources* shows how FOSS provides opportunities to develop and exercise the Common Core ELA practices through science. A detailed table identifies these opportunities in the three FOSS modules for the fifth grade.



Engaging in Online Activities through FOSSweb

The simulations and online activities on FOSSweb are designed to support students' learning at specific times during instruction. Digital resources include streaming videos that can be viewed by the class or small groups. Resources may also include virtual investigations and tutorials that students can use to review the active investigations and to support students who need more time with the concepts or who have been absent and missed the active investigations.

The Technology chapter provides details about the online activities for students and the tools and resources for teachers to support and enrich instruction. There are many ways for students to engage with the digital resources—in class as individuals, in small groups, or as a whole class, and at home with family and friends.

The screenshot shows the 'Technology' chapter page on the FOSSweb platform. The page features a header with 'EARTH AND SUN — Technology' and a navigation menu on the right. The main content area includes an 'INTRODUCTION' section with text about digital resources and a 'NOTE' section at the bottom right. A table of contents is visible on the right side of the page.

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Requirements for Accessing FOSSweb	86
Troubleshooting and Technical Support	88

NOTE
To get the most current information, download the latest Technology chapter on FOSSweb.

Assessing Progress

The FOSS assessment system includes both formative and summative assessments. Formative assessment monitors learning during the process of instruction. It measures progress, provides information about learning, and is predominantly diagnostic. Summative assessment looks at the learning after instruction is completed, and it measures achievement.

Formative assessment in FOSS, called **embedded assessment**, is an integral part of instruction, and occurs on a daily basis. You observe action during class in a performance assessment or review notebooks after class. Performance assessments look at students' engagement in science and engineering practices or their recognition of crosscutting concepts, and are indicated with the second assessment icon. Embedded assessment provides continuous monitoring of students' learning and helps you make decisions about whether to review, extend, or move on to the next idea to be covered.

Benchmark assessments include the *Survey*, *I-Checks*, *Posttest*, and interim assessments. The *Survey* is given before instruction begins. It provides information about students' prior knowledge. **I-Checks** are actually hybrid tools: they can provide summative information about students' achievement, but more importantly, they can be used formatively as well to provide diagnostic information. Reviewing specific items on an I-Check with the class provides additional opportunities for students to clarify their thinking. The *Posttest* is a summative assessment given after instruction is complete.

Interim assessments give students practice with items specifically designed to measure three-dimensional learning described by NGSS performance expectations. Interim assessment tasks generally begin with a scenario, and ask students to apply practices and crosscutting concepts as well as disciplinary core ideas to respond to the item. Interim assessment tasks can be administered during a module, at the end of the module, or as an end-of-year grade-level assessment.

All benchmark items are carefully designed to be valid, reliable, and accessible to all students. They focus on assessment *for* learning, and when accompanied by thoughtful self-assessment activities and feedback, contribute to the development of a growth mindset.



► TECHNOLOGY COMPONENTS OF THE FOSS ASSESSMENT SYSTEM

FOSSmap for teachers and online assessment for students are the technology components of the FOSS assessment system. Students in grades 3–5 can take assessments online. FOSSmap provides the tools for you to review those assessments online so you can determine next steps for the class or differentiated instruction for individual students based on assessment performance. See the Assessment chapter for more information on these technology components.



Taking FOSS Outdoors

FOSS throws open the classroom door and proclaims the entire school campus to be the science classroom. The true value of science knowledge is its usefulness in the real world and not just in the classroom. Taking regular excursions into the immediate outdoor environment has many benefits. First of all, it provides opportunities for students to apply things they learned in the classroom to novel situations. When students are able to transfer knowledge of scientific principles to natural systems, they experience a sense of accomplishment.

In addition to transfer and application, students can learn things outdoors that they are not able to learn indoors. The most important object of inquiry outdoors is the outdoors itself. To today's youth, the outdoors is something to pass through as quickly as possible to get to the next human-managed place. For many, engagement with the outdoors and natural systems must be intentional, at least at first. With repeated visits to familiar outdoor learning environments, students may first develop comfort in the outdoors, and then a desire to embrace and understand natural systems.

The last part of most investigations is an outdoor experience. Venturing out will require courage the first time or two you mount an outdoor expedition. It will confuse students as they struggle to find the right behavior that is a compromise between classroom rigor and diligence and the freedom of recreation. With persistence, you will reap rewards. You will be pleased to see students' comportment develop into proper field-study habits, and you might be amazed by the transformation of students with behavior issues in the classroom who become your insightful observers and leaders in the schoolyard environment.

