

Elements of Biology

Biomes

Teacher's Guide

Grade Level: 9–12

Curriculum Focus: Life Science

Lesson Duration: Three class periods

Program Description

Organisms thrive or perish depending on their ability to adapt to the geographic and climatic conditions of their biome. Explore the world's major biomes, and see how organisms adapt to these ecological communities.

Lesson Plan Summary

Students research and write a descriptive paper about one of seven of the world's biomes. Working in small groups, they create a map locating the biome, including its vegetation and inhabitants. All the students share what they learned about biomes.

Onscreen Questions

- What are three major biomes?
 - What are some similarities between different biomes?
 - How are marine biomes different from terrestrial biomes?
 - What do whales have in common with land animals?
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Lesson Plan

Student Objectives

- Identify the world's major biomes.
- Study one biome and its key features.
- Create a map of each biome showing its location and key features.
- Write a descriptive paragraph about the temperature and climate of the biome.

Materials

- *Elements of Biology: Biomes* video
- Computer with Internet access
- Print resources such as atlases and encyclopedias
- Newsprint and markers
- Large outline of a world map
- Colored pencils

Procedures

1. Begin the lesson by having students watch the program entitled *Elements of Biology: Biomes*. Tell them to focus on the following segments: "Tundra and Taiga," "The Temperate Zone," and "Deserts and Tropics."
2. After watching, hold a brief discussion about biomes. Make sure students understand that a biome is a major ecological community that includes ecosystems with similar climates and organisms. Then make a class list of the world's major biomes. The list should include the following biomes:
 - tundra
 - taiga
 - deciduous forest
 - grasslands
 - savanna
 - desert
 - tropical forests
3. Divide students into groups of four or five. Assign each group to one of the seven biomes on the class list, explaining that their task is to create map of a biome that includes the following elements:
 - The biome's location
 - A color-coded system indicating the climate and the vegetation
 - A representation of the animals that live in the biome

4. Allow enough class time to work on maps. Tell students that they can find outline maps to use on the following Web site: <http://www.eduplace.com/ss/maps/>. Many reference books have this information. Suggest that they refer to an atlas or an encyclopedia. In addition, students can take a look at the following Web sites for additional information:
 - <http://www.mbgnet.net/>
 - <http://www.factmonster.com/ipka/A0769052.html>
 - <http://oncampus.richmond.edu/academics/education/projects/webunits/biomes/biomes.html>
 - http://cybersleuth-kids.com/sleuth/Science/Earth_Science/Biomes/
 - <http://www.blueplanetbiomes.org/rainforest.htm>
 - <http://www.ucmp.berkeley.edu/glossary/gloss5/biome/deserts.html>
5. After students have completed the maps, tell each group to write a descriptive paragraph about the biome, including such information as climate, average temperature, and unique features.
6. During the next class, have each group share its map. At the end of each presentation, post the map on the bulletin board so that students can see a visual display of the diversity of biomes in the world.
7. Conclude the lesson by asking students what they learned about biomes as a result of completing this activity. What do they know now that they didn't know before? Do they have a greater appreciation of the diversity of regions in the world?

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students identified all seven biomes; created an attractive, accurate map in their group; and contributed significantly to the group's accurate, descriptive paragraph.
- **2 points:** Students identified five of the seven biomes; created a satisfactory map in their group; and contributed to the group's satisfactory paragraph.
- **1 point:** Students identified fewer than four of the seven biomes; did not work with their group to create a map; and did not contribute to the group's paragraph.

Vocabulary

biome

Definition: A major ecological community that includes ecosystems with similar climates and organisms

Context: Biomes are based on climate, so similar ones are found in different parts of the world.



deciduous forest

Definition: A biome in eastern North America, Asia, Australia, and Western Europe characterized by moist, temperate climates

Context: A deciduous forest includes trees such as elm, maple, and oak that have leaves that change color in autumn and fall off every winter.

desert

Definition: The driest biome on Earth; arid land with usually sparse vegetation and less than 10 inches of sporadic rainfall annually

Context: Although little rain falls in a desert, a wide array of plants and animals thrive there.

grasslands

Definition: A biome in a temperate climate, including the American Midwest, the pampas in Central South America, and the steppes in central Eurasia

Context: Antelope, bison, and wolves are among the animals that live in grasslands.

savanna

Definition: A biome in tropical latitudes characterized by a long, dry season and grasses and shrubs

Context: Africa has the world's largest savannas, where herds of wildebeest, elephants, and zebras live.

taiga

Definition: A biome just south of the tundra characterized by cold winters, a short growing season, and forests of coniferous trees

Context: The area that separates the tundra from the taiga is known as the tree line.

tropical forest

Definition: A biome characterized by a hot, wet climate found near the equator

Context: Some tropical forests are rain forests, where it rains much of the time; others have a wet and a dry season.

tundra

Definition: A biome in the northernmost parts of world characterized by long winters and short summers

Context: The tundra has permafrost, a hardened layer underneath the topsoil that remains frozen throughout the year.

Academic Standards

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K–12. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>.

This lesson plan addresses the following national standards:

- Life Science: Matter, energy, and organization of living systems

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K–12 Education addresses 14 content areas. To view the standards and benchmarks, visit

<http://www.mcrel.org/compendium/browse.asp> .

