

Food Chain Game

TEACHER DIRECTIONS

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 to 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.

Grades: 3-5

Time: 30-40 Minutes

Materials:

--For each “Animal”:

- 1 sash
- 1 sandwich-bag “stomach”

--For the Food:

- 4-5 Liters of popped popcorn
- 1 data board
- 1 marking pen
- 1 Kitchen timer with bell
- 1 roll of 1 inch masking tape

Lesson Objective: The student will understand the process of a food chain and the organisms within.

Teacher Directions:

Preparation:

1. You will need at least twelve students for this activity, but more will add excitement to the game.

2. **Sashes:** Obtain three different colors of cloth 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. **Optional colors: Hopper Sash= green; Frog Sash= Orange; Hawk Sash= Blue.** (For twelve players, you will need eight hopper sashes, four frog sashes, and four hawk sashes.) Each sash should be about a meter long and 2-4 inches wide.
3. **Stomachs:** Make the stomach bags by placing strips of masking tape across each 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.
4. **Playing Area:** Select a large lawn or other open levels that is suitable for a vigorous game of tag.

Action:

1. Introduce the food chain whole still in the classroom or on an outdoor drawing board. Diagram the plants \Rightarrow grasshoppers \Rightarrow frogs \Rightarrow hawks food chain on the board to display 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 different food chain for the game, such as corn/mouse/snake/hawk, or plankton/anchovy/salmon/sea lion, or one that the group suggests (maybe 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.)
 - a. Make sure that each student knows which animal he/she is playing. Ask everyone to wear their sash so that it is plainly visible to all the other players. Example: 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 (they need to put the popcorn in their bags), the frog will try to eat grasshoppers (by tagging them(and the 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.

- a. 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.*
 - b. Frogs can eat more than one grasshopper, and hawks can eat more than one frog.*
 - c. Announce that the round will last five minutes or so or until all of one kind of animal is 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 animal that obtained enough food to survive.
 - a. 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).*
 - b. Hawks need the equivalent of one frog with a full stomach to survive.*
 - c. 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.
 - a. 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 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 changes, redistribute the “stomach” bags, and return the popped corn to the activity site.
 - a. Record the starting populations, reset the timer, and let the game begin.*
10. Allow the students 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 table. Encourage the students to compare their results after each round to help them figure out how to balance their food chain.

Food Chain Game Lab

STUDENT WORKSHEET

In this lab you are going to become part of a **food chain**. You will either play the role of a grasshopper, frog, or a hawk. When you have received your role, be sure to read the slip of paper that goes along with your job within this food chain in the ecosystem.

You will receive a “stomach” to be used while hunting for food.

When the game begins, the grasshopper will try to eat popcorn plants by putting the popcorn in their “stomach” bags. The frogs will try to eat grasshoppers (by tagging them) and the hawks will try to eat frogs (by tagging them also). When a frog tags a grasshopper, it takes the grasshopper’s “stomach” and the grasshopper leaves the game. When a hawk tags a frog, it takes the frog’s “stomach” and the frog leaves the game.

After playing the challenge, you then need to record the number of each kind of animal that obtained enough food to survive.

Question: What role within this food chain will survive the longest?



Hypothesis:

My animal role in this food chain was... _____

Did my animal stay in the game the entire time? _____ If not, how fast did I get out of the game each trial?

Why do you think some animals stayed in longer than others?

Record the number of Animals that started each trial as well as the number of survived animals after each trial:

# of Animals survived:  Trial #: 	Beginning # of Grasshoppers	Survived # of Grasshoppers	Beginning # of Frogs	Survived # of Frog	Beginning # of Hawks	Survived # of Hawk
Trial #1						
Trial #2						
Trial #3						
Trial #4						
Trial #5						

Analyze the data: What does the table tell us?

Conclusion: Was my hypothesis correct? Why or Why not?

Food for Thought:

1. What might happen if there were only half as many popped corn plants? Twice as many? No plants?

2. If there were no frogs, what might happen to the grasshopper population? The plant population? The hawk population?

3. What is one food chain that includes humans?

Line of Learning (LOL):

I shared with my neighbor about what I learned in the Food Chain Lab today.

_____ **My Neighbors Autograph**

Congratulations, you will become a GRASSHOPPER for your role in the Food Chain Game.

Your job for this challenge is to feed on the popcorn plants on the ground. You will put your food in your "stomach" bag. However, you will want to keep from being tagged by the Frogs. So you will have to be tricky in order to get plenty of food within the amount of time.

Congratulations, you will become a FROG for your role in the Food Chain Game.

Your job for this challenge is to feed on the grasshoppers. By feeding on the grasshopper, you will tag the grasshopper and you will take the stomach bag from the grasshopper. However, you will want to keep from being tagged by the hawks. So you will have to be tricky in order to get plenty of food within the amount of time.

Congratulations, you will become a HAWK for your role in the Food Chain Game.

Your job for this challenge is to feed on the frogs. By feeding on the frogs, you will tag the frogs and you will take the stomach bag from the frogs. You are the top of the food chain, so you do not need to fear being tagged by any other animal within our ecosystem.