THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

Lawrence Hall of Science has new instructional materials that address the Next Generation Science Standards!

Check out these Grade 5 Units…

As just one example, compare Grade 5 units from four different Hall programs. See for yourself how each program goes about addressing the Grade 5 NGSS Life Science Standards, and choose the approach that best meets the needs of your school district.

Grade 5 NGSS Performance Expectations

- 5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

- 5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

- 5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Sample Units from Four Different Hall Programs

- Amplify Science—*Ecosystem Restoration: Matter and Energy in a Rain Forest*

- FOSS Next Generation—*Living Systems*

- Ocean Sciences Sequence—*What kind of place is the ocean?*
  What is life like in the ocean?
  How are humans and the ocean connected?

- Seeds of Science/Roots of Reading—*Aquatic Ecosystems*

Description of a Grade 5 unit from Amplify Science

Ecosystem Restoration: Matter and Energy in a Rain Forest

Grade 5 Unit — requiring at least 22 60-minute class sessions

(one of four Grade 5 Amplify Science units)

The Problem: A portion of the Costa Rican rain forest ecosystem is failing. Many years ago, its trees were cut down, and the land was dedicated to cattle grazing. Since then, the cattle have left, and trees were replanted on the land. However, the organisms in this area of the rain forest—jaguars, sloths, and cecropia trees—don't appear to be numerous or healthy. Why?

Students' Role: Students take on the role of ecologists to investigate this question and figure out what can be done to return the ecosystem to its original healthy state. As ecologists working with Natural Resources Rescue, a fictional organization dedicated to protecting Earth's fragile ecosystems, students work to explain why the animals and plants in this part of the Costa Rican rain forest ecosystem aren't growing and thriving. In order to understand what's causing the problem, students investigate what it means to grow and how living things get the matter and energy they need to grow.

What Students Figure Out: Students investigate animals, plants, and decomposers in three successive chapters. First, they investigate why the jaguars and sloths in the failing rain forest ecosystem aren't growing and thriving. Students read texts and use a digital Simulation to investigate what happens at the molecular level as these animals eat other animals and plants in order to add new matter to their bodies. After investigating the animals, students conclude that there are not enough sloths for the jaguars to eat; and there are not enough cecropia trees for the sloths to eat. Students go on to explore why the cecropia trees in the failing rain forest ecosystem aren't growing. Observing a terrarium they've built, reading a new book, testing ideas in the Simulation, and engaging in a variety of hands-on activities, students learn the basics of photosynthesis—the process by which plants make their own food by using water molecules and carbon dioxide molecules from the environment and energy from the sun.

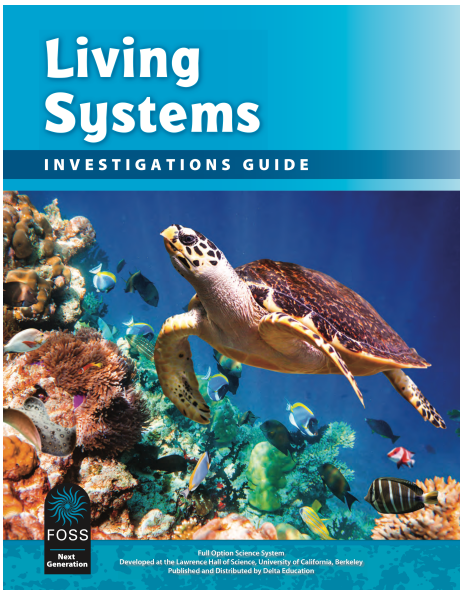
However, after comparing the amount of rainfall, carbon dioxide, and sunlight between the restoration area and a healthy part of the Costa Rican rain forest, students see no difference. Considering other possible explanatory factors, students try to find out whether there might be differences in the soil in which the cecropia trees are growing. Through an analysis of soil data, a hands-on investigation of soil samples, reading a new book, and testing more ideas in the Simulation, students figure out the clear link between decomposers, nutrients, and plant growth, and come up with an explanation for the unhealthy restoration area.

Arguing for a Solution: Throughout the unit, students engage in oral and written scientific argumentation about the source of the problem in the failing ecosystem. They also have an opportunity to write and revise a Rain Forest Restoration Plan in which they explain, in their own words, why the ecosystem is failing and support their arguments by using evidence. At the end of the unit, students present their final restoration plans, including a recommended course of action to restore the failing rain forest ecosystem closer to its original condition.

For more about Amplify Science and information about purchasing units from this NGSS-designed K-8 program: https://www.amplify.com/curriculum/amplifyscience

Description of a Grade 5 module from FOSS Next Generation

Living Systems



Grade 5 Module — requiring at least 50 45-minute class sessions

(One of three FOSS Grade 5 modules)

Guiding question for phenomenon:
What is Earth's biosphere and what sustains it?

