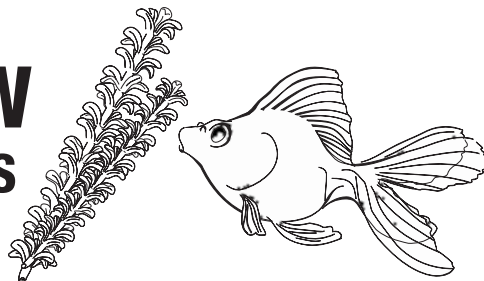


OVERVIEW ENVIRONMENTS



GOALS

All living things depend on the conditions in their environment. The study of the relationships between one organism and its environment builds knowledge of all organisms. With this knowledge comes an awareness of limits. Changes in an environment can be hard on organisms. Such knowledge is important because humans can change environments. To do so without awareness of possible consequences can lead to disasters. The **Environments Module** consists of six investigations that introduce students to these basic concepts in environmental biology.

FOSS EXPECTS STUDENTS TO

- Develop an attitude of respect and understanding for life.
- Gain experience with the major environmental factors in terrestrial and aquatic systems.
- Conduct controlled experiments with plants to determine ranges of tolerance.
- Determine an organism’s optimum conditions and environmental preferences.
- Organize and analyze data from experiments and investigations with plants and animals.
- Observe and describe changes in complex systems over time.
- Relate laboratory studies to natural systems.
- Apply mathematics in the context of science.
- Acquire vocabulary associated with environmental biology.
- Exercise language, math, and social studies skills in the context of biology investigations.
- Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, organizing, and relating.

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OVERVIEW CONTENTS

Goals	1
FOSS and National Science Education Standards	2
Science Background	3
Working in Collaborative Groups	8
Encouraging Discourse	9
Guiding FOSS Investigations	10
Assessing Progress	11
Integrating the Curriculum	12
FOSS for All Students	13
The FOSS Teacher Guide Organization	14
The FOSS Investigation Folio Organization	15
Scheduling the Environments Module	16
Safety in the Classroom	17
Environments Module Matrix	18
FOSS Staff	20

ENVIRONMENTS MODULE MATRIX

SYNOPSIS

SCIENCE CONTENT

THINKING PROCESSES

1. TERRESTRIAL ENVIRONMENTS

Students set up terrariums, observe them for 2 weeks, and describe the environmental factors that contribute to the terrarium environment.

- Everything that surrounds an organism makes up the organism's environment.
- Terrestrial environments include both living and nonliving factors.

- Observe and describe changes in a terrarium over time.
- Organize and communicate observations.

2. BUGS AND BEETLES

Students construct a runway to investigate how isopods and darkling beetles respond to environmental factors such as water and light, and determine the environmental preferences.

- Each organism has a set of preferred environmental conditions.
- Isopods prefer moist, dark environments; beetles prefer dry, dark environments.

- Set up and observe animal investigations.
- Organize data and communicate results of investigations.
- Relate the behavior of an animal to environmental factors.

3. WATER TOLERANCE

Students set up and monitor an experiment to determine the range of water tolerance for early growth of four kinds of plants: corn, pea, barley, and radish.

- Organisms have ranges of tolerance for environmental factors.
- Optimum conditions are those most favorable to an organism's survival, growth, and reproduction.

- Conduct a plant experiment to determine range of tolerance.
- Organize data and communicate results.
- Relate differences in growth to the factor of water.

4. AQUATIC ENVIRONMENTS

Students set up freshwater aquariums with fish and plants. They monitor the environmental factors in the systems, testing the acidity of the water using a chemical indicator.

- Aquatic environments include living and nonliving factors.
- Carbon dioxide produced by aquatic organisms changes the acidity of the water.
- The chain of feeding relationships between a series of organisms is called a food chain.

- Observe and describe changes in an aquarium over time.
- Use a chemical indicator to indirectly measure an environmental factor.
- Relate differences in acid content to changes in carbon dioxide.

5. BRINE SHRIMP HATCHING

Students conduct a controlled experiment to determine which of four salt concentrations allow brine shrimp eggs to hatch. They determine range of tolerance and optimum conditions.

- Brine shrimp eggs can hatch in a range of salt concentrations but hatch best under certain optimum salt conditions.

- Experiment to determine the range of tolerance to salinity for brine shrimp eggs.
- Organize data and compare results.
- Relate the hatching of eggs to the factor of salinity.

