Animal Adaptations: Focus on Bird Beaks

Grade Level(s): 6
Subject(s):

- Science/Animals

Duration: two 45-minute sessions
Description: This is an activity designed to provide students with a hands-on activity to help them explore animal adaptations, namely the shape of a bird's beak in relation to their food source.
Goals: Teach science as Inquiry; Life Science: Diversity and adaptations of organisms through an exploration of bird beaks
Objectives: Students will:
1.) Comprehend that birds have physically adapted in relation to their type of food supply.
2.) Deduce what beaks are most efficient for given foods by experimenting with imitation beaks and given food sources.
3.) Describe what will happen to a bird population if its environment could no longer support the bird's food source.
Materials:

- **Beaks:** 2 eyedroppers, 1 pliers, 5 sets of chopsticks, 4 tweezers, 1 shoestring, 1 sponge strip, 1 straw, 1 wrench, 2 slotted spoons, 1 strainer, 3 tongs, 1 envelope, 1 turkey skewer;

- **Food:** coloured water in a long narrow container, gummy worms, sunflower seeds, styrofoam cubes, popped popcorn, rice, marshmallows, loose tea;

- **Other:** potting soil, shallow pans, 8 boxes, data tables for each student, 8 cups, vase or graduated cylinder, pictures of various birds with corresponding environment/habitat and food source

Procedure:
Scientific Explanation/Teacher information:
What are animal adaptations? Animal adaptations are any body shape, process, or behaviour that allows an organism to survive in its environment. Animals change over time to fit the needs of their environment. Why do birds have different shaped beaks? Birds have many different kinds of beaks, depending on what they eat and where their food source is. For instance, birds may find their food in water, mud, flowers, seeds, or in wood. A hummingbird has a long, thin bill that allows it to sip the nectar from inside flowers. The different shapes of beaks allow easier access to these various food supplies. If an environment altered, organisms within the area would need to change - adapt- in order to survive. Natural selection is the process by which organisms best suited to the environment survive and reproduce, there by passing their genes to the next generation.
Focus Phase:
Have any of you ever had to adapt to a situation? Adaptation basically means organisms changes in order to better live in their environment. Most of the examples we've talked about have been examples of behavioural adaptations. Can any of you think of an example of an animal's characteristic that helps that animal to survive? (Make a list on the board.).
Do a "Birdbrain Storm." Ask the students to share with the class what they know about birds. What makes a bird a bird? What do birds need to survive? What kinds of food do they think birds eat? (Insects, seeds, berries, and meat are among the most common.) Where do birds live? Can you name some birds that you see or hear near your home or school?
Use an overhead with pictures of birds and their beaks (the beaks of these birds should reflect the supplies you are using). Have students open their science notebooks or take out a piece of paper.

Label the top "My Predictions" and number 1 through 8. Students will predict what each bird eats with its beak and write any ideas they have about how it might use its beak to eat. Students may want to sketch the beak next to their predictions.

Challenge Phase:

In front of the class, arrange:

1. A tall, thin vase filled with coloured water.
2. A dish of potting soil with gummy worms buried throughout.
3. Sunflower seeds spread throughout a pan.
4. A dish of water with styrofoam cubes floating in shallow water.
5. A dish of water with loose-leaf tea or herbs.
6. Popped popcorn
7. Rice grains tucked into the bark of a log (or styrofoam)
8. Marshmallows hanging on strings.

Tell students that each of these items represents a type of food eaten by various birds. Ask students if they can hypothesize what each bird would have to do in order to reach their food supply. Does the shape of a bird's beak limit their food supply? (see overhead)

Note:

1. Nectar (coloured water) will need to be sucked out. Hummingbird
2. Worms (gummy worms) need to be dug and pulled out.
3. Seeds (sunflower seeds) need to be cracked open. Sparrows, Finches
4. Fish (styrofoam pieces) will probably need to be scooped out of the water. Heron
5. Fine bits of vegetation (tea or herbs) will need to be carefully scooped out of water. Ducks, Geese, Swans
6. Flying insects (popcorn) need to be caught in wide openings. Swallows
7. Small insects (rice) will need to be picked and pried out of small crevices. Woodpeckers
8. Meat (marshmallows) will need to be pulled off of bones. Owls, Hawks

Divide Students into groups of three (there will be eight different group challenges, so divide students accordingly). Pass out "challenges" and equipment to each group. (Each group gets a different food source and a set of three different utensils, which they are to use as sample "beaks.") After reading their card, ask students to write which "beak" they predict will work best for "eating" their specific "food" in their science notebooks. Each group will time in seconds how long it takes to get a certain amount of "food" with each utensil. (See challenge cards).

