Unit 3: Environments Unit

Content Area: **Science**
Course(s): **Science**
Time Period: **Marking Period 4**
Length: **10 Weeks**
Status: **Published**

Unit Overview

In this module, students will study the structures and behaviors of organisms and the relationships between one organism and its environment builds knowledge of all organisms. With this knowledge comes an awareness of limits. Such knowledge is important because humans can change environments. This module has four investigations that focus on the concepts that organisms have structures and behaviors, including sensory receptors, that serve functions in growth, survival, reproduction, and living organisms depend on one another and on their environment for their survival and the survival of populations.

Standards

Disciplinary Core Ideas (DCI's)

4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
4-LS1-2	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

Crosscutting Concepts (CC's)

CCC.1.1	students identify similarities and differences in order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and to use these patterns to make predictions.
CCC.2.1	students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.
CCC.7.1	students measure change in terms of differences over time, and observe that change may occur at different rates. Students learn some systems appear stable, but over long periods of time they will eventually change.
SCI.3-5.3.2	Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
SCI.3-5.4.2	A system can be described in terms of its components and their interactions.

SCI.3-5.5.3	Energy can be transferred in various ways and between objects.
SCI.3-5.6.2	Substructures have shapes and parts that serve functions.

Science and Engineering Practices (SEP's)

SEP.1.c	Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
SEP.2.f	Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.
SEP.3.a	Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
SEP.3.b	Evaluate appropriate methods and/or tools for collecting data.
SEP.3.c	Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
SEP.3.d	Make predictions about what would happen if a variable changes.
SEP.4.a	Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
SEP.4.b	Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
SEP.4.c	Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
SEP.5.b	Organize simple data sets to reveal patterns that suggest relationships.
SEP.6.a	Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).
SEP.6.b	Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
SEP.6.c	Identify the evidence that supports particular points in an explanation.
SEP.7.c	Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
SEP.7.d	Construct and/or support an argument with evidence, data, and/or a model.
SEP.7.e	Use data to evaluate claims about cause and effect.
SEP.8.a	Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.
SEP.8.d	Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
SEP.8.e	Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.

Essential Questions

Investigation 1: Environmental Factors-

- How do mealwork structures and behaviors help them grow and survive?
- What moisture conditions do isopods prefer?

- What light conditions do isopods prefer?
- What are the characteristics of animals living in the leaf-litter environment?

Investigation 2: Ecosystems-

- What are the environmental factors in an aquatic system?
- What are the roles of organisms in a food chain?
- How does food affect a population in its home range?
- How do animals use their sense of hearing?

Investigation 3: Brine Shrimp Hatching-

- How can we find out if salinity affects brine shrimp hatching?
- How does salinity affect the hatching of brine shrimp eggs?
- Does changing the environment allow the brine shrimp eggs to hatch?
- What are some benefits of having variation within a population?

Investigation 4: Range of Tolerance-

- How much water is needed for early growth of different kinds of plants?
- What is the salt tolerance of several common farm crops?
- How does mapping the plants in the schoolyard help us to investigate environmental factors?
- What are some examples of plant adaptations?

Application of Knowledge: Students will know that…

- a relationship exists between environmental factors and how well organisms grow.
- adaptations are structures and behaviors of an organism that help it survive and reproduce.
- an environment is everything living and nonliving that surrounds an influences an organism.
- animals have structures and behaviors that function to support survival, growth, and reproduction.
- aquatic environments include living and nonliving factors (water and temperature)
- brine shrimp eggs can hatch in a range of salt concentrations, but more hatch in environments with optimum salt concentration.
- decomposers eat dead plant and animal materials and recycle the nutrients in the system.
- every organism has a set of preferred environmental conditions.
- fossils are important evidence about extinct organisms and past environments.
- individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing.
- organisms have ranges of tolerance for environmental factors. Within a range of tolerance, there are optimum conditions that produce maximum growth.
- organisms have ranges of tolerance for environmental factors. Within a range of tolerance, there are optimum conditions that produce maximum reproduction and growth.
- organisms have sensory systems to gather information about their environment and act on it.
- organisms have specific requirements for successful growth, development, and reproduction. A

relationship exists between environmental factors and how well organisms grow.