Teaching outdoors is the same as teaching indoors—except for the space. You need to manage the same four core elements of classroom teaching: time, space, materials, and students. Because of the different space, new management procedures are required. Students can get farther away. Materials have to be transported. The space has to be defined and honored. Time has to be budgeted for getting to, moving around in, and returning from the outdoor study site. All these and more issues and solutions are discussed in the Taking FOSS Outdoors chapter in *Teacher Resources*.

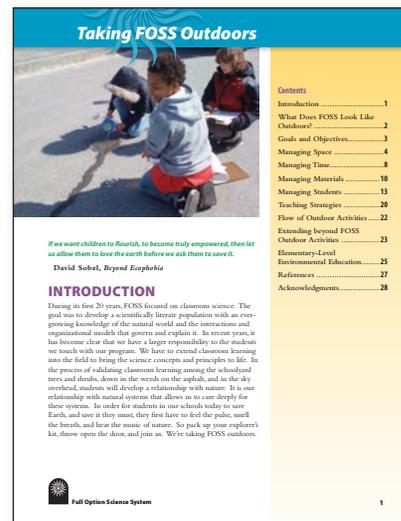
The Three Rs of Conservation

A natural resource is something found in nature that people need or use. Trees, soil, and water are some natural resources. Keeping natural resources safe and using them wisely is called conservation. How can you practice conservation? Follow the three Rs: reduce, reuse, and recycle!



NOTE

The kit includes a set of four *Conservation* posters so you can discuss the importance of natural resources with students.



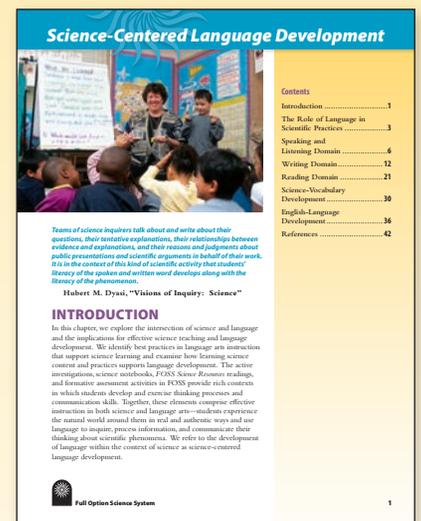
Science-Centered Language Development and Common Core State Standards for ELA

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. These elements are essential for effective instruction 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. FOSS refers to this development of language process and skills within the context of science as science-centered language development.

In the Science-Centered Language Development chapter in *Teacher Resources*, we explore the intersection of science and language and the implications for effective science teaching and language development. Language plays two crucial roles in science learning: (1) it facilitates the communication of conceptual and procedural knowledge, questions, and propositions, and (2) it mediates thinking—a process necessary for understanding. For students, language development is intimately involved in their learning about the natural world. Science provides a real and engaging context for developing literacy and language-arts skills identified in contemporary standards for English language arts.

The most effective integration depends on the type of investigation, the experience of students, the language skills and needs of students, and the language objectives that you deem important at the time. The Science-Centered Language Development chapter is a library of resources and strategies for you to use. The chapter describes how literacy strategies are integrated purposefully into the FOSS investigations, gives suggestions for additional literacy strategies that both enhance students’ learning in science and develop or exercise English-language literacy skills, and develops science vocabulary with scaffolding strategies for supporting all learners. We identify effective practices in language-arts instruction that support science learning and examine how learning science content and engaging in science and engineering practices support language development.

Specific methods to make connections to the Common Core State Standards for English Language Arts are included in the flow of Guiding the Investigation. These recommended methods are linked to the CCSS ELA through ELA Connection notes. In addition, the FOSS and the Common Core ELA chapter in *Teacher Resources* summarizes all of the connections to each standard at the given grade level.



“Active science by itself provides part of the solution to full inclusion and provides many opportunities at the same time for differentiated instruction.”

DIFFERENTIATED INSTRUCTION FOR ACCESS AND EQUITY

Learning from Experience

The roots of FOSS extend back to the mid-1970s and the Science Activities for the Visually Impaired and Science Enrichment for Learners with Physical Handicaps projects (SAVI/SELPH Program). As this special-education science program expanded into fully integrated (mainstreamed) settings in the 1980s, hands-on science proved to be a powerful medium for bringing all students together. The subject matter is universally interesting, and the joy and satisfaction of discovery are shared by everyone. Active science by itself provides part of the solution to full inclusion and provides many opportunities at the same time for differentiated instruction.

