



Outdoor Biology Instructional Strategies

FOOD CHAIN GAME

BACKGROUND

Feeding relationships are often difficult to observe. In this activity, youngsters gain some understanding of these relationships by assuming the roles of animals, playing tag, and simulating feeding relationships. Popcorn is spread over a lawn area. The kernels of popcorn represent plants, which are food sources for the plant eaters. Some youngsters play grasshoppers (plant eaters), some play frogs (which eat grasshoppers), and some play hawks (which eat frogs). The object of the game is for each animal to get something to eat without being eaten before the “day” (five minutes) is over.

In nature, the populations of plants and animals are usually large enough to insure continuation of the species if some are lost. In this game, populations (popcorn plants, hoppers, frogs, hawks) are so small, that the survival of even one of each kind will be considered an indication of a “balanced,” ongoing community. You can repeat this game many times during one activity session. With each repeat, encourage the youngsters to change rules of behavior and numbers of each kind of animal until a “balance” is achieved in your corn-hopper-frog-hawk **food chain**.

CHALLENGE

Survive as an animal in a make-believe food chain by getting enough to eat while avoiding being eaten yourself.

MATERIALS

For each animal:

- Sashes about 20 cm x 100 cm (see preparation section for number)
- 1 plastic bag “stomach” (sandwich bag)

For the group:

- 4-5 liters of popped corn
- 1 data board
- 1 marking pen
- 1 kitchen timer with bell
- 1 roll of 1” masking tape

PREPARATION

At least ten youngsters are needed for best results.

Sashes: Make the sashes from strips of cloth in three different colors. Have enough sashes for $\frac{3}{4}$ of the group to be grasshoppers, $\frac{1}{3}$ to be frogs, and $\frac{1}{3}$ to be hawks. The unbalanced ratio provides the opportunity to change the population numbers in the game. Make the sashes about a meter long and 20 to 30 cm wide. Prepare “stomach” bags. Place a strip of masking tape across the sandwich bag so the bottom edge of the tape is 4 cm from the bottom of the bag. (See **Analysis** section of **Action**.)

Site Selection: A section of lawn 15 meters on a side is sufficient. The group may decide to designate potential “home bases” such as trees, a walk, etc., where hoppers and frogs can hide or be “safe.”

ACTION

Introducing food chains: Ask the participants if they know what mice eat and what eats mice. “Mice eat seeds and snakes eat mice.” They may respond. Diagram the relationship they describe and introduce it as a **food chain**. (Arrows point in the direction that the food goes.)

Seeds → mice → snakes

Ask the students if they can think of other food chains, including a food chain that contains man.

FOOD CHAIN GAME

1. Describe the limits of the gaming area. Spread popcorn over the area. (Save a little for later.) Tell the group that you are distributing plants that grasshoppers eat.
2. Hand out a plastic bag and a grasshopper sash (all one color) to $\frac{1}{3}$ of your group. Tell the students to put their “food” (popcorn) in their “stomachs” (bags) when the game starts.
3. Hand out a bag and a frog sash to a second $\frac{1}{3}$ of the group, and hawk sashes to the last $\frac{1}{3}$. When the game starts, frogs will try to capture (tag) hoppers, and the hawks will pursue frogs. When a frog captures a hopper, the hopper’s stomach contents are transferred to the stomach of the frog. When the hawk captures a frog, he takes the frog’s whole stomach. Hawks do not eat hopper in this game.
4. State the challenge. Set the timer for five minutes and holler “Go!”. The first game usually lasts only a few seconds with one of two things happening.

Hoppers are gobbled up before they have a chance to forage, or the frogs are gobbled up and hoppers continue to eat popcorn and get fat.

5. **Analysis:** How many animals survive? For a hopper to survive, popcorn must fill the stomach bag to the bottom of the tape (4 cm). For a frog to survive, popcorn must fill the stomach bag to the top of the tape (6-1/2 cm). Hawks must have the equivalent of one frog with sufficient food to survive. If at least one of each kind of animal survives, you have an ongoing food chain. Return the corn to the activity area after each game.
6. **Instant Replay:** learning by making rule variations – Ask for suggestions on rule changes that might result in more of a balance after the five-minute day. Usually one rule is changed for each replay. When you have settled on your new rules, play again. Suggest these changes if the students can't offer any:
 - a. Change the number of hoppers and/or frogs and/or hawks.
 - b. Let each hopper come back as another hopper once after being captured and transferring "stomach" contents.
 - c. Provide a "safety zone" for frogs and/or hoppers where they can be safe.
 - d. Timed releases: Let hoppers go first to forage unmolested. One minute later release the frogs, and later the hawk(s).
 - e. Spread out more popcorn.

NOTE: You may want to eliminate bickering over who will be which organism by drawing markers from a hat to assign roles for replays.

FOOD FOR THOUGHT

After each game, analyze the results. How many hoppers got a full stomach? How many frogs? The hawks?

Encourage youngsters to compare game results after each rule change, and to comment on how the game "balance" compares with balance in the real world. In nature's balance, there are more plants than plant eaters and more plant eaters than animal eaters. You might wish to graphically represent the results on your data board.

- What would happen if there were only half as many popcorn plants?
- What would happen to the animal that depends on those plants?
- If there were no frogs, what would happen to the plant population? The hopper population? The hopper population? The hawk population?
- Do hawks need plants to survive? Explain!
- Can you describe some food chains that YOU are part of?
- Are there any plants or animals that are NOT part of any food chains?

MORE LINKS IN THE CHAIN

- Look for evidence of plants being used for food. Can you find the animals responsible? Make sun prints of the evidence you find. (See Habitat Sun Prints, Set 1.)
- Find some ladybugs, or better yet, some ladybug larvae. Put them in with some aphids in a small container and observe. Describe the food chain they are part of.

WHAT TO DO NEXT

Attract a Fish

A Better Fly Trap

Flocking to Food

Gaming in the Outdoors