- organisms interact in feeding relationships in ecosystems (food chains and food webs).
- producers (plants, algae, phytoplankton) make their own food, which is also used by animals (consumers).
- the interaction of organisms with one another and with the nonliving environment is an ecosystem. Organisms may compete for resources in an ecosystem.
- when environments change, some plants and animals survive and reproduce; others move to new locations; and some die.

Application of Skills: Students will be able to...

- conduct a scientific investigation and build explanations from evidence.
- conduct controlled experiments with four kinds of plants to discover their range of tolerance for water and their range of salt tolerance.
- design an investigation so that the effects of one environmental factor can be observed.
- design an investigation to test the viability of brine shrimp eggs.
- determine an organism's environmental preferences for various nonliving environmental factors to better understand the environment in which it will survive.
- graph and interpret data from multiple trials from plant experiments.
- identify and describe ecosystem feeding relationships.
- observe and record changes in animals and their environments over time.
- use modeling to construct representations of the natural world and make predictions.

Assessments

Pre-Assessment/Survey

Investigation 1 - Environmental Factors:

- Formative Assessments: Science Notebook entry, Response Sheet and Performance Assessment
- Benchmark Assessments: Survey, Investigation 1 I-Check

Investigation 2 - Ecosystems:

- Formative Assessments: Science Notebook entry and Response Sheet
- Benchmark Assessments: Investigation 2 I-Check

Investigation 3 - Brine Shrimp Hatching:

- Formative Assessments: Science Notebook entries, Response Sheet and Performance Assessment
- Benchmark Assessments: Investigation 3 I-Check

Investigation 4 - Range of Tolerance:

- Formative Assessments: Response Sheet and Performance Assessment

- Benchmark Assessments: Posttest

Suggested Activities

Investigation 1

- **Part 1**: Observing the Mealworms
    - Introduce mealworms and make observations
    - Set up the containers and feed the mealworms
    - Introduce environment and environmental factor
    - Design an experiment
    - Introduce Life of a Mealworm calendar
    - Science Resource Book "Two Terrestrial Environments" and make a concept grid
    - Discuss mealworm molting and introduce larva
    - Observe the first pupae and the first adults
    - Observe and draw beetle structures and the darkling beetle multigenerational environment
    - Science Resource Book "Darkling Beetles"
- **Part 2**: Designing an Isopod Environment
    - Introduce isopods and make observations
    - Discuss environmental factors and test the factor of moisture
    - Moisture investigation
    - Science Resource Book "Setting Up a Terrarium"
    - Investigate a different environmental factor
    - Science Resource Book "Isopods"
    - Design an isopod environment
- **Part 3**: Leaf-Litter Critters
    - Outdoor exploration for critters
    - Conduct sorting activities
    - Science Resource Book "Amazon Rain Forest Journal"

Investigation 2

- **Part 1**: Designing an Aquarium
    - Review living and nonliving environmental factors
    - Discuss aquatic aquariums and introduce the aquariums
    - Observe the fish and place into their environments then add crustaceans
    - Introduce ecosystem and observe changes in the aquariums
    - Science Resource Book "Freshwater Environments"
- **Part 2**: Food Chains and Food Webs
    - Introduce food web cards- producer, consumer, decomposer
    - Study the organisms and identify feeding interactions
    - Practice with food chains
    - Introduce competition for resources
    - Draw a food web
    - Science Resource Book "What is an Ecosystem?" and "Food Chains and Food Webs"
- **Part 3**: Population Simulation

    - Review organism roles in food chain
    - Introduce the simulation and the recording table and go outdoors
    - Science Resource Book: "Human Activities and Aquatic Ecosystems" and "Comparing Aquatic and Terrestrial Ecosystems"
    - View online activities: Virtual Aquarium and Virtual Terrarium
- **Part 4**: Sound Off
    - Activity outdoors to see how animals use their sense of hearing
    - View the video, "Animal language and communication"
    - Science Resource Book: "Animal Sensory Systems" and "Saving Murrelets through Minicry"

