Classroom Activity: Food Webs

Subject: Biology/Ecology

Grades: 6-12

Standards: See end of lesson plan.

Time: 10 minutes (can last as long as you want depending on how much you develop the activity)

Materials: Yarn, index cards, hole puncher, marker

Lesson objective: The student will understand the interrelatedness of food webs and see how populations affect other populations.

Content:

1. Write the names of various plants and animals (a variety of types) on index cards. You can use the list below, construct your own, or have participants select their own organism. Be sure to include the sun, plants, plant eaters, and flesh eaters in the array.

   sun, grasshopper, robin, grass, berry brush, hawk, quail, dandelion, mouse, worm, rabbit, cow, flea, meadowlark, owl, wheat, tick, fox, weeds, coyote, mushrooms, microscopic bacteria

2. Punch holes in each card and give each participant a card and a piece of string to hang the card around his/her neck.

3. Have individuals identify energy (or food) sources. As each one is identified, pass a ball of yarn between the two people. For example: One student is a cow, and one is the grass. The cow will take the ball of yarn, hold onto one end of the string and pass the rest of the ball to the grass. The grass will hold onto the yarn and pass the rest of the ball to “what it eats,” in this case, the sun. Be sure that the sun is connected to all the plants. Once the string gets to the sun, cut it off, and start again in another place.

4. Continue building the web, making the relationships as complex as time and numbers of participants allow. Define terms such as herbivore, carnivore, insectivore, decomposer, etc and include them in your web. [Note that insectivores are specialized carnivores.] Students can be in as many chains as you have time for; they do not have to be in all of the chains.

5. Discuss the nature and complexity of the food web that is formed. Note that it is not as complete or complex as most natural food webs, but that it illustrates how living things are dependent upon one another. Biologists feel that more complex food webs are more stable than simple ones.

6. After discussing the food web, the leader could ask what would happen if a species were removed from the web. Have a student pull on the strings they hold; anyone who feels a tug is directly affected by that organism. Those “organisms” affected directly could then pull on their strings and more organisms are affected. Have different students pull on their strings. When the “sun” pulls on its string, everyone should be affected. Have some organisms drop their string (become extinct) and see who is affected. Have students tell you if certain populations will grow or decline. The teacher can represent nature and cause any type of problem to occur; for example, a wildfire could occur, but some birds were able to fly

away and some types of trees reseed well after a fire. The teacher defines what happens and who is affected; the students then reveal what would happen. New species could also move into the area at any time disrupting the web.

7. Discuss what would happen if all of the predators were removed. Some species might exhaust their food supply and starve, but others will continue to reproduce only until the food supply becomes limiting or their interactions limit population size.

8. If desired, discuss the simplified food webs that produce most foods used by people. Remind the participants that such food webs are inherently unstable and require large amounts of management (raising/slaughtering cows, chickens, etc) to avoid problems.

Closure: Review everything with students telling them that this is the way a food web works. They can throw away their yarn pieces. Students could complete the Food Web Worksheet from the teacher resource page.

Assessment: The activity could be assessed by participation, or students could complete a worksheet like the Food Web Worksheet from the teacher resources page.

This activity was adapted from the 4-H Shooting Sports Program.

Standards:

7.II. Life Science

B. Regulation and Behavior

1. All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.
    a. Analyze the basic characteristics and needs of living things.
    b. Compare and contrast how organisms use resources, grow, reproduce, and maintain stable internal conditions (homeostasis).

D. Populations and Ecosystems

2. Populations of organisms can be categorized by the function they serve in an ecosystem. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.
    a. Analyze the role of producers, consumers and decomposers in an ecosystem.
    b. Identify kinds of relationships organisms have with each other (predator/prey, competition).
    c. Analyze energy flow in a food chain and its relationship to a food web.

3. The number of organisms an ecosystem can support depends on the biotic resources available. Given adequate biotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.
    a. Compare and contrast how cooperation, competition and predation affect population growth.
    b. Analyze the effects of overpopulation within an ecosystem on the amount of resources available.
    c. Analyze how natural hazards (earthquakes, landslides, wildfires, volcanic eruptions, floods, and storms) affect populations.

7.III. Earth Science

A. Structure of the Earth System

6. For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

b. Trace the path of solar energy through a simple food chain and through food webs that include humans.

c. Examine how energy is transferred through an ecosystem.

d. Examine how energy is distributed in an energy pyrimad.

8. II. Life Science

A. Diversity and Adaptations of Organisms

2. Biological change accounts for the diversity of species developed through gradual processes over many generations. Biological adaptations, which involve the selection of naturally occurring variations in populations, enhance survival and reproductive success in a particular environment. How a species moves, obtains food, reproduces, and responds to danger is based in the species' evolutionary history.

b. Analyze how an adaptation can increase an organism's chances to survive and reproduce in a particular habitat (e.g., cacti needles/leaves, fur/scales). *[This concept has been taught at a previous grade level]

3. Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival.

a. Determine the factors that contribute to an organism becoming extinct.

b. Explain some of the natural and human-made pressures that can cause extinction.

c. Examine ways to prevent the extinction of an organism.