The **Living Systems Module** has four investigations that focus on systems as the unit of study. The idea of a system is one of the grand integrating (crosscutting) concepts that pervades all of science. Students start by considering Earth as the interaction of four Earth systems or subsystems—the geosphere, the atmosphere, the hydrosphere, and the biosphere. The focus of the module then turns to the phenomenon of the biosphere as students explore ecosystems and organisms in terms of their interacting parts.

Students think about systems on different scales—nutrient and transport systems within an organism that move matter and provide energy throughout individual organisms, and feeding relationships in ecosystems that move matter and energy through plants, animals, decomposers, and a physical environment. Students come to understand through a variety of experiences that plants get the materials they need for growth primarily from water and air, and that energy in food originated in the Sun. There are many opportunities for students to explore how human activities in agriculture, industry, and everyday life can impact natural systems. Students gain experiences that will contribute to the understanding of crosscutting concepts: patterns; scale, proportion, and quantity; systems and system models; and energy and matter.

Investigation 1: Systems
Students are introduced to a system as a collection of interacting parts that work together to make a whole or produce an action. They explore Earth as a system, focusing on the biosphere and describing ecosystems by looking at feeding relationships and energy transfers, described as food webs. Each group of students sets up a redworm habitat to study detritivores and the role of decomposition in ecosystems.

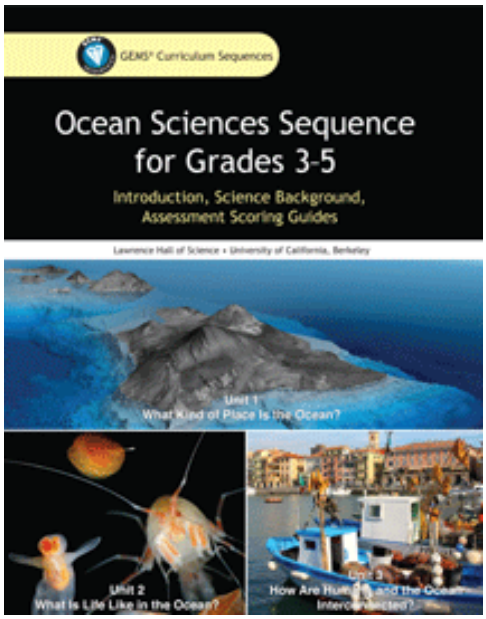
Investigation 2: Nutrient Systems
Students investigate nutrient systems of yeast, plants, and animals. They design an investigation to determine the necessary conditions for activating dry yeast. They plant wheat and observe the seedlings to determine which plants have chlorophyll. Students infer that the plants growing in light are producing food to provide nutrients to their cells. Students investigate how animals acquire nutrients by eating and digesting food.

Investigation 3: Transport Systems
Students learn that all cells have basic needs: water, food, gas exchange, and waste disposal. They explore the transport systems that multicellular organisms have for moving nutrients and wastes. Students investigate leaf transpiration, model a human heart system, and investigate their lung volume to find out about the interacting parts of the vascular system in plants and the circulatory and respiratory systems in humans.

Investigation 4: Sensory Systems
Through video, text, and simulations, students learn about the role of sensory and motor neurons in nervous system messaging. They explore ways that animals communicate through sound, visual displays, and smell. They find out the roles that instinct and learned behavior play in the life of animals. To bring closure to the study of systems, students find out about the North Atlantic Ocean ecosystem and its importance in the carbon cycle.

For more about FOSS Next Generation and information about purchasing units from this NGSS-aligned K-8 program:
https://www.deltaeducation.com/foss/how-foss-works

Description of three Grade 5 units from Ocean Sciences Sequence



What kind of place is the ocean?

What is life like in the ocean?

How are humans and the ocean connected?

Three Grade 5 Units — each unit requiring at least 25 60-minute class sessions

(three of three Grade 5 Ocean Sciences Sequence units)

Units in this instructional sequence engage students in exploring ocean currents, features of the ocean floor, ocean habitats, ocean organism diversity, ocean food webs, adaptations to the ocean environment, and human interconnections with the ocean, including exploration, technology, pollution, and solutions.

Unit 1: What kind of place is the ocean? Students learn that the ocean is the defining feature of our planet. By exploring globes, students discover that one large, interconnected ocean covers a majority of Earth's surface. Students investigate ocean currents and ocean layers through physical models, a computer visualization, and specific scenarios. They learn that differences in temperature and salinity create layers of moving ocean water. Students learn about the depth of the ocean and discover that it varies greatly—it is deeper in places than the tallest mountains are high.