Investigation 3

- **Part 1**: Setting Up the Experiment
    - Introduce salt lake and brine and brine shrimp
    - introduce the problem and set up the hatching experiment
    - Science Resource Book: "Brine Shrimp"
- **Part 2**: Determining Range of Tolerance
    - Observe hatcheries and record
    - Science Resource Book: "The Mono Lake Story" and make a food web
    - View online activity: "Food Webs"
    - Science Resource Book: "What Happens When Ecoystems Change?"
    - Introduce range of tolerance and optimum
- **Part 3**: Determining Viability
    - Question the viability of unhatched eggs, formulate a prediction and test it
    - Science Resource Book: "The Shrimp Club"
    - View online activity: "Trout Range of Tolerance"
- **Part 4**: Variation in a Population
    - Outdoor experience
    - Science Rescource Book: "Variation and Selection"

Investigation 4

- **Part 1**: Water or Salt Tolerance and Plants
    - Discuss and perform water experiment then perform the salt water experiment
    - Over days, observe the plant growthh
    - Science Resource Book: "Environmental Scientists" and "Range of Tolerance" and "How Organisms Depend on One Another"
- **Part 2**: Plant Patterns
    - Introduce plant distribution
    - Outdoor activity to answer how does mapping the plants in the schoolyard help us to investigate environmental factors?
- **Part 3**: Plant Adaptations
    - Introduce All About Plant Adaptations video
    - Review Investigation 4

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student's IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments
    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Prioritize tasks
    - Think in concrete terms and provide hands-on-tasks
    - Position student near helping peer or have quick access to teacher
    - Anticipate where needs will be
    - Break tests down in smaller increments

Differentiation for ELL's:

- General modifications may include:
    - Strategy groups
    - Teacher conferences
    - Graphic organizers
    - Modification plan
    - Collaboration with ELL Teacher
    - Model and encourage the use of new vocabulary
    - Project the equipment photo card for each objects and write the object's name on the word wall
    - Provide sentence frames for students who need them
    - Use Spanish provided resources if applicable
- Content specific vocabulary important for ELL students to understand include: adult, antennae, behavior, condition, darkling beetle, environment, environmental factor, function, inference, isopod, larva, life cycle, living, mealworm, molting, nonliving, observation, organism, pill bug, preferred environment, pupa, pupate, sow bug, stage, structure, algae, aquarium, aquatic environment, carnivore, competition, consumer, decomposer, ecosystem, elodea, energy, food web, food chain, freshwater environment, herbivore, interaction, microorganism, omnivore, phytoplankton, population, predator, prey, producer, zooplankton, brine, brine shrimp, controlled experiment, inherited trait, migrate, optimum, range of tolerance, reproduce, salinity, salt lake, survive, thrive, tolerance, variation, viable, adaptation, dominant plant, drought, irrigate

Differentiation to extend learning for gifted students may include:

- Home/School Extension Activities
- Online Activities
- Cross Interdisciplinary Activities
-
    - Utilize the Math extension problems and Science extensions provided in Foss Teacher Manual

- Investigate local isopods
- Conduct isopod races
- Make a terrarium of local organisms
- Build a compost pile
- Make critter replicators
- Research pheromones
- Design and build another class aquarium
- Observe the life cycle of brine shrimp
- Investigate effects of gray water
- Plant a school garden
- Make terrariums from around the world

Integrated/Cross-Disciplinary Instruction

Technology: Environments Online Activities

Investigation 2, Part 3: Population Simulation

- "Virtual Terrarium"
- "Virtual Aquarium"

Investigation 3, Part 2: Determining Range of Tolerance

- "Food Webs"

Investigation 3, Part 3: Determining Viability

- "Trout Range of Tolerance"

Investigation 4, Part 1: Water or Salt Tolerance and Plants

- "Analyzing Environmental Experiments"

Investigation 1: (refer to pages 133-137 in Teacher's Manual)

ELA Extensions:

Write organisms booklets

Math Extensions:

