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Lesson Plan: Teaching Food Web Using AgentSheets

Objectives:

The Students will be able to:

- Define food web
- Identify the interdependence of organisms within a system
- Describe how natural events and human activities can impact a food web

Standards:

MST Standard 4 The Living Environment

Students will: understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Key Idea

4. Organisms maintain a dynamic equilibrium that sustains life.
5. Plants and animals depend on each other and their physical environment.
6. Human decisions and activities have had a profound impact on the physical and living environment.

Materials:

AgentSheets model land foodweb

AgentSheets model landfoodchain

AgentSheets model ocean foodweb

AgentSheets model ocean foodchain

Student worksheet

Prior Knowledge:

This lesson can be modified to meet the needs of the students. Some students will be able to use AgentSheets program to create their own foodweb or foodchain. Some students will not have these skills and will have to use preexisting models. In addition, for some students it will be beneficial to begin with only one model, such as only the forest, before introducing other models. More advanced students will be able to view more than one from the beginning.

Procedure:

1. In this activity, students will learn about the interdependency of life in various environments such as forests and oceans. Begin the lesson by discussing, and listing on the board, the different kinds of life that can be found in a forest and/or ocean. Encourage students to help you generate the list.

2. Explain that three major types of organisms live in an ecosystem: producers, consumers, and decomposers. Producers create their own food through the process of photosynthesis. Consumers must hunt or forage for the nutrients they need to survive. Decomposers obtain nutrients by breaking down parts of organisms into simple forms; for example, mushrooms feed off plant tissues on tree bark, and bacteria on a forest floor feed off the leaf tissue of fallen leaves, causing them to decay. Go back to the list you've created and have students help you mark items with "P" for producers, "C" for consumers," and "D" for decomposers.
3. Review with students the three types of consumers: herbivores, carnivores, and omnivores. Explain that herbivores are animals that eat only plant material, such as the caterpillar. Carnivores eat animals; for example, forest ants eat other insects. And omnivores eat both plant material and animal flesh. Humans are omnivores. Ask students to look at the consumers on their list and decide which type best describes each one.
4. Next, define food webs and food chains. Food webs are diagrams that show how organisms living in an ecosystem depend on one another to obtain the nutrients and energy they need to live. For example, make a food web for an oak tree. Caterpillars eat the tree's leaves for nourishment; beetles live on the tree and eat the bark; woodpeckers eat the beetles living on the tree; jays and squirrels eat the acorns; and the oak tree makes its own food with energy from the sun through the process of photosynthesis. The web becomes more complex as additional organisms are added to it. A food chain is a smaller, less complicated diagram that examines one piece of the food web to show how specific organisms obtain their energy from other organisms. Food chains show a single line of energy transfer. An example of a food chain from the food web above would be oak tree—beetle—woodpecker—bird of prey (the beetle eats the oak tree, the woodpecker eats the beetle, and the bird of prey eats the woodpecker).
5. Tell students they will be using AgentSheets models to make observations and conclusions about foodwebs and foodchains.
6. Ask the kids what they think would happen if something happened to one of the elements in the web. Now demonstrate a simulation of a foodweb or foodchain using AgentSheets.
7. You may wish to show multiple simulations using various AgentSheets models. The activity will be different each time because animals and plants interact in many different ways.
8. Discuss the activity with your students. Ask them what they think would happen if more than one organism in the food web was killed. Conversely, what if the population of one animal increased suddenly? What if there were

too many carnivores and few herbivores? Or, if there were too few carnivores and too many herbivores? What would happen to the food web?

9. Students answer student worksheet.

## Student Worksheet

1. Discuss why decomposers are important to food webs and the environment. List examples of decomposers that might be found in a local forest habitat.
2. Animals must adapt to changing seasons in their habitats. How do animals in your area survive seasonal changes? Which animals hibernate, migrate, or become dormant? Which animals change their appearance with the seasons? How does this help them survive?
3. Hypothesize what would happen if a particular organism became extinct in the forest or ocean. Would this missing organism affect the rest of the forest or ocean? Provide examples of human activity or natural disasters that could affect the food web.
4. Discuss the different energy needs of organisms in a food web. Compare the energy levels in the forest food web with the energy levels in another food chain.
5. Discuss ways in which humans change animal food chains. One example is what has been fed to some cattle, who are natural herbivores. In tracing the spread of mad cow disease, scientists discovered that ground-up animal parts added to cattle feed were the cause. Debate how food resources for animals and humans should be controlled.
6. Think of all the organisms you had an interaction with in the past day. How did they relate to you? Discuss whether any of the organisms were predators or prey.