FOSS

Developed at:

The Lawrence Hall of Science
UNIVERSITY OF CALIFORNIA, BERKELEY

Science is best learned when it's discovered.

Active investigation is at the heart of FOSS.

Every student deserves the larger benefits of science education, not just exposure to science words seen on the pages of a book or during a video. The developers at the Lawrence Hall of Science designed FOSS® to effectively engage students by inviting them to investigate, understand, and solve problems in the world around them. This philosophy is aligned with the Virginia Standards of Learning and the 5 C's of the Profile of a Virginia Graduate. It's a student-centered, hands-on approach that affords all students, regardless of background, culture, language, or ability, a full opportunity to become future-ready graduates.

Why FOSS?

- Student-first approach using hands-on activities and differentiated resources
- Aligned to the Standards of Learning with implementation tools for Virginia's teachers
- Student problem-solving through Engineering Design and Environmental Literacy
- Unmatched support and comprehensive resources for teachers and students
- FOSS passes the test with proven results for Virginia students

Comprehensive packages for complete learning.

FOSS® is more than just a science curriculum or science kit. Your investment in any FOSS Middle School course buys you all the student and teacher components to deliver world-class science education. No teachers scrambling or budgets strained to provide what's been left out—all the key components are included, with each element thoughtfully designed to conserve your money, space, and precious time.

"FOSS kits have provided a scaffolded path for a regular science teacher to improve her instruction and become a role model in science teaching and learning practices. From the excellent background knowledge it provides to math and language acquisition connections, FOSS curriculum and specific labs have turned around my teaching of Virginia science."

Adriana F., Science Teacher
Alexandria, VA

Equipment Kit

Durable equipment and classroom tested materials, selected and designed expressly for FOSS, lead to successful investigations for all students. Kits include permanent equipment for classes of 32 students (8 groups) with enough consumables for five (5) uses at middle school.

Investigations Guide

This is the core instructional tool that supports the teacher in facilitating student investigations. Chapters include Overview, Alignment with Virginia SOLs, Materials, Technology, Assessment, and each detailed Investigation. Available in print and digital.

FOSS Science Resources

FOSS student reading materials are in-depth articles that connect students' firsthand experiences to informational text, helping expand understanding from the concrete to the abstract. Available in print, eBook, and audiobook.

FOSS Technology

FOSSweb offers simulations and virtual investigations. Online activities provide differentiating instruction. Student ebooks and streaming video are also included. Comprehensive teacher preparation videos and instructional slides support teachers.

Teacher Resources

Provided in print and available online, resources include grade-level chapters on sense-making and three-dimensional teaching and learning; connections to Common Core ELA and Math standards; AVAs (Activities for Virginia); taking FOSS outdoors; equity in science; science-centered language development; using science notebooks; and notebook, teacher, and assessment masters.

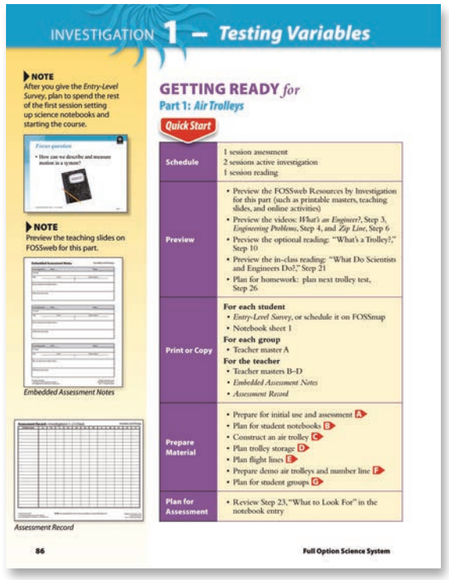
Spanish Resources

Spanish editions of *FOSS Science Resources* are offered both in print and eBook. FOSSweb provides audio files for *FOSS Science Resources*, as well as notebook, assessment, and teacher masters, module vocabulary and definitions, teaching slides, and Focus Questions.

Materials management made easy.

We believe that students learn science best by *doing* science. Your commitment to preparing for FOSS hands-on experiences comes to fruition when you see your students' engagement soar and their understanding grow. We've spent decades working in classrooms to provide comprehensive materials management support for teachers of all levels of experience.

- *Investigations Guide* with step-by-step instructions to help you through lesson preparation, facilitation, and assessment.
- Teacher preparation videos to provide visuals for important investigation setups.
- Efficient equipment kits, designed for middle schools—outfit your classroom with materials to complete each investigation with five classes of students.
- Handy refill kits replace consumables so you can make the most of your time teaching science.


INVESTIGATION 1 — *Testing Variables*

NOTE
After you give the *Entry-Level Survey*, plan to spend the rest of the first session setting up science notebooks and starting the course.