Problem of the Week

Science and Engineering Extensions:

Investigate local isopods

Conduct isopod races

Sample terrestrial environments

Make terrarium of local organisms

Investigate beetle complete metamorphosis

Build a compost pile

Make critter replicators

Research pheromones

Research other terrestrial environments

Investigation 2: (refer to pages 196-201 in Teacher's Manual)

ELA Extensions:

Describe aquatic environments

Math Extensions:

Problem of the Week

Science and Engineering Extensions:

Monitor guppy population size

Design and build another class aquarium

Observe movement of snails

Investigate water holes to mini-ponds

Investigation 3: (refer to pages 255-259 in Teacher's Manual)

Math Extensions:

Problem of the Week

Science Extensions:

Observe the life cycle of brine shrimp

Observe adult brine shrimp

Evaluate accuracy of advertising

Investigate brine shrimp and light

Investigate other environmental factors

Show the "Mono Lake Story" video

Investigation 4: (refer to pages 308-311 in Teacher's Manual)

ELA Extensions:

Research drought areas

Research salt on roads

Keep an environmental-news bulletin board

Math Extensions:

Problem of the Week

Science Extensions:

Visit a nursery

Simulate acid rain

Investigate affects of gray water

Plant a school garden

Make terrariums from around the world

LA.RI.4.1	Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
LA.RI.4.2	Determine the main idea of a text and explain how it is supported by key details; summarize the text.
MA.4.NBT.B.5	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
LA.RI.4.3	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text,

	including what happened and why, based on specific information in the text.
LA.RI.4.4	Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.
LA.RI.4.5	Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.
LA.RI.4.6	Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.
LA.RI.4.7	Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
LA.RI.4.8	Explain how an author uses reasons and evidence to support particular points in a text.
LA.RI.4.9	Integrate and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) information from two texts on the same topic in order to write or speak about the subject knowledgeably.
LA.RI.4.10	By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
MA.4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table.
MA.4.MD.A.2	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
LA.SL.4.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.4.4	Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
LA.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Resources

FOSSweb provides a list of recommended resources for each module. These resources include listings for nonfiction and fiction books for students, resource books for teachers, websites, images, videos, and local resources that extend the hands-on science activities in each module.

URL : https://www.fossweb.com/web/foss-fossweb/additional-resources-books-xslt?dDocName=D2944415#non-fiction-books

Description: Here is a list of recommended nonfiction books about Enironments

URL: https://www.fossweb.com/web/foss-fossweb/additional-resources-books-

xslt?dDocName=D2944415#fiction-books

Description: Here is a list of recommended fiction books about Environments

URL: https://www.fossweb.com/foss-content?htmlContentID=G3955635

Description: Here are the Interactive Whiteboard files that accompany this module

URL: arctic.fws.gov

Description: The Arctic National Wildlife Refuge was established to preserve wildlife, wilderness and recreational values.

URL: www.gcrio.org

Description: A reference service provided by Global Change Research Information Office (GCRIO) that assists in finding information and data relevant to global environmental change. Provides students with a searchable collection of answers to questions about issues related to climate change and students can submit questions of their own and explore related links

URL: www.billnye.com

Description: This site contains Bill Nye the Science Guy's online labs which contain chemistry experiments.

URL: mbgnet.mobot.org

Description: Play games, watch video clips, view animated diagrams, and sing songs to learn about plant parts, photosynthesis, pollination, seed dispersal, and plant adaptations. From the Missouri Botanical Garden.

URL: www.b2science.org

Description: Take a virtual trip to Biosphere 2, a 204,000 cubic meter (7,200,000 cubic foot) sealed glass and spaceframe structure. It includes elements from the original Biosphere 1. Inside the structure you'll find seven wilderness ecosystems, including a rainforest and a 3,400,000 liter (900,000 gallon) ocean, as well as a human habitat which now houses interactive exhibits.

URL: ut.water.usgs.gov

Description: More information about the life cycle of brine shrimp and the commercial brine shrimp industry.

URL: www.calflora.org

Description: Search plants found in California. Nonnatives are included here, too.