6. SALT OF THE EARTH

Students set up a controlled experiment to test the effect of salinity on four kinds of plants. They monitor growth of the seeds into plants and determine the plants' tolerance for salt.

- Organisms have ranges of tolerance for environmental factors.
- Plants have different tolerances for salt.
- In a controlled experiment, one variable is manipulated while all others are kept the same.

- Conduct a plant experiment to determine range of tolerance for salt.
- Organize data and describe results.
- Compare data from different kinds of plants.
- Relate the difference in growth to the factor of salinity.

Language Extension

- Keep an environmental-news bulletin board.

Math Extensions

- Problem of the week.
- Measure terrarium plants.

Science Extensions

- Plant a school garden.
- Make terrariums from around the world.

See the Science Stories folio.

- *Amazon Rainforest Journal*
- *Terrestrial Environments around the World*

www.fossweb.com

Check the FOSS website for interactive simulations, to communicate with a scientist, for teaching tips, and to talk with other classes using FOSS.

Home/School Connection: Students list living and nonliving factors of their home environments.

Language Extension

- Write natural history of beetles and isopods.

Math Extension

- Problem of the week.

Art Extension

- Draw beetles and isopods.

Science Extensions

- Make a terrarium of local organisms.
- Investigate beetle metamorphosis.

See the Science Stories folio.

- *Beetles*
- *The Darkling Beetle*
- *Isopods*

Home/School Connection: Students go on an insect and small-animal safari in their neighborhood and describe the animals and their environments.

Language Extensions

- List wet and dry words.
- Research deserts.

Math Extensions

- Problem of the week.
- Find averages of plant height, root length, etc.

Science Extension

- Use water gauges.

See the Science Stories folio.

- *Auntie's Plants*

Home/School Connection: Students set up an experiment to find the optimum place to grow plants at home.

Language Extensions

- Describe aquatic environments.
- Research acid lakes.

Math Extension

- Problem of the week.

Science Extensions

- Design and build a class aquarium.
- Test acid content of local water samples.
- Record movement of aquatic snails.

See the Science Stories folio.

- *Aquatic Environments around the World*
- *Water Pollution: The Lake Erie Story*
- *Sources of Water Pollution*
- *What Is an Ecosystem?*

Home/School Connection: Students investigate aquatic environments in their neighborhood or inventory natural aquatic environments.

Language Extension

- Debate water use through role-playing.

Math Extension

- Problem of the week.

Science Extensions

- Refine the hatching experiment.
- Investigate other factors in shrimp hatching.

See the Science Stories folio.

- *The Brine Shrimp*
- *The Mono Lake Story*
- *Shrimp Aquaculture*

Home/School Connection: Students raise brine shrimp to see if they can achieve a complete life cycle.

Language Extension

- Research salt use on local roads.

Math Extensions

- Problem of the week.
- Make a graph to compare plant growth.

Science Extension

- Research the effect of acid rain on plants.

See the Science Stories folio.

- *Breeding Plants*
- *What Happens When Ecosystems Change?*
- *How Organisms Depend on Each Other*

Home/School Connection: Students may work at home with family members to prepare their project reports.

FOSS AND NATIONAL STANDARDS

The **Environments Module** encourages students to develop the skills of investigation in order to build explanations based on knowledge and evidence. This module supports the following National Science Education Standards.

SCIENCE AS INQUIRY

Develop students' abilities to do and understand scientific inquiry.

- Identify questions; design and conduct a scientific investigation to answer those questions.
- Employ tools to gather, analyze, and interpret data.
- Use data to construct reasonable explanations.
- Develop and communicate explanations using evidence.
- Analyze alternative explanations and predictions.
- Understand that scientists use different kinds of investigations and tools to develop explanations using evidence and knowledge.

CONTENT: LIFE SCIENCE

Develop students' understanding of organisms and their environments.

- The growth and survival of organisms depend on the biotic and abiotic factors in the environment. Lack of resources and other factors limit the growth of populations of organisms.
- Organisms cause changes in their environment.
- Behavior is one kind of response an organism can make to an environmental factor or stimulus.
- For ecosystems, the major source of energy is sunlight. Energy from the sun passes from organism to organism in food webs.

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

Develop students' decision-making skills.

- Resources are things that we get from the living and nonliving environment to meet human needs.
- Some environmental changes occur slowly, and others occur rapidly.
- Causes of environmental degradation and resource depletion vary from region to region and country to country.