

2019 Core Knowledge Science Sequence

Grade 5 Unit 2: Energy and Matter in Ecosystems

Introduction

This unit focuses on the scientific concept that energy and matter flow through an ecosystem to individual organisms and back to the ecosystem in a continuous cycle. Students will learn that every organism on Earth needs energy to live. Both energy and matter cycle through an ecosystem. Life on Earth derives its energy from the sun. Plants and algae take in the energy of sunlight and transform it into the chemical energy of food. When animals eat plants, the chemical energy of food moves into the bodies of animals, so the energy that animals use originally came from the sun.

The flow of energy and matter through ecosystems becomes clearer once students understand the following:

- Ecosystems consist of many interdependent relationships in which matter and energy cycle.
- Plants use energy from the sun to start the movement of energy and matter in an ecosystem.
- Producers, consumers, and decomposers interact in food chains, which make up food webs.
- Ecosystems can be easily disrupted by changes in the physical environment, by changes in the animals or plants living there, or by human actions.

Note to Teachers and Curriculum Planners

The background knowledge established in this unit will be extended and applied during Grade 5 Unit 4 *Protecting Earth's Resources*. This unit also introduces Grade 5 students to real-world examples and fundamental concepts that will be explored in greater depth in later grades. Students will learn about the needs and usages of energy that organisms have, how plants and animals obtain energy and matter, and how energy and matter are cycled through an ecosystem.

- This unit introduces specific examples and models of ecosystems and discusses the causal relationships that occur when organisms interact to meet their needs. It does not assess students on their comprehensive understanding of the flow of energy between organisms.
- Living things need chemical energy from food for all life processes, and this energy originates from the sun and moves through producers, consumers, and decomposers.
- As producers, plants need sufficient sunlight and water to grow. As consumers, animals get their energy by eating other organisms. This process transfers the energy from producers to consumers.
- Ecosystems are the living and nonliving things in an area. As matter cycles through an ecosystem, the interactions of producers, consumers, and decomposers meet the needs of those living things in the ecosystem.

2019 Core Knowledge Science Sequence

Grade 5 Unit 2: Energy and Matter in Ecosystems



2019 CORE KNOWLEDGE SCIENCE SEQUENCE	SUGGESTED LEARNING OBJECTIVES	LANGUAGE OF INSTRUCTION
<p>The Sequence guidelines identify specific content and skills for building knowledge coherently from grade to grade.</p>	<p>These suggested learning objectives may be modified to meet state and local standards as well as the needs of specific schools and classrooms.</p>	<p>This word list provides a sampling of the vocabulary to which students should be repeatedly exposed during instruction. The list is not intended for use in isolated drill or memorization.</p>
<p>A. Organisms Need and Use Energy</p> <ul style="list-style-type: none"> ● Living things need chemical energy from food for all life processes. ● The energy in animals' food originated as energy from the sun. ● Producers, consumers, and decomposers: <ul style="list-style-type: none"> ○ Producers use energy from the sun to make their own food. ○ Consumers get their food by eating other organisms. ○ Decomposers break down the tissues of dead organisms for food and function as recyclers. <p>NGSS References:</p> <ul style="list-style-type: none"> ● 5-PS3-1 ● DCI PS3.D ● DCI LS1.C ● Science and Engineering Practice: Developing and Using Models ● Cross-cutting Concept: Energy and Matter 	<ul style="list-style-type: none"> ● Explore living things, how they grow and change, and how they meet their energy needs. ● Identify the basic function in an ecosystem of producers and consumers. ● Identify food as the source of chemical energy needed for survival. ● Create a model that shows the relationship between sunlight, producers, consumers, and decomposers. ● Explain how the energy in animals' food originated as energy from the sun. 	<p>food matter energy energy transfer/transformation living (things) organism habitat environment sunlight glucose sugar photosynthesis metabolism producer consumer decomposer scavenger</p>
<p>B. Plants and Animals</p> <p><u>Plants are producers</u></p> <ul style="list-style-type: none"> ● Plants need sufficient sunlight, warmth, soil, water, and air to grow. ● Plants get the substances they need for growth mainly from air and water. 	<ul style="list-style-type: none"> ● Use evidence to support an argument that plants mainly get the materials they need for growth from air and water. ● Explain that experiments have shown that the increase in matter during plant growth does not come from the soil 	<p>energy food living (things) photosynthesis sunlight water</p>

