Unit 3 Energy and Matter in an Ecosystem

Content Area: **Science**
Course(s):
Time Period: **Trimester 3**
Length: **10-12 Weeks**
Status: **Published**

Summary

In this unit of study, students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment, and they can explain that energy in animals' food was once energy from the sun.

The crosscutting concepts of energy and matter and systems and system models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in developing and using models and engaging in argument from evidence. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit will be taught utilizing Life Science: Living System FOSS program kit.

Revision Date: July 2021

Standards

LA.W.5.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information.
LA.W.5.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.W.5.5	With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
LA.W.5.6	With some guidance and support from adults and peers, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.
LA.W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different perspectives of a topic.
LA.RI.5.2	Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
LA.RI.5.3	Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the

	text.
LA.RI.5.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.
LA.RI.5.5	Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.
LA.RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
MA.5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
MA.5.MD.B	Represent and interpret data.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
SCI.5.LS1.C	Organization for Matter and Energy Flow in Organisms
SCI.5.LS1.C	Organization for Matter and Energy Flow in Organisms
SCI.5.LS2.A	Interdependent Relationships in Ecosystems
SCI.5.LS2.B	Cycles of Matter and Energy Transfer in Ecosystems
SCI.5.ESS2.A	Earth Materials and Systems
SCI.5.ESS3.C	Human Impacts on Earth Systems
SCI.5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources, environment, and address climate change issues.
SCI.5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
SCI.5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.
SCI.5-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
SCI.5-PS1	Matter and its Interactions
SCI.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.
WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
TECH.9.4.5.CI.2	Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
TECH.9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).

TECH.9.4.5.CT.2	Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1).
TECH.9.4.5.CT.3	Describe how digital tools and technology may be used to solve problems. The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.

Essential Questions

Essential Questions:

- *How does matter and energy play a role in each organism?*
- *To what extent do the structures and behaviors of plants serve as functions in their growth, survival, and reproduction?*
- *To what extent do organisms and their populations depend on their environmental interactions with both living things and nonliving factors.*
- *To what extent is the Sun a major source of energy in animals?*
- *To what extent do scientists and engineers contribute to the development and use of models?*

Enduring Understandings:

- Everything is a system.
- The largest life system on Earth is the biosphere, which is made up of millions of subsystems.
- All living things need food, water, a way to dispose of waste, and an environment in which they can live.
- The energy released from food was once energy from the Sun that was captured by plants.
- The food of almost any animal can be traced back to plants.
- Earth's major systems, the geosphere, hydrosphere, atmosphere, and biosphere, interact in multiple ways to affect Earth's surface materials and processes.
- The oceans support a variety of ecosystems, organisms, shapes landforms, and influences climate.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air and outer space.
- Individuals, scientists, engineers, and communities continuously strive to improve on ways to protect Earth's resources and environments.
- Scientists and engineers create conceptual and physical models to explain how something works. These models develop the theory and act as a proof for the law.
- Engineers improve existing technologies or develop new ones as people's needs, wants, and demands change.

Objectives

Students will know:

- that a system is defined as a collection of interacting parts that work together to make a whole or produce a function.
- that a subsystem in itself is a system and part of a larger whole.
- that Earth is a system made up of four subsystems: geosphere, hydrosphere, atmosphere and biosphere.
- that all living things are part of Earth's biosphere.
- how ecosystems are defined as relationships amongst the organisms living there.
- that food webs are made up of producers, consumers, decomposers, and the Sun.
- that plants make their own food by photosynthesis.
- that animals obtain nutrients by eating other organisms.
- how animals use digestion to break down complex food items into simple nutrients.
- how a model can be used to demonstrate and describe natural objects that exist from the very small to the immensely large
- how working in collaborative groups is important in the scientific and engineering process.

Students will be skilled at:

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating and communicating information

Learning Plan

In this unit of study, students make observations and use models to understand how energy flows and matter cycles through organisms and ecosystems. In every habitat and ecosystem on Earth, plants and animals survive, grow, reproduce, die, and decay.

To engage students, and see what prior knowledge they may have, chart the following questions:

1. What happens to the matter and energy that are part of each organism?
2. Where does it come from and where does it go?

Students should first understand that plants acquire their material for growth chiefly from air and water.

Students will need opportunities to observe a variety of plants over time. As students document plants' continual need for water and air in order to grow, they recognize that this evidence supports the argument that plants acquire their material for growth chiefly from air and water (not from soil).

1. This can be done throughout the year by keeping a plant diary. Teacher can either bring in a plant or seed OR have students observe trees. Students document through a photo journal and discuss where the plant gets its energy. In addition, as students observe that plants also need sunlight, they begin to recognize that plants use energy from the sun to transform air and water into plant matter. An idea to help see this is to place a plant in the window, and the same type of plant in a closet. This will allow one to thrive, and one to die.
2. Once students understand that plants acquire material for growth from air and water, they need opportunities to observe animals and plants interacting within an ecosystem. Terrariums, such as those built in 3-liter bottles, are ideal for this because they are large enough for small plants and animals to survive and grow, yet easy to build and maintain. In these terrariums, students should observe plants growing and providing a source of food for small herbivores, carnivores consuming other animals, and decomposers consuming dead plant material. All of these interactions may not be observable within a single terrarium; however, a class could use a number of 3-liter bottles to set up different ecosystems, each with a few carefully chosen plants and animals. This will give students opportunities to observe different types of interactions within a variety of enclosed systems.
3. As a supplement, there may be wildlife cameras that teachers may be able to access in order to show an environment. http://explore.org/live-cams/player/beluga-boat-cam-underwater - This link will take you to a website with all kinds of wilderness cameras. *When students record their observations of these small systems, it is important that students be able to:

- Identify the living and nonliving components of a system.
- Describe the interactions that occur between the living and nonliving components of each system.
- Develop models (such as food chains or food webs) that describe the movement of matter among plants, animals, decomposers, and the environment.

