

Lesson Outline for Teaching

Lesson 1: Ecosystems and Biomes

A. What are ecosystems?

1. Ecology is the study of how organisms interact with each other and with their environment.
2. A(n) ecosystem is made up of all the living and nonliving things in one place.

B. Abiotic Factors

1. Abiotic factors are the nonliving parts of an ecosystem.
2. Some abiotic factors on Earth include water, light, temperature, atmosphere, and soil.
3. The types and amounts of abiotic factors that are available in an ecosystem help determine which organisms can live there.
 - a. All organisms need water to live, but some need more than others.
 - b. Some organisms, such as plants, require light energy to make food.
 - c. Ecosystems with more sunlight tend to have higher temperatures.
4. Earth's atmosphere contains many gases that organisms need, such as water vapor, oxygen, carbon dioxide, and nitrogen.
5. The nutrient content, texture, moisture content, and depth of soil affect which organisms can live in an ecosystem.

C. Biotic Factors

1. Biotic factors are all the living or once-living things in an ecosystem.
2. A(n) population is made up of all the members of one species that live in an area at one time.
3. A(n) community is all the populations that live together in an ecosystem at the same time.
4. A(n) biome is a geographic area that contains ecosystems with similar biotic and abiotic features.
5. All biomes are part of the biosphere, which is the part of Earth that supports life.
6. Terrestrial biomes include forests, deserts, tundra, and grasslands.
7. Aquatic biomes include saltwater areas and freshwater areas.

D. What happens when environments change?

1. Changes in the environment are caused by natural processes and human actions.
2. Usually, a change in an ecosystem results in positive and negative effects.
3. Succession is the gradual change from one community to another community in an area.

Lesson Outline for Teaching

Lesson 2: Populations and Communities

A. Populations

1. A(n) population is all the members of one species that live in an area at one time.
2. The size of a population can increase or decrease in response to changes in abiotic or biotic factors in the environment.
3. Populations can increase when individuals move into an area or when more individuals are born. They can decrease when individuals move away from an area or die.
4. Population density describes the number of organisms in an area relative to the amount of space available.
 - a. Limiting factors limit the growth of a population. One factor is the lack of sufficient resources such as water; some individuals cannot survive under these circumstances.
 - b. Factors such as predation, competition, and disease are examples of limiting factors.
5. Biotic potential is the potential growth of a population if it could grow in perfect conditions with no limiting factors.
6. Carrying capacity is the largest number of individuals of a species that an ecosystem can support over time.
7. The limiting factors of an area determine the area's carrying capacity.
8. Overpopulation occurs when a population's size becomes larger than the ability of the area to support it.

B. Communities

1. Populations that live in the same area interact as a(n) community.
2. Populations in a community might compete for resources such as space. They might also compete directly as they hunt each other for food or hide from predators.

C. Symbiotic Relationships

1. All the populations in a community share a(n) habitat, the physical place where a population or an organism lives.
2. A(n) niche is the unique way that an organism survives, obtains food and shelter, or avoids danger in its habitat.
3. A(n) symbiotic relationship occurs when two different species live together in a close relationship over a long period of time.
 - a. Mutualism is a symbiotic relationship in which two species in a community help each other.
 - b. Parasitism is a symbiotic relationship in which one species (the parasite) benefits while another (the host) is harmed.
 - c. Commensalism is a symbiotic relationship in which one species benefits and the other is not helped or harmed.

Lesson Outline for Teaching

Lesson 3: Energy and Matter

A. Energy Flow

1. All life on Earth needs energy for cell processes.
2. Organisms get energy either by using light or chemical energy to make food or by eating other organisms.
3. Energy travels through organisms, populations, communities, and ecosystems in a(n) flow. Energy does not return to its source, as matter does in a(n) cycle.

B. Organisms and Energy

1. Producers change the energy available in their environment into food energy.
2. Plants, algae, and some microorganisms use a chemical process called photosynthesis and change light energy from the Sun into food energy.
3. Some producers use chemosynthesis to change chemical energy into food energy.
4. Consumers cannot make their own food and get energy by eating other organisms.
 - a. Herbivores consume only producers.
 - b. Carnivores consume only other consumers.
 - c. Omnivores eat other consumers and producers.
 - d. Detritivores eat dead plant or animal material.

C. Modeling Energy Flow

1. A(n) food chain models how energy flows in an ecosystem through feeding relationships.
2. Each stage of a food chain has less available food energy than the last one because some food energy is converted to thermal energy, commonly called heat, and then it moves into the environment.
3. A(n) food web is a model that shows several connected food chains.

D. Modeling Energy Pyramids

1. A(n) energy pyramid shows the amount of food energy available at each level of community or trophic level.
2. At each successive trophic level of the pyramid, the amount of usable food energy decreases.
3. The top level of an energy pyramid is usually a(n) carnivore.

E. Matter Cycles

1. Unlike energy, matter does not flow, but moves in a cycle. It is used again and again throughout a(n) ecosystem.
2. The water cycle includes oceans, rivers, organisms, and the atmosphere.

Lesson Outline continued

3. Oxygen moves among producers, consumers, and the atmosphere through the processes of photosynthesis and respiration.
4. Carbon is involved in photosynthesis and respiration.
5. Human activities such as the burning of fossil fuels add carbon to the atmosphere.

Discussion Question

What are two ways producers can make food energy?

Plants, algae, and some microorganisms use photosynthesis to change light energy from the Sun into food energy. Some producers use chemosynthesis to change chemical energy into food energy.