

# FOOD CHAIN GAME

In this activity, students investigate the food chains by assuming the roles of animals that are part of a food chain.

## BACKGROUND

The transfer of food from its source, plants, to one or more organisms is called a food chain. (To go deeper, the chain actually starts with photosynthesis - the germination of a seed and the growing of the plant.) This transfer occurs when one organism consumes another. In this game, there are four links to the food chain: plants, grasshoppers, frogs, and hawks.

Popcorn represents the plants, and students play the parts of grasshoppers, (plant eaters), frogs (which eat grasshoppers) and hawks (which eat frogs). During each round of the game, the "animals" must get enough to eat and avoid being eaten.

In this game, the populations (one kind of organism living in a given area) are so small that the survival of two grasshoppers, two frogs and one hawk (which can fly and find a mate and thus reproduce) represents a "balanced" food chain.

## MATERIALS

### For each "Animal":

- 1 sash (see Preparation)
- 1 sandwich-bag "stomach" (see Preparation)

### For the Food:

- 4-5 liters of popped popcorn
- 1 data board
- 1 marking pen
- 1 kitchen timer with bell (or a watch to be used with verbal signals)
- 1 roll of 2.54 cm (1") masking tape

## PREPARATION

You will need at least twelve students for this activity, but more will add excitement to the game. Plan on 30-40 minutes of play time.

**Sashes:** Obtain three different colors of cloth for sashes. For every three players, make two hopper sashes of one color, one frog sash of another color, and one hawk sash of the third color. (For twelve players, you would need eight hopper sashes, four frog sashes and four hawk sashes.) Each sash should be about a meter long and 6-10 cm wide (2-4").

**Stomachs:** Make the stomach bags by placing strips of masking tape across each plastic sandwich bag so that the bottom edge of the tape is 4 cm from the bottom of the bag. The top of the tape, then, will be 6.5 cm from the bottom of the bag.

**Playing Area:** Select a large lawn or other open level area that is suitable for a vigorous game of tag.

## **ACTION**

1. **Introduce the food chain** while still in the classroom or on an outdoor drawing board. Diagram the plants  $\Rightarrow$  grasshoppers  $\Rightarrow$  frogs  $\Rightarrow$  hawks food chain on the data board, and display it to the group.

Explain that the transfer of food from plants to one or more organisms is called a food chain and that you have drawn a food chain of four organisms.

2. **Introducing the game.** Explain to the students that they are going to be playing grasshoppers, frogs and hawks in a food chain game. You may want to use a different food chain for the game, such as corn/mouse/snake/hawk, or plankton/anchovy/salmon/sea lion, or one that the group suggests (perhaps one that includes humans).

3. **Spreading out the plants.** Scatter most of the popped corn over the area, and explain that the popped corn represents plants that grasshoppers eat.

4. **Assigning parts.** Divide the students equally into three groups, and distribute grasshopper sashes to one group, frog sashes to the second group, and the hawk sashes to the third group (you will have some grasshopper sashes left over).

Make sure that each youngster knows which animal she is playing. Ask everyone to wear their sash so that it is plainly visible to all the other players, e.g., around their waist, upper arm or head.

5. **Outlining the rules.** Give each "animal" one "stomach." Explain that when the game starts, the grasshoppers will try to eat popcorn plants (put popped corn in their bags), the frogs will try to eat grasshoppers (by tagging them) and hawks will try to eat frogs (also by tagging them). When a frog tags a grasshopper, it takes the grasshopper's "stomach" and the grasshopper player leaves the game. When a hawk tags a frog, it takes the frog's "stomach" and the frog leaves the game.

Emphasize that grasshoppers can only feed on the popcorn plants on the ground, and that frogs can only feed on grasshoppers, and hawks can only feed on frogs, and that animals that are eaten must wait on the sidelines.

Frogs can eat more than one grasshopper, and hawks can eat more than one frog.)

Announce that the round will last five minutes or so or until all of one kind of animal are eaten.

6. **Play the game.** Record the starting population numbers on the data board. State the challenge, set the time for five minutes, then yell "GO!" The first round often lasts only a few seconds because all the hoppers or frogs are quickly eaten.

7. **Counting survivors.** After the first round, record on the data board the number of each kind of animal that obtained enough food to survive.

To survive, a grasshopper's stomach must be filled up to the bottom of the tape (4 cm), and a frog's stomach must be filled up to the top of the tape (6.5 cm from the bottom of the bag).

Hawks need the equivalent of one frog with a full stomach to survive.

Animals with less than a full stomach at the end of the round "starve to death."

8. **Balancing the food chain.** Explain that at least two grasshoppers, two frogs and one hawk must be alive at the end of a five-minute round to have a "balanced" food chain.

Ask the students how they can change the game to produce a balanced food chain. Typical suggestions are: change the number of grasshoppers, frogs and hawks; provide more plants (popcorn); set up safety zones for the grasshoppers and frogs where they are protected from attack; time releases, e.g., grasshoppers forage for thirty seconds before frogs "get up."

9. **Playing again.** Record on the data board the suggestion the group wants to try first, e.g., different numbers of organisms (twenty grasshoppers, eight frogs, two hawks). Make the necessary sash changes, redistribute the "stomach" bags, and return the popped corn to the activity site.

Record the starting populations, reset the timer, and let the play begin.

10. **Adaptation.** Allow the players to keep changing the rules and repeating the game until they end up with a balanced food chain. At the end of each round, record the number of survivors on the data board. Encourage the students to compare the results after each round to help them figure out how to balance their food chain.

## **FOOD FOR THOUGHT**

1. What population sizes of grasshoppers, frogs and hawks produced a balanced food chain?
2. What might happen if there were only half as many popped corn plants? Twice as many? No plants?
3. If there were no frogs, what might happen to the grasshopper population? The plant population? The hawk population?
4. What are some food chains that include humans?

## **ADDING LINKS TO THE CHAIN**

1. Look for evidence of plants being eaten in the activity site. What animals are responsible?
2. Find three possible links in the food chain in the activity site.
3. Play new versions of the food chain game that include one or more new organisms (people, scavengers, decomposers), or the effects of various factors (pesticides, sudden population explosion or reduction of one of the organisms, a drought). For example, obtain a small amount of colored popcorn to represent pesticide laden food. Three colored kernels may be fatal to hoppers, five for frogs, and ten for hawks.

*Adapted from Delta Science activities.*