This lesson plan addresses the following national standards:

- Science: Life Sciences – Understands relationships among organisms and their physical environment
- Geography – Understands the concept of regions
- Language Arts: Viewing – Uses viewing skills and strategies to understand and interpret visual media; Writing: Uses the general skills and strategies of the writing process, Gathers and uses information for research purposes; Reading: Uses reading skills and strategies to understand and interpret a variety of informational texts

DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

How To Use the DVD

The DVD starting screen has the following options:

Play Video – This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.



Video Index – Here the video is divided into sections indicated by video thumbnail icons; brief descriptions are noted for each one. Watching all parts in sequence is similar to watching the video from start to finish. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

Curriculum Units – These are specially edited video segments pulled from different sections of the video (see below). These nonlinear segments align with key ideas in the unit of instruction. They include onscreen pre- and post-viewing questions, reproduced below in this Teacher's Guide. Total running times for these segments are noted. To play a particular segment, press Enter on the TV remote or click once on the Curriculum Unit title on a computer.

Standards Link – Selecting this option displays a single screen that lists the national academic standards the video addresses.

Teacher Resources – This screen gives the technical support number and Web site address.

Video Index

I. Tundra and Taiga (5 min.)

Discover the conditions and climate of the tundra and taiga and learn about the plant and animal species living in this region.

II. The Temperate Zone (4 min.)

Explore grasslands and deciduous forests to learn about the vegetation, animal life, and climate of these temperate biomes.

III. Deserts and Tropics (6 min.)

Deserts, savannahs, and tropical rain forests are high-temperature biomes, but they have many differences.

IV. Aquatic Biomes (2 min.)

Learn about the aquatic biomes and discover why most marine life lives in the photic zone.

V. Whales (29 min.)

Discover what caused whales' ancestors to move from land to water and how they successfully adapted to a life at sea.



Curriculum Units

1. Tundra and Taiga

Pre-viewing question

Q: Describe the winter where you live.

A: Answers will vary.

Post-viewing question

Q: What demarcates the tundra and the taiga?

A: The demarcation between tundra and taiga is generally known as the tree line. North of the line, vegetation is limited to small shrubs and ground-hugging plants. South of the tree line the coniferous forest is predominant.

2. Forest Biomes

Pre-viewing question

Q: What does the term “temperate” mean in relation to the environment?

A: Answers will vary.

Post-viewing question

Q: What is the main climate difference between grassland and deciduous forest biomes?

A: The main climate difference between grassland and deciduous forest biomes is the amount of annual precipitation. Located near continental shores, temperate deciduous forests are relatively moist because they receive precipitation nearly year-round. Grasslands are considerably drier, with most precipitation falling as winter snow.

3. High-Temperature Biomes

Pre-viewing question

Q: How are deserts and tropical forests different?

A: Answers will vary.

Post-viewing question

Q: What is a savannah, and where are most located?

A: A savannah is a type of grassland likely to include grasses, large shrubs, and trees. Temperatures are hot year-round, and the climate includes distinct wet and dry seasons. The largest savannahs are in central and southern Africa, as well as in parts of South America, Australia, and India.

4. Aquatic Biomes

Pre-viewing question

Q: What types of organisms live in ocean and freshwater habitats?

A: Answers will vary.

Post-viewing question

Q: Why do most marine species live in the photic zone?



A: Most species live in this zone, the top 200 meters of water in aquatic biomes, because it receives all the available sunlight, which contributes to its diversity of life. Phytoplankton that rely on sunlight are the base of almost all aquatic food chains.

5. Adapting to a Life at Sea

Pre-viewing question

Q: What do you know about whales?

A: Answers will vary.

Post-viewing question

Q: What adaptations allow whales to stay underwater for long periods of time?

A: The whale, a mammal, uses breathes oxygen with great economy. While underwater, the brain and other essential organs receive oxygen while others go into oxygen debt until the animal returns to the surface. A diving whale descends with almost half its total oxygen stored in its muscles, where it is slowly released over time. When a whale surfaces, it can replace as much as 90 percent of the air in its lungs in a few seconds.

6. Sounds and Echolocation

Pre-viewing question

Q: What do you know about dolphins?

A: Answers will vary.

Post-viewing question

Q: How do dolphins and whales use echolocation, sonar navigation, and sounds?

A: Dolphins emit short pulses of ultrasonic sound that bounce off of objects, producing echoes that used to create sound pictures of its surroundings. Beluga whales use sonar to navigate: Muscles above its jaw focus a beam of sound that produces a very precise image of its surroundings so it can plot a route through the channels underneath ice. Sperm whales use a series of clicks, known as codas, to communicate with one another. Humpback whales sing individual songs to attract a mate or communicate other information.

7. Baleen Whales

Pre-viewing question

Q: What do whales eat?

A: Answers will vary.

Post-viewing question

Q: How do baleen whales feed?

A: Baleen whales have rows of baleen plates suspended from ridges in the upper jaw. They feed on krill by opening their mouths to take in prey and water. They expel water when they close their mouths and raise their tongues, leaving only their food.

8. The Evolution of Whales

Q: What might the earliest whales have looked like?

A: Answers will vary.

Post-viewing question

Q: What kinds of changes took place in whales as they evolved into aquatic animals?

A: The evolution of land mammals into whales was chemical and physical. Early whales developed large hind feet built for swimming. Later whales developed a tail with detachable vertebrae that enabled it to move up and down for propulsion. Kidneys evolved to deal with excess salt in the water. Fluids covered the eyes to protect them from the saline environment and body hair was lost.