NOTE
Preview the teaching slides on FOSSweb for this part.

Embedded Assessment Notes

Assessment Record

GETTING READY *for*
Part 1: *Air Trolleys*

Quick Start

Schedule	1 session assessment 2 sessions active investigation 1 session reading
Preview	• Preview the FOSSweb Resources by Investigation for this part (such as printable masters, teaching slides, and online activities) • Preview the videos: *What's an Engineer?*, Step 3, *Engineering Problems*, Step 4, and *Zip Line*, Step 6 • Preview the optional reading: "What's a Trolley?," Step 10 • Preview the in-class reading: "What Do Scientists and Engineers Do?," Step 21 • Plan for homework: plan next trolley test, Step 26
Print or Copy	**For each student** • *Entry-Level Survey*, or schedule it on FOSSmap • Notebook sheet 1 **For each group** • Teacher master A **For the teacher** • Teacher masters B–D • *Embedded Assessment Notes* • *Assessment Record*
Prepare Material	• Prepare for initial use and assessment A • Plan for student notebooks B • Construct an air trolley C • Plan trolley storage D • Plan flight lines E • Prepare demo air trolleys and number line F • Plan for student groups G
Plan for Assessment	• Review Step 23, "What to Look For" in the notebook entry

86 Full Option Science System

FOSS *Investigations Guides* include a streamlined Quick Start Guide for each part of every investigation that highlights exactly what needs to be printed, set up, or prepared in advance of the lesson.

New equipment options for middle schools

We listened to middle school teachers from across the country when developing FOSS Middle School and now offer greater flexibility in equipping your FOSS classroom or lab. **Ask your FOSS Specialist** which equipment option is the best fit for you.

	FULL KIT	LITE KIT
Consumable items (refill kits available)	X	X
Unique, program-specific permanent items	X	X
Common science lab items (beakers, graduated cylinders, etc.) or items found in multiple FOSS courses	X	

Course Descriptions: The options are all yours.

Full Option Science System® courses for the middle school grades are designed for flexibility. FOSS provides a suggested scope for grades 6–8, but each course can be used as primary or supplemental science education and taught at any grade in the 6–8 range, in accordance with Virginia requirements and your school's curriculum. Courses vary in length from 4 to 14 weeks.

"I have been fortunate to work with FOSS curriculum materials for over 15 years. They provide teachers with a model of excellent curriculum design, lessons that are easy to implement, an integrated curriculum with science as the focus, instructional support, and models for high quality standards-based lessons. FOSS engages students in high-quality science learning experiences."

Elizabeth Edmondson, Ph.D.
Science Education
Virginia Commonwealth University

Course Descriptions for Grade 6

Planetary Science/Watersheds

EARTH SCIENCE

Students develop a thorough understanding of the local cosmos — including the organization of the solar system and day/night/seasons—before turning their study to the top planetary science headlines of our times, in particular, the hunt for exoplanets.

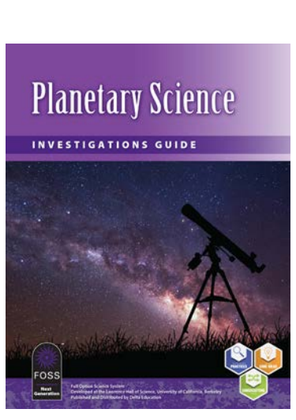
Course Driving Question:

What is my cosmic address?

Preview of Phenomena Investigated:

Students engage with the anchor phenomenon of Earth, an object in space, to explain day, night, seasons, solar system formation, and human impact to Earth's systems.

Virginia Science SOL & SEP: 6.2, 6.3, 6.8, 6.9; SEP 6.1



In Chesapeake Bay Watershed, students explore the Chesapeake Bay ecosystem interactions, including human use of the watershed system. Students design and use models in order to better understand their personal connection to the greater Chesapeake watershed, and consider how humans are both positively and negatively impacting local systems. This investigation, developed with support from the Chesapeake Bay Foundation, will prepare students with the scientific habits of mind at an age-appropriate level to develop an understanding of the local environment as a part of their Meaningful Watershed Educational Experiences (MWEE).

Course Driving Questions:

- How do models help us understand our watershed?
- What impact do humans have on Virginia's watersheds?

Preview of Phenomena Investigated:

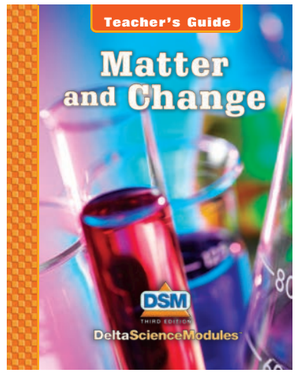
Ecosystem interactions and the impact of humans.