URL: www.californiacarnivores.com

Description: Everything you ever wanted to know about carnivorous plants.

URL: www.nps.gov

Description: The home page for the Delaware Water Gap National Recreation Area, sponsored by the National Park Service.

URL: desertusa.com

Description: A guide to the deserts of the southwestern United States. Information about the ecosystems and land use.

URL: www.enature.com

Description: This site features complete field guides to animals and plants. The regional search feature allows you to find species in your region.

URL: www.scorecard.org

Description: Find out how your community rates on the pollution scorecard. All you need to know is your zip code and you will get a report of the major polluters that affect your area.

URL: www.epa.gov

Description: Designed for older students, this site includes activities and resources dealing with the following topics: air, water, human health, waste and recycling, conservation, and more.

URL: www.kidsplanet.org

Description: Electronic facts sheets on over 50 endangered species.

URL: allaboutfrogs.org

Description: This site is everything you always wanted to know about frogs.

URL: insects.tamu.edu

Description: Frequently asked questions and information about common household, lawn and garden, and agriculture pests. The site includes an identification key and field guide to common insects. Although the focus is on insects found in Texas, this is still a valuable source of information.

URL: www.learner.org

Description: Students across North America gathered migration data and posted results. This can be an opportunity for students to get involved and post their own data.

URL: education.usgs.gov

Description: Explore the USGS Biological Resources Division for kids.

URL: www.nsf.gov

Description: A great, short video on leaf-cutter ants available to view online or for download.

URL: www.monolake.org

Description: Mono Lake website sponsored by the Mono Lake Committee.

URL: montereybay.nos.noaa.gov

Description: Home page for the Monterey Bay National Marine Sanctuary.

URL: www.nature.nps.gov

Description: Links to lists of endangered species in North America and national parks. Also links to articles on restoration and protection efforts for the National Park Service and U.S. Fish and Wildlife Service.

URL: www.photolib.noaa.gov

Description: This collection of images from the National Oceanic and Atmospheric Administration (NOAA)

includes many wonderful pictures of both land- and ocean-dwelling creatures, including bears, whales, birds, and walruses.

URL: www.nps.gov

Description: Home page for the Saguaro National Park, sponsored by the National Park Service.

URL: www.epa.gov

Description: Pictures and facts about some of the endangered plants and animals in the United States, including why they are endangered.

URL: www.sonic.net

Description: Learn where bristlecone pines were discovered, where they live, and about their unique strategies for survival. Focuses on the White-Inyo mountain range of California.

URL: www.urbanext.uiuc.edu

Description: Help Detective Leplant and his partners unlock the amazing mysteries of plant life. Sponsored by the University of Illinois Extension Program. Includes a Spanish version. Young students may need help with reading the text.

URL: www.wildflower.org

Description: Formerly the National Wildflower Research Center, a nonprofit educational organization with links to native plant societies and environmental organizations.

URL: www.tryscience.org

Description: Find out about more than 400 science and technology centers and museums worldwide. Use an interactive map of the world to find and explore a science and technology center or museum near you. You can also find online adventures and field trips, ideas for experiments at home, plus live webcams. TryScience.org is your gateway to experience the excitement of contemporary science and technology through on and offline interactivity with science and technology centers worldwide. TryScience is brought to you through a partnership between IBM Corporation, the New York Hall of Science (NYHOS), the Association of Science-Technology Centers (ASTC), and science centers worldwide.

URL: www.usgs.gov

Description: This site includes a photo gallery, education links, special interest stories, plus other information concerning the Ecosystems Mission (formerly the Biological Resources Division).

URL: mbgnet.mobot.org

Description: Find out about the biomes and ecosystems in our world.

URL: wonderwise.unl.edu

Description: Introduces you to women who have made science their career. You can take several field trips, including space geology, African plant exploration, and urban ecology.

21st Century Skills

CAEP.9.2.4.A.1	Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
CAEP.9.2.4.A.2	Identify various life roles and civic and work - related activities in the school, home, and community.
CAEP.9.2.4.A.3	Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
CAEP.9.2.4.A.4	Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.