As students continue to observe each system, they learn that:

1. The food of almost any kind of animal can be traced back to plants.
2. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
3. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as decomposers.
4. Decomposition eventually restores (recycles) some materials back to the soil.
5. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life.
6. Organisms can survive only in environments in which their particular needs are met.
7. Matter cycles between the air and soil and among plants and animals as these organisms live and die.
8. Organisms obtain gases and water from the environment and release waste matter (gas, liquid, or solid) back into the environment.

- Students can conduct research to determine the effects of newly introduced species to an ecosystem. This can be done through experimentation as well as through hypothetical scenarios. Teacher can also use Time For Kids as a great resource. Online articles have been published about Invasive Species.
- Students revisit the concept of energy flow in systems. At the beginning of this unit of study, students learned that energy from the sun is transferred to plants, which then use that energy to change air and water into plant matter. After observing the interactions between the living and nonliving components of small ecosystems, students recognize that energy, like matter, is transferred from plants to animals. You may also want to have students see that decomposing animals also provide nutrients, and energy,

to plants. When animals consume plants, that food provides animals with the materials they need for body repair and growth and with the energy they need to maintain body warmth and for motion.
- Students can use diagrams or flowcharts to describe the flow of energy within an ecosystem, tracing the energy in animals' food back to the energy from the sun that was captured by plants.

Foss Investigations that support the above:

Investigation 1 Part 1: Everyday Systems

Investigation 1 Part 2: The Earth System

Investigation 1 Part 3: Kelp Forest Food Web

Investigation 1 Part 4: Recycling (*Note Live materials must be ordered in advance)

Investigation 2 Part 3: Animal Nutrition (Painted Ladies must be ordered in advance)

Investigation 2 Part 2: Plant Nutrition (Address plants get material they need to grow from water and air)

- What do seeds need? What do plants need to grow? (60 min)

Class chart/KWL, What do they know about plant growth? Get into groups, Conduct some seed identification as we plant some seeds in cups. Make sure cups have holes in the bottom for drainage. *Be sensitive with spring break.

- Parts of the plant video (30 min) This is a review. Prime them for the rest of our unit. Students can identify parts of the plant with a worksheet and an interactive video online. (*Something else with planting- make sure you have everything. Seeds need to be ordered and THEY EXPIRE!) There is a smart notebook file for parts of the plant. Parts of plant video that need to be previewed. https://www.generationgenius.com/videolessons/plant-parts-video-for-kids/

Investigation 3 Part 1: Plant Vascular Systems

Investigation 3 Part 2: Circulatory System (optional)

Investigation 3 Part 3: Respiratory System (optional)

Investigation 4 Parts 1-3 Exploring Sensory Systems)optional)

Investigation 4 Part 4: Ecosystems (Planned with worm habitat in mind)

Gizmos that support above:

5-LS: Life Science

5-LS1: From Molecules to Organisms: Structures and Processes

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

Plants and Snails

5-LS2: Ecosystems: Interactions, Energy, and Dynamics

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

Carbon Cycle

Food Chain

Forest Ecosystem

Plants and Snails

Prairie Ecosystem

Ecosystems - undefinedSTEM Case

Assessment

Formative: teacher observation, student responses during lessons, exit tickets, science notebook questions/observations

Summative: investigation response sheets, science notebooks, quizzes, Survey/Posttest Questions

Benchmark: iChecks , Science Notebook

Alternative: oral presentation with visual model such as a Google slideshow to demonstrate understanding of concepts, drawing models, FOSS extensions, Google Applied Digital Skills Classroom lessons, Gizmo Lesson Assessment

Materials

FOSS kit- Unit 3: Living Systems

Bill Nye Science Guy/BrainPOP

Science notebook for assessment and journaling

Gizmos (grades 3-5) See learning plan for which Gizmo supports each investigation/concept.

Core Book List 2019-2020

Science Web Apps for the Classroom

Integrated Accommodation and Modifications

Integrated Accommodation and Modifications, Special Education students, English Language Learners, At-Risk students, Gifted and Talented students, Career Education, and those with 504s

This link includes content specific accommodations and modifications for all populations:

https://docs.google.com/spreadsheets/d/1Pp6EJOCsFz5o4-opzsXpQDQoa6aClW-bkRGPDRHXVrk/edit?usp=sharing

These additional strategies are helpful when learning Science content and skills:

- Reading texts aloud for students for difficult concepts by utilizing Foss Interactive Science Resource Book, Audio version, or FOSS APP
- Providing opportunities for text-to-speech for written responses.
- Use visual presentations of all materials to include graphic organizers for writing.
- Mark texts with a highlighter.