Many years later, FOSS began a collaboration with educators and researchers at the Center for Applied Special Technology (CAST), where principles of Universal Design for Learning (UDL) had been developed and applied. FOSS continues to learn from our colleagues about ways to use new media and technologies to improve instruction. Here are the UDL guiding principles.

Principle 1. Provide multiple means of representation. Give learners various ways to acquire information and demonstrate knowledge.

Principle 2. Provide multiple means of action and expression. Offer students alternatives for communicating what they know.

Principle 3. Provide multiple means of engagement. Help learners get interested, be challenged, and stay motivated.

FOSS for All Students

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. Procedures found effective with students with special needs and students who are learning English are incorporated into the materials and strategies used with all students during the initial instruction phase. In addition, the **Access and Equity** chapter in *Teacher Resources* (or go to FOSSweb to download this chapter) provides strategies and suggestions for enhancing the science and engineering experiences for each of the specific groups noted above.

Throughout the FOSS investigations, students experience multiple ways of interacting with phenomena and expressing their understanding through a variety of modalities. Each student has multiple opportunities to demonstrate his or her strengths and needs, thoughts, and aspirations.

The challenge is then to provide appropriate follow-up experiences or enhancements appropriate for each student. For some students, this might mean more time with the active investigations or online activities. For other students, it might mean more experience and/or scaffolds for developing models, building explanations, or engaging in argument from evidence.

For some students, it might mean making vocabulary and language structures more explicit through new concrete experiences or through reading to students. It may help them identify and understand relationships and connections through graphic organizers.

For other students, it might be designing individual projects or small-group investigations. It might be more opportunities for experiencing science outside the classroom in more natural, outdoor environments or defining problems and designing solutions in their communities.

Assessment and Extensions

The next-step strategies suggested during the self-assessment sessions following I-Checks provide opportunities for differentiated instruction. These strategies can also be used to provide targeted and strategic instruction for students who need additional specific support. For more on next-step strategies, see the Assessment chapter.

There are additional approaches and strategies for ensuring access and equity by providing appropriate differentiated instruction. The FOSS Program provides tools and strategies so that you know what students are thinking throughout the module. Based on that knowledge and what you know about your students' cultural and linguistic background, as well as their individual strengths and needs, read through the extension activities for additional ways to enhance the learning experience for your students. Interdisciplinary extensions in the arts, social studies, math, and language arts, as well as more advanced projects are listed at the end of each investigation. Use these ideas to meet the individual needs and interests of your students. In addition, online activities including tutorials and virtual investigations are effective tools to provide differentiated levels of instruction.

English Learners

The FOSS Program provides a rich laboratory for language development for English learners. A variety of techniques are provided to make science concepts clear and concrete, including modeling, visuals, and active investigations in small groups. Instruction is guided and scaffolded through carefully designed lesson plans, and students are supported throughout.

Science vocabulary and language structures are introduced in authentic contexts while students engage in hands-on learning and collaborative discussion. Strategies for helping all students read, write, speak, and listen are described in the Science-Centered Language Development chapter. A specific section on English learners provides suggestions for both integrating English language development (ELD) approaches during the investigation and for developing designated (targeted and strategic) ELD-focused lessons that support science learning.

FOSS INVESTIGATION ORGANIZATION

Modules are subdivided into **investigations** (five in this module). Investigations are further subdivided into three to five **parts**. Each investigation has a general guiding question for the phenomenon students investigate, and each part of each investigation is driven by a **focus question**. The focus question, usually presented as the part begins, engages the student with the phenomenon and signals the challenge to be met, mystery to be solved, or principle to be uncovered. The focus question guides students' actions and thinking and makes the learning goal of each part explicit for teachers. Each part concludes with students recording an answer to the focus question in their notebooks.

The investigation is summarized for the teacher in the At-a-Glance chart at the beginning of each investigation.

Investigation-specific **scientific background** information for the teacher is presented in each investigation chapter organized by the focus questions.