Concept Introduction Phase:

Ask each group to describe their "food" and rationalize which shape of beak and bird from the overhead they think would best suit the food source. Ask them if they can think of any other adaptations that might help each bird better survive in its niche. Ask the class as a whole what kinds of adaptations they think birds in this area might have (Osprey, Magpie, or pet birds, etc.). According to Darwin's theory of survival of the fittest, the individuals with the best combinations of inherited traits were the most likely to survive and reproduce. Natural selection means that over time, populations of these animals are more numerous than populations without special adaptations. Adaptations are what make a heron better at catching fish than a woodpecker. Living organisms are often adapted in several different ways to the environment in which they live.

Reinforces:

The finch's beak has repeatedly adapted to changing environments.

The owl has a disc shaped face that allows them to have incredible hearing for hunting.

The Clark's Nutcracker has a beak that is exactly long enough to plant white bark pine seeds when the bird is storing food for later in the ground.

The crossbill has a beak that allows it to open strong pinecones.

Review how they made predictions about what each bird will eat. Were their predictions supported with evidence? Write an explanation next to their prediction. How might they see things differently after doing the experiment? As a final question, ask students to relate what might happen to a bird population if its natural environment experienced a natural disaster where all the flora or fauna were wiped out. What would happen if a farmer used an insecticide that killed off all the insects? What would happen to woodpeckers or other birds that eat small bugs?

What would happen if the old trees and snags were cut down? Where would osprey and eagles watch for their meal?

Application Phase:

On another sheet of paper, have students create a bird that feeds on a particular food source. Be sure to include adaptations in addition to their beaks, such as long legs for a wading bird like the heron. Have them draw a picture and write a description of what adaptations this bird has to feed on its chosen food source.

Challenge #1

You have been given a graduated cylinder as a food source. You have also been given sample beaks: 1) a shoestring, 2) a medicine dropper, and 3) a sponge strip. Your challenge is to find out how many seconds it takes each "beak" to get 10mL of water from the graduated cylinder to the cup.

Record the three times in the data table provided. Try several trials with each "beak." Calculate the average time for each "beak." Construct a bar graph of the averages.

Challenge #2

You have been given gummy worms as your food source. You have also been given sample beaks: 1) a straw, 2) chopsticks, and 3) a wrench. Your challenge is to find out how many seconds it takes to remove the gummy worms form the dirt using each "beak." Use multiple trials, burying the worms after each trial.

Record your times in the data table. Calculate the average time for each "beak." Construct a bar graph of the averages.

Challenge #3

You have been given sunflower seeds as your food source. You have also been given sample beaks: 1) pliers, 2) chopsticks, and 3) tweezers. Your challenge is to find out how many seconds it takes each "beak" to crack the shell and remove the seed inside.

Record your times in the data table. Try this several times. Calculate the average time for each "beak.' Construct a bar graph of the averages.

Challenge #4

You have been given floating styrofoam squares as your food source. You have also been given sample beaks: 1) chopsticks, 2) tweezers, and 3) a slotted spoon. Your challenge is to find out how many seconds it takes each "beak" to remove all of the styrofoam square from the water. Try several trials, returning the squares after each trial.

Record your times in the data table. Try this several times. Calculate the average time for each "beak.' Construct a bar graph of the averages.

Challenge #5

You have been given tea as your food source. You have also been provided sample beaks: 1) a slotted spoon, 2) a strainer, and 3) tweezers. Your challenge is to find out how many seconds it takes to get all of the tea from the water. Try this several times, returning the materials each time.

Record your times in the data table. Try this several times. Calculate the average time for each "beak.' Construct a bar graph of the averages.

Challenge #6

You have been given popped popcorn as your food source. You have also been provided sample beaks: 1) tongs, 2) an envelope, and 3) chopsticks. A group member will gently toss some kernels into the air. Your challenge is to find out how many seconds it takes to capture 20 kernels with each "beak." The kernels must be caught while they are in the air. Try this several times.

Record your times in the data table. Try this several times. Calculate the average time for each "beak.' Construct a bar graph of the averages.

Challenge #7

You have been given rice as your food source. You have also been provided sample beaks: 1) a medicine dropper, 2) tongs, and 3) tweezers. Your challenge is to find out how many seconds it takes for each "beak" to remove thirty grains of rice from the bark of a tree. Try this several times, returning the rice to the bark each time.

Record your times in the data table. Try this several times. Calculate the average time for each "beak.' Construct a bar graph of the averages.

Challenge #8

You have been