2019 Core Knowledge Science Sequence

Grade 5 Unit 2: Energy and Matter in Ecosystems



<ul style="list-style-type: none"> ○ Photosynthesis: Plants use air, water, and the energy of sunlight to make food. ○ Plants use glucose as the fundamental food for all processes of their lives. <p><u>Animals are consumers</u></p> <ul style="list-style-type: none"> ● As consumers, animals get their energy by eating other organisms. <ul style="list-style-type: none"> ○ Herbivores: animals that eat only plants ○ Carnivores: animals that eat other animals ○ Omnivores: animals that eat both plant and animals ● Energy is transferred from the sun to producers and then to consumers. <p>NGSS References:</p> <ul style="list-style-type: none"> ● 5-LS1-1 ● DCI LS1.C ● Science and Engineering Practice: Engaging in Argument from Evidence ● Cross-cutting Concept: Energy and Matter 	<ul style="list-style-type: none"> ● Develop a model to show the basic idea of photosynthesis, that air and water use sunlight to produce food (a sugar called glucose). ● Create/make a presentation that explains the energy relationship between the sun, plants, herbivores, omnivores, and carnivores 	<p>air carbon dioxide sugar/glucose hydroponics transpiration herbivore carnivore omnivore scavenger environment predator prey</p>
<p>C. Matter Cycles Through Ecosystems</p> <ul style="list-style-type: none"> ● Ecosystems are the living and nonliving things in an area ● Producers make food and the chemical energy of food cycles from producers to consumers. <ul style="list-style-type: none"> ○ Food chain and food web: models of how matter and energy flows through an ecosystem 	<ul style="list-style-type: none"> ● Define the term <i>ecosystem</i> and describe at least four examples. ● Compare a food chain to a food web. ● Create and use a model to show the cycling of matter and energy from producers to consumers to decomposers ● Use a model to describe how the interactions of producers, consumers, 	<p>matter energy ecosystem environment energy transfer food chain food web decomposer scavenger</p>

2019 Core Knowledge Science Sequence

Grade 5 Unit 2: Energy and Matter in Ecosystems



<ul style="list-style-type: none"> ○ As matter cycles through an ecosystem, the interactions of producers, consumers, and decomposers meet the needs of living things in the ecosystem. ● Anything that disrupts food webs may harm an ecosystem. <ul style="list-style-type: none"> ○ Plants and animals can disrupt an ecosystem (for example, by moving to a new location). ○ Humans can disrupt an ecosystem (for example, by changing a habitat). ○ Environmental changes can disrupt ecosystems (for example, a drought or flood). <p>NGSS References:</p> <ul style="list-style-type: none"> ● 5-LS2-1 ● DCI LS2.A ● DCI LS2.B ● Science and Engineering Practice: Developing and Using Models ● Cross-cutting Concept: System and System Models 	<p>and decomposers meet the needs of the living things in an ecosystem.</p> <ul style="list-style-type: none"> ● Describe specific ways that an ecosystem and its food webs can be disrupted and protected. ● Gather evidence to show how a specific ecosystem can be disrupted by changes in the environment and by human activities. 	<p>disrupt/interrupt environmental changes evidence invasive species human disruption/activities conservation</p>
--	--	---

Possible Science Biographies
 Eugene Odum ("the father of modern ecology")

Other scientists to consider studying during this domain of study:
 Charles Elton
 Beatrix Potter (author who also submitted a study of fungi when only men were allowed to present at/attend the Linnaean Society)
 E.O. Wilson
 Robert T. Paine
 Henry A. Gleason

2019 Core Knowledge Science Sequence

Grade 5 Unit 2: Energy and Matter in Ecosystems

As noted above, this unit references the following standards that are a part of the [Next Generation Science Standards \(NGSS\)](#)

[Grade 5 Topic Matter and Energy in Organisms and Ecosystems](#):

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

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water. [\[Evidence Statements for 5-LS1-1\]](#)

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [\[Evidence Statements for 5-LS2-1\]](#)