The **Teaching Children about** section makes direct connections to the NGSS foundation boxes for the grade level—Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts. This information is later presented in color-coded sidebar notes to identify specific places in the flow of the investigation where connections to the three dimensions of science learning appear. The Teaching Children about section ends with information about teaching and learning and a conceptual-flow graphic of the content.

The **Materials** and **Getting Ready** sections provide scheduling information and detail exactly how to prepare the materials and resources for conducting the investigation.

Teaching notes and **ELA Connections** appear in blue boxes in the sidebars. These notes comprise a second voice in the curriculum—an educative element. The first (traditional) voice is the message you deliver to students. The second (educative) voice, shared as a teaching note, is designed to help you understand the science content and pedagogical rationale at work behind the instructional scene. ELA Connection boxes provide connections to the Common Core State Standards for English Language Arts.

FOCUS QUESTION

How and why does your shadow change during the day?

SCIENCE AND ENGINEERING PRACTICES

Developing and using models

DISCIPLINARY CORE IDEAS

ESS1.B: Earth and the solar system

CROSSCUTTING CONCEPTS

Systems and system models

TEACHING NOTE

This focus question can be answered with a simple yes or no, but the question has power when students support their answers with evidence. Their answers should take the form “Yes, because ____.”

The **Getting Ready** and **Guiding the Investigation** sections have several features that are flagged in the sidebars. These include several icons to remind you when a particular pedagogical method is suggested, as well as concise bits of information in several categories.



The **safety** icon alerts you to potential safety issues related to chemicals, allergic reactions, and the use of safety goggles.



The small-group **discussion** icon asks you to pause while students discuss data or construct explanations in their groups.



The **new-word** icon alerts you to a new vocabulary word or phrase that should be introduced thoughtfully.



The **vocabulary** icon indicates where students should review recently introduced vocabulary.



The **recording** icon points out where students should make a science-notebook entry.



The **reading** icon signals when the class should read a specific article in the *FOSS Science Resources* book.



The **technology** icon signals when the class should use a digital resource on FOSSweb.

The **assessment** icons appear when there is an opportunity to assess student progress by using embedded or benchmark assessments. Some are performance assessments—observations of science and engineering practices, indicated by a second icon which includes a beaker and ruler.



The **outdoor** icon signals when to move the science learning experience into the schoolyard.



The **engineering** icon indicates opportunities for an experience incorporating engineering practices.



The **math** icon indicates an opportunity to engage in numerical data analysis and mathematics practice.



The **crosscutting concepts** icon indicates an opportunity to expand on the concept by going to *Teacher Resources*, Crosscutting Concepts chapter. This chapter provides details on how to engage students with that concept in the context of the investigation.



The **EL note** provides a specific strategy to use to assist English learners in developing science concepts.

EL NOTE

To help with pacing, you will see icons for **breakpoints**. Some breakpoints are essential, and others are optional.

POSSIBLE BREAKPOINT





ESTABLISHING A CLASSROOM CULTURE

Working in Collaborative Groups

Collaboration is important in science. Scientists usually collaborate on research enterprises. Groups of researchers often contribute to the collection of data, the analysis of findings, and the preparation of the results for publication.

Collaboration is expected in the science classroom, too. Some tasks call for everyone to have the same experience, either taking turns or doing the same things simultaneously. At other times, group members may have different experiences that they later bring together.

Research has shown that students learn better and are more successful when they collaborate. Working together promotes student interest, participation, learning, language development, and self-confidence. FOSS investigations use collaborative groups extensively. Here are a few general guidelines for collaborative learning that have proven successful over the years.

For most activities in upper-elementary grades, collaborative groups of four in which students take turns assuming specific responsibilities work best. Groups can be identified completely randomly (first four names drawn from a hat constitute group 1), or you can assemble groups to ensure diversity and inclusion. Thoughtfully constituted groups tend to work better.

Groups can be maintained for extended periods of time, or they can be reconfigured frequently. Six to nine weeks seems about optimum, so students might stay together throughout an entire module.

Functional roles within groups can be determined by the members themselves, or they can be assigned in one of several ways. Each member in a collaborative group can be assigned a number or a color. Then you need only announce which color or number will perform a certain task for the group at a certain time. Compass points can also be used: the person seated on the east side of the table will be the Reporter for this investigation.

The functional roles used in the investigations follow. If you already use other names for functional roles in your class, use them in place of those in the investigations.

The **Getter** is responsible for materials. One person from each group gets equipment from the materials station, and later returns the equipment.

