

FOOD CHAIN GAME

BIO Game/Simulation
KEY Food Chain
Population



OVERVIEW

In this activity, the youngsters investigate 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**. This transfer takes place when one organism eats another. The food chain in this game consists of four links: plants→hoppers→frogs→hawks. Popcorn represents the plants, and the youngsters play the parts of the grasshoppers (plant eaters), frogs (which eat grasshoppers), and hawks (which eat

frogs). During each round, the “animals” must get enough to eat and avoid being eaten.

A **population** is a group of organisms of one kind that lives in the same area. In *Food Chain Game* the populations are so small that the survival of two hoppers, two frogs, and one hawk (which can fly to find a mate) represents a “balanced” food chain.



CHALLENGE: STAY ALIVE BY GETTING ENOUGH TO EAT AND AVOIDING BEING "EATEN."

MATERIALS



For each "animal":

- 1 sash* (See "Preparation.")
- 1 sandwich-bag "stomach"* (See "Preparation.")

For the group:

- 4-5 liters of popped popcorn (or beans, acorns, etc.)
- 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 in.) masking tape

*Available from Delta Education.

PREPARATION



Group Size. You need at least twelve youngsters for this activity, but more youngsters add excitement to the game.

Time. Plan on thirty to forty-five minutes for the activity.



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 remaining 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.

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.



Site. Select a large lawn or other open level area that is suitable for a vigorous game of tag.

ACTION



1. Introducing food chains. Diagram the plants → grasshoppers → frogs → 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.



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2. Introducing the game. Explain to the youngsters 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, e.g. 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 popcorn over the area, and explain that the popcorn represents plants that grasshoppers eat.

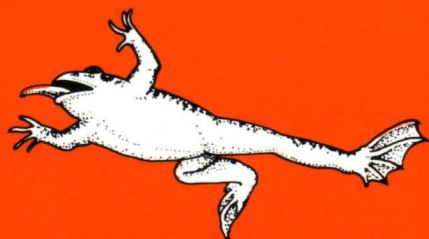
4. Assigning parts. Divide the youngsters equally into three groups, and distribute grasshopper sashes (most numerous) to one group, frog sashes to the second group, and hawk sashes to the remaining group. (You will have some hopper sashes left over.) Make sure that each youngster knows which animal he is playing. Ask everyone to wear his sash so it is plainly visible, e.g. around his head, arm, or waist.

5. Outlining the rules. Give each "animal" one "stomach." Explain that when the game starts, the grasshoppers will try to eat popcorn plants (put popcorn in their stomach bags), the frogs will try to eat grasshoppers (tag them), and the hawks will try to eat frogs (tag them). When a frog tags a hopper, the frog takes the hopper's stomach, and the hopper leaves the game. When a hawk tags a frog, the hawk takes the frog's stomach, and the frog leaves the game.

This simulates the transfer of food when one organism eats another.

- Emphasize that hoppers can feed *only* on the popcorn plants on the ground, frogs can feed *only* on grasshoppers, and hawks can feed *only* on frogs.
- Animals that are eaten (tagged) must wait on the sidelines for the next round.
- Announce that the round will last five minutes 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, and 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 hopper's stomach must be filled to the *bottom* of the tape (4 cm) and a frog's stomach filled to the *top* of the tape (6½ cm). Hawks need the equivalent of one frog with a full stomach to survive. Animals with less than a full stomach at the end of a round "starve to death."

8. Balancing the food chain. Explain that at least two hoppers, two frogs, and one hawk must be alive at the end of a five-minute round to have a "balanced" food chain. Ask the youngsters how they can change the game to produce a balanced food chain. Typical suggestions are:

- Change the numbers of hoppers, frogs, and hawks.
- Provide more plants (popcorn).
- Set up safety zones for the hoppers and frogs where they are protected from attack.
- Time releases, e.g. hoppers 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 hoppers, eight frogs, and two hawks. Make the necessary sash changes, redistribute stomach bags, and

return the popcorn to the activity site. Record starting populations, reset the timer, and play the game again.

10. Allow the youngsters 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 youngsters 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 our balanced food chain?
2. What might happen if there were only half as many popcorn plants? No plants?
3. If there were no frogs, what might happen to the plant population? The hopper population? The hawk population?
4. What are some food chains that include humans?

ADDING LINKS



1. Look for *evidence* of plants being eaten in the activity site. What animals are responsible?
2. Find three possible links in a 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, a 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 might be fatal to hoppers, five for frogs, and ten for hawks.

START	FINISH
ROUND 1 8 HOPPERS 8 FROGS 8 HAWKS	4 HOPPERS NO FROGS NO HAWKS
ROUND 2 - CHANGE POPULATION NUMBERS 14 HOPPERS 8 FROGS 2 HAWKS	6 HOPPERS NO FROGS 2 HAWKS
ROUND 3 - SET UP HOPPER & FROG SHELTERS - 14 HOPPERS 8 FROGS 2 HAWKS	7 HOPPERS 1 FROG 1 HAWK
ROUND 4 - CHANGE POPULATION NUMBERS 16 HOPPERS 6 FROGS 2 HAWKS	