Unit 2: What is life like in the ocean? Students learn about the diversity of habitats and organisms in the ocean. Through videos, photographs, and readings, students investigate a range of ocean habitats, including coral reefs, arctic waters, and rocky shores. They investigate differences in conditions between habitats and discover that some ocean habitats support more life than others. Through videos, photographs, readings, organism models, and data, students investigate ocean organisms, including plankton. Students learn what an adaptation is and find out about adaptations ocean organisms have that help them survive in specific ocean habitats. Particular focus is placed on adaptations related to movement and eating. Students create ocean food webs and build an understanding of how different organisms within a habitat can be connected. Students learn how habitats can be connected by organisms that use different habitats at different stages in their life cycles.

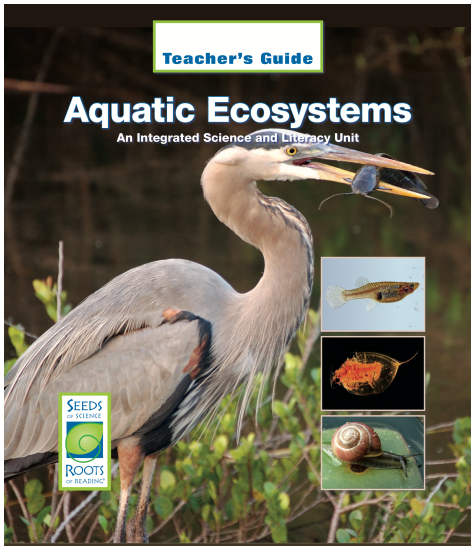
Unit 3: How are humans and the ocean interconnected? Students learn about interconnections between people and the ocean. Students explore ways that people use, need, harm, and protect the ocean. Particular focus is placed on fisheries and overfishing, pollution of the ocean, and what people can do to solve these problems and protect the ocean. Throughout the unit, students learn about the practices of science, with a focus on the use of models and scientific explanations and the role of evidence

Throughout each unit, students learn about the practices of science, with a focus on the use of models, scientific explanations, and the role of evidence, as well as the role of technology in providing new evidence. This upper elementary curriculum prepares students to understand the climate-ocean-connection and climate change curriculum they will be exposed to in middle school.

For more about Ocean Sciences Sequences and information about downloading this and one other NGSS-designed sequence:
http://mare.lawrencehallofscience.org/curriculum/ocean-science-sequence

Description of a Grade 5 unit from Seeds of Science/Roots of Reading

Aquatic Ecosystems



Grade 5 Unit — requiring 40
60-minute class sessions

(one of four Grade 5 Seeds of Science/Roots of Reading units)

Investigation 1: Exploring Ecosystems. Students are introduced to the concept of ecosystems and consider the plant, animal, and nonliving parts that make up ecosystems, through engaging in hands-on experiences, using a reference book, and participating in student-to-student talk. They set up their own tabletop model ponds and use observation to learn about how the parts of an ecosystem interact. They focus on making careful observations, take detailed notes about their organisms as a scientist would, and write scientific descriptions. Students learn how sketching for science differs from other kinds of drawing, and they practice sketching the organisms from their model ponds as a scientist would. To learn more about the nonliving parts of ecosystems, students measure water clarity and temperature and they examine graphs about the temperature of water in which different types of fish can live. Students conduct a brief investigation about mosquitofish and light.

Investigation 2: Conducting Ecosystem Investigations. Students continue to learn about ecosystems by conducting their own independent investigations about new organisms that they add to their model ponds—dragonfly nymphs. Students observe and sketch the nymphs and brainstorm questions they have about them. They read the first of two books read during Investigation 2 that model how scientists conduct investigations. Each group chooses a question about dragonfly nymphs to investigate, and work to plan and conduct their investigations, make sense of their data, and create bar graphs to help them answer their investigation questions.

Investigation 3: Food Webs and Energy. The focus in Investigation 3 shifts away from the model ponds as students learn more about categories of organisms—producers, herbivores, omnivores, carnivores, and decomposers—and how ecologists use these categories to help them understand energy flow through ecosystems. Students obtain information from books and learn how ecologists use food-chain and food-web diagrams to investigate what would happen if the organisms in an ecosystem change. They use models and participate in a simulation to learn about energy flow. As students read the books in this investigation, they learn that posing "Why..?" and "How…?" questions can lead to more meaningful ways to read books.

Investigation 4: Human Impact on Ecosystems. Students investigate how humans interact with ecosystems using what they've learned so far. They consider the impact of releasing the mosquitofish from their model ponds into a natural aquatic habitat, discussing evidence for and against doing this. They continue thinking about human impact as they read a book about how one class of students made a positive change to an ecosystem near their school. Groups then research human impact and propose changes to their schoolyard so it could support more organisms.

For more about Seeds of Science/Roots of Reading and information about purchasing units from this Grade 2-5 program:
https://www.amplify.com/curriculum/seeds-of-science-roots-of-reading