One person is the **Starter** for each task. This person supervises setting up the equipment and makes sure that everyone gets a turn and that everyone has an opportunity to contribute ideas to the investigation.

The **Recorder** makes sure that everyone has recorded information in his or her science notebook and, as appropriate, records the group data and ideas.

The **Reporter** reports group data to the class or transcribes it to the board or class chart, and shares the main points of the group discussion during class discussion.

Getting started with collaborative groups requires patience, but the rewards are great. Once collaborative groups are in place, you will be able to engage students in more meaningful conversations about science content. You are free to “cruise” the groups, to observe and listen to students as they work, and to interact with individuals and small groups as needed.

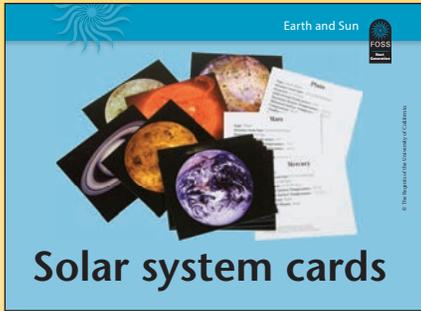
Norms for Sense-Making Discussions

Setting up norms for discussion and holding yourself and your students accountable is the first step toward creating a culture of productive talk in the classroom that supports engagement in the science and engineering practices. Students need to feel free to express their ideas, and to provide and receive criticism from others as they work toward understanding of the disciplinary core ideas of science and methods of engineering.

Establish norms at the beginning of the school year. It is recommended that this be done together as a class activity. However, presenting a poster of norms to students and asking them to discuss why each one is important can also be effective. Before each sense-making discussion, review the norms. Review what it will look like, sound like, and feel like when everyone is following the agreements. You might have students work on one or two at a time as they are developing their oral discourse skills. After discussion, save a few minutes for reflection on how well the group or the class adhered to the norms and what they can do better next time. More strategies for supporting academic discourse can be found in the Sense-Making Discussions for Three-Dimensional Learning and Science-Centered Language Development chapters in *Teacher Resources* (also available as downloadable PDFs on FOSSweb).



This poster is an example of student responsibilities that the class discussed and adopted as their norms.



Managing Materials

The Materials section lists the items in the equipment kit and any teacher-supplied materials. It also describes things to do to prepare a new kit and how to check and prepare the kit for your classroom. Classroom volunteers and helpful students can also assist in setting up and preparing the materials.

Individual photos of each piece of FOSS equipment are available for printing from FOSSweb, and can help students and you identify each item. They can be used to support emerging readers and English language learners to acquire and use new vocabulary words necessary to engage in the investigations. (Photo equipment cards are available in English and Spanish formats.)

The FOSS Program designers suggest using a central materials distribution system. You organize all the materials for an investigation at a single location called the materials station. As the investigation progresses, one member of each group gets materials as they are needed, and another returns the materials when the investigation is complete. You place the equipment and resources at the station, and students do the rest. Students can also be involved in cleaning and organizing the materials at the end of a session. Be sure to work with students to Reduce, Reuse, and Recycle the materials used in science.

When Students Are Absent

When a student is absent for a session, give him or her a chance to spend some time with the materials at a center. Another student might act as a peer tutor. Allow the student to bring home a *FOSS Science Resources* book to read with a family member. There are suggested interactive reading strategies for each article as well as embedded review items that the student can respond to verbally or in writing.

There is a set of two or three virtual investigations for each FOSS module for grades 3–5. Students who have been absent from certain investigations can access these simulations online through FOSSweb. The virtual investigations require students to record data and answer concluding questions in their science notebooks. Sometimes the notebook sheet that was used in the classroom investigation is also used for the virtual investigation.



Collaborative Teaching and Learning

Collaborative learning requires a collective as well as individual growth mindset. A growth mindset is when people believe that their most basic abilities can be developed through dedication and hard work (see the research of Carol Dweck and her book *Mindset: The Psychology of Success*). As students work together to make sense of phenomena and develop their inquiry and discourse skills, it's important to recognize and value their efforts to try new approaches and their willingness to make their thinking visible. Remind students that everyone in the classroom, including you the teacher, will be learning new ideas and ways to think about the world. Where there is productive struggle, there is learning. Here are a few ways to help students develop a growth mindset for science and engineering.