Virginia Science SOL & SEP: 6.1, 6.8, 6.9

Delta Science Module: Matter and Change*

PHYSICAL SCIENCE

Students explore the chemical makeup, properties, and interactions of substances through hands-on activities and reading. Activity sheets become lab reports as young chemists hypothesize, test, record, and draw conclusions about the nature of matter. In this chemistry primer, students investigate atomic structure and learn to read the Periodic Table of Elements. With three-dimensional models and corresponding chemical equations, students explore the covalent and ionic molecular bonds of compounds.



Virginia Science SOL & SEP: 6.1 and 6.5

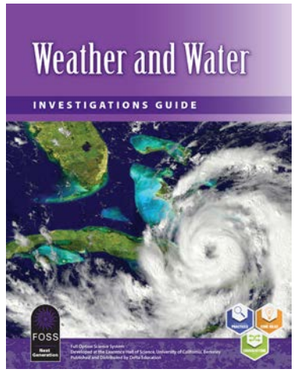
*Delta Science Modules are provided by Delta Education.

Delta Education®

Weather and Water

EARTH SCIENCE

Students explore physical science processes to explain earth science phenomena. They learn about atoms and molecules, density, wind, and energy transfer and then investigate phase change, the water cycle, ocean currents, climate change, and meteorology.



Course Driving Question:

What makes weather happen?

Preview of Phenomena Investigated:

Students engage with the anchor phenomenon of observable local weather conditions to make sense of why weather changes and explore climate patterns.

Virginia Science SOL & SEP: 6.4, 6.5, 6.6, 6.7; SEP 6.1

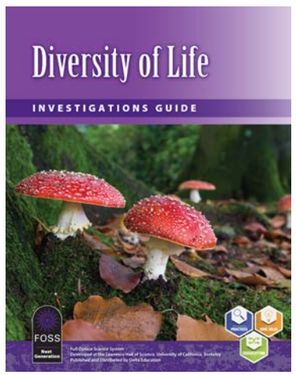
“The FOSS lessons are student-led investigations that encompass many different learning styles and encourage a student’s natural curiosity and desire for learning. My students are excited for school and absolutely love science class.”

Donna R., Teacher
Giles County, VA

Course Descriptions for Grade 7

Diversity of Life
LIFE SCIENCE

Students discover that all living things share the same basic characteristics, that all organisms are composed of cells, and that a single cell is the fundamental unit of life. Students then explore the relationship of organisms to their environment, and explore the concept of biodiversity.



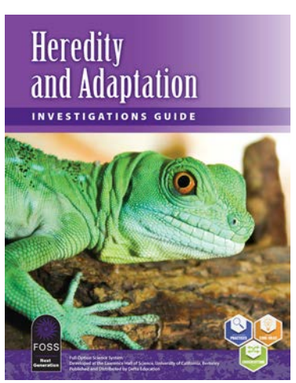
Course Driving Question:
How do you know something is living?

Preview of Phenomena Investigated:
Students engage with the anchor phenomenon of life on Earth to consider what it means to be alive.

Virginia Science SOL & SEP: LS.2, LS.3, LS.4, LS.7; SEP LS.1

Heredity and Adaptation
LIFE SCIENCE

Students explore evidence for evolution, including the fossil record, the similarities between past and present organisms, the genetic principles of inheritance, and how natural selection produces adaptations that lead to changes in species and eventually the creation of new species.



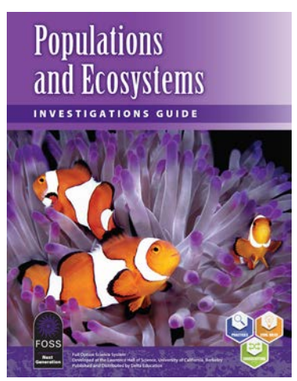
Course Driving Question:
How can we explain the diversity of life that has lived on Earth?

Preview of Phenomena Investigated:
Students search for evidence that explains the anchor phenomenon of biodiversity on Earth.

Virginia Science SOL & SEP: LS.10. LS.11; SEP LS.1

Populations and Ecosystems
LIFE SCIENCE

Students learn that every organism has a role to play in its ecosystem. To understand how ecosystems work and what they need to remain healthy, students explore how changes to one part of the ecosystem affect others by studying ecosystem interactions of matter and energy.



Course Driving Question:
How do organisms, matter, and energy interact in an ecosystem?

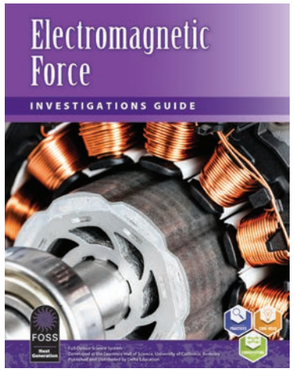
Preview of Phenomena Investigated:
Students engage with the anchor phenomenon of population dynamics within ecosystems by studying matter and energy flow and addressing a student-chosen ecological issue.

Virginia Science SOL & SEP: LS.4, LS.5, LS.6, LS.8, LS.9; SEP LS.1

Course Descriptions for Grade 8

Electromagnetic Force
PHYSICAL SCIENCE

Students begin to explore the concept of force. They measure the force of invisible magnetic fields, learn to build a circuit, design an electromagnet, and explain the energy transfers that make it all possible. They consider energy sources for human use and limitations of renewable and nonrenewable resources.



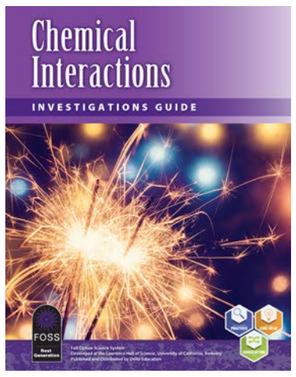
Course Driving Question:
What is the relationship between magnetic and electric forces?

Preview of Phenomena Investigated:
Students engage with the anchor phenomena of magnetic and electric forces by exploring their interactions and effects.

Virginia Science SOL & SEP: PS.1, PS.5, PS.8, PS.9; SEP PS.1

Chemical Interactions
PHYSICAL SCIENCE

Students conduct experiments to observe macroscopic matter transformations and apply kinetic particle theory to explain those transformations at the atomic level. They explore conservation of energy and matter and use those principles to explain phase change and chemical reactions.



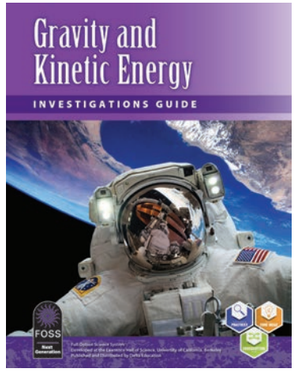
Course Driving Question:
How does matter interact?

Preview of Phenomena Investigated:
Students engage with the anchor phenomenon of interactions of matter to explain how energy and matter interact, including phase changes and chemical reactions.

Virginia Science SOL & SEP: PS.1, PS.2, PS.3, PS.4, PS.5; SEP PS.1

Gravity and Kinetic Energy
PHYSICAL SCIENCE

Students explore speed, acceleration, gravity, and collision physics. They explore how the force of gravity is related to the mass of objects and distance between them, and how this relates to gravity on various celestial objects. They learn Newton's laws and engage in an engineering challenge to design a helmet that will provide protection during impact.



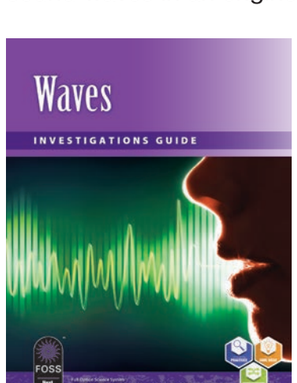
Course Driving Question:
How does matter interact?

Preview of Phenomena Investigated:
Students engage with the anchor phenomenon of interactions of matter to explain how energy and matter interact, including phase changes and chemical reactions.

Virginia Science SOL & SEP: PS.1, PS.5, PS.8; SEP PS.1

Waves
PHYSICAL SCIENCE

Students learn about mechanical and electromagnetic waves. They manipulate springs and lasers to determine properties of waves that are eventually used to explain how their cell phones and other modes of modern communications work. They create designs that affect transmission of sound waves in an engineering challenge.



Course Driving Question:
How is energy transferred through waves?

Preview of Phenomena Investigated:
Students engage with the anchor phenomenon of energy transfer by waves to explain mechanical waves, electromagnetic waves, and communication technology.

Virginia Science SOL & SEP: PS.1, PS.6, PS.7; SEP PS.1

FOSS® & Delta Education® 6-8 Recommended Scope

Grade	Courses			
8	Chemical Interactions	Electromagnetic Force†	Gravity & Kinetic Energy†	Waves†
7	Diversity of Life	Populations & Ecosystems		Heredity & Adaptation†
6	Matter & Change*	Weather & Water	Planetary Science /Watersheds	

*Delta Science Modules provided by Delta Education®.
†Half-length courses

Your partners in supporting quality science education.

At School Specialty, providing science curriculum is our specialty, every day of every year. We'll be right there with you, from purchase through implementation and ongoing annual professional development. Our team is supported by experienced FOSS consultants and by the program authors themselves at the Lawrence Hall of Science. We go beyond the ordinary to ensure that you have all you need to ignite your students' curiosity. With decades of combined FOSS experience, we stand ready to support your success.

Learn more.

Go to **FOSS-Science.com/Virginia**

FOSS™

Developed at: The Lawrence Hall of Science, University of California, Berkeley®

Published & distributed by: School Specialty®

Delta Education®