- **Praise effort, not right answers.** When students are successful at a task, provide positive feedback about their level of engagement and effort in the practices, e.g., the efforts they put into careful observations, how well they organized and interpreted their data, the relevancy of their questions, how well they connected or applied new concepts, and their use of precise vocabulary, etc. Also, try to provide feedback that encourages students to continue to improve their learning and exploring, e.g., is there another way to approach this question? Have you thought about ____? What evidence is there to support ____?
- **Foster and validate divergent thinking.** During sense-making discussions, continually emphasize how important it is to share emerging ideas and to be open to the ideas of others in order to build understanding. Model for students how you refine and revise your thinking based on new information. Make it clear to students that the point is not for them to show they have the right answer, but rather to help each other arrive at new understandings. Point out positive examples of students expressing and revising their ideas.

Establishing a classroom culture that supports three-dimensional teaching and learning centers on collaboration. Collaborative groupings, materials management, and norms are structures you can put into place to foster collaboration. These structures along with the expectations that students will be negotiating meaning together as a community of learners, creates a learning environment where students are compelled to work, think, and communicate like scientists and engineers to help one another learn.

SAFETY IN THE CLASSROOM AND OUTDOORS

Following the procedures described in each investigation will make for a very safe experience in the classroom. You should also review your district safety guidelines and make sure that everything you do is consistent with those guidelines. Two posters are included in the kit: *FOSS Science Safety* for classroom use and *FOSS Outdoor Safety* for outdoor activities.

Look for the safety icon in the Getting Ready and Guiding the Investigation sections that will alert you to safety considerations throughout the module.

Safety Data Sheets (SDS) for materials used in the FOSS Program can be found on FOSSweb. If you have questions regarding any SDS, call Delta Education at 1-800-258-1302 (Monday–Friday, 8 a.m.–5 p.m. ET).



Science Safety

- 1 Listen carefully to your teacher's instructions. Follow all directions. Ask questions if you don't know what to do.
- 2 Tell your teacher if you have any allergies.
- 3 Never put any materials in your mouth. Do not taste anything unless your teacher tells you to do so.
- 4 Never smell any unknown material. If your teacher tells you to smell something, wave your hand over the material to bring the smell toward your nose.
- 5 Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.
- 6 Always protect your eyes. Wear safety goggles when necessary. Tell your teacher if you wear contact lenses.
- 7 Always wash your hands with soap and warm water after handling chemicals, plants, or animals.
- 8 Never mix any chemicals unless your teacher tells you to do so.
- 9 Report all spills, accidents, and injuries to your teacher.
- 10 Treat animals with respect, caution, and consideration.
- 11 Clean up your work space after each investigation.
- 12 Act responsibly during all science activities.



Outdoor Safety

- 1 Listen carefully to your teacher's instructions. Follow all directions. Ask questions if you don't know what to do.
- 2 Tell your teacher if you have any allergies. Let your teacher know if you have never been stung by a bee.
- 3 Never put any materials in your mouth.
- 4 Dress appropriately for the weather and the outdoor experience.
- 5 Stay within the designated study area and with your partner or group. When you hear the "freeze" signal, stop and listen to your teacher.
- 6 Never look directly at the Sun or at the sunlight being reflected off a shiny object.
- 7 Know if there are any skin-irritating plants in your schoolyard, and do not touch them. Most plants in the schoolyard are harmless.
- 8 Respect all living things. When looking under a stone or log, lift the side away from you so that any living thing can escape.
- 9 If a stinging insect is near you, stay calm and slowly walk away from it. Tell your teacher right away if you are stung or bitten.
- 10 Never release any living things into the environment unless you collected them there.
- 11 Always wash your hands with soap and warm water after handling plants, animals, and soil.
- 12 Return to the classroom with all of the materials you brought outside.



Science Safety in the Classroom

General classroom safety rules to share with students are listed here.

1. Listen carefully to your teacher's instructions. Follow all directions. Ask questions if you don't know what to do.
2. Tell your teacher if you have any allergies.
3. Never put any materials in your mouth. Do not taste anything unless your teacher tells you to do so.
4. Never smell any unknown material. If your teacher tells you to smell something, wave your hand over the material to bring the smell toward your nose.
5. Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.
6. Always protect your eyes. Wear safety goggles when necessary. Tell your teacher if you wear contact lenses.
7. Always wash your hands with soap and warm water after handling chemicals, plants, or animals.
8. Never mix any chemicals unless your teacher tells you to do so.
9. Report all spills, accidents, and injuries to your teacher.
10. Treat animals with respect, caution, and consideration.
11. Clean up your work space after each investigation.
12. Act responsibly during all science activities.

SCHEDULING THE MODULE

Below is a suggested teaching schedule for the module. The investigations are numbered and should be taught in order, as the concepts build upon each other from investigation to investigation. We suggest that a minimum of 11 weeks be devoted to this module.

Active-investigation (A) sessions include hands-on work with materials, active thinking about experiences, small-group discussion, writing in science notebooks, and learning new vocabulary in context.

Reading (R) sessions involve reading *FOSS Science Resources* articles. Reading can be completed during language-arts time to make connections to Common Core State Standards for ELA (CCSS ELA).

During **Wrap-Up/Warm-Up (W)** sessions, students share notebook entries and engage in connections to CCSS ELA. These sessions should be completed during language-arts time.

I-Checks are short summative assessments at the end of each investigation. Students have a short notebook review session the day before and a self-assessment of selected items the following day. (See the Assessment chapter for the next-step strategies for self-assessment.)

Week	Day 1	Day 2	Day 3	Day 4	Day 5
	Survey				
1	START Inv. 1 Part 1		START Inv. 1 Part 2		
	A	A/W	A	A	A
2	R/W	START Inv. 1 Part 3	Review	I-Check 1	Self-assess
		A/R			
3	START Inv. 2 Part 1			START Inv. 2 Part 2	
	A	A/R	R/W	A/R	R/W
4	START Inv. 2 Part 4			START Inv. 2 Part 5	
	A	A/R	R/W	A	A/R
5	R/Review	I-Check 2	Self-assess	START Inv. 3 Part 1	
				A	R/W
6	START Inv. 3 Part 2	START Inv. 3 Part 3			
	A/R/W	A	R/Review	I-Check 3	Self-assess
7	START Inv. 2 Part 3	optional R/R/W	START Inv. 4 Part 1		
	A		A	A	R/W
8	START Inv. 4 Part 2			START Inv. 4 Part 3	
	A	A	R/W	A	R/W
9	START Inv. 4 Part 4				
	A	A	A/R	Review	I-Check 4
10	START Inv. 5 Part 1		START Inv. 5 Part 2		START Inv. 5 Part 3
	A	A/R/W	A	A/W	A
11		START Inv. 5 Part 4			
	A/R/R	W/A/R	R	Review	Posttest

NOTE

The Getting Ready section for each part of an investigation helps you prepare. It provides information on scheduling the activities and introduces the tools and techniques used in the activity. Be prepared—read the Getting Ready section thoroughly and review the teacher preparation video on FOSSweb.

NOTE

Review **Investigation 2, Part 1, Night-Sky Observations**, at the beginning of the module. Plan to start those observations when there is a first-quarter Moon visible during the school day.

We suggest that you continue to observe the Moon over the next 4 weeks. You should go on to **Investigation 2, Parts 2, 4, and 5** and conduct **Investigation 3** during that time. If you choose to do the optional **Investigation 2, Part 3, Moon Phases**, do so at the beginning of week 7 (in purple).

FOSS CONTACTS

General FOSS Program information

www.FOSSweb.com

www.DeltaEducation.com/FOSS

Developers at the Lawrence Hall of Science

foss@berkeley.edu

Customer Service at Delta Education

www.DeltaEducation.com/contact.aspx

Phone: 1-800-258-1302, 8:00 a.m.–5:00 p.m. ET

FOSSmap (online component of FOSS assessment system)

<http://FOSSmap.com/>

FOSSweb account questions/access codes/help logging in

techsupport.science@schoolspecialty.com

Phone: 1-800-258-1302, 8:00 a.m.–5:00 p.m. ET

School Specialty online support

loginhelp@schoolspecialty.com

Phone: 1-800-513-2465, 8:30 a.m. –6:00 p.m. ET

FOSSweb tech support

support@fossweb.com

Professional development

www.FOSSweb.com/Professional-Development

Safety issues

www.DeltaEducation.com/SDS

Phone: 1-800-258-1302, 8:00 a.m.–5:00 p.m. ET

For chemical emergencies, contact Chemtrec 24 hours per day.

Phone: 1-800-424-9300

Sales and replacement parts

www.DeltaEducation.com/FOSS/buy

Phone: 1-800-338-5270, 8:00 a.m.–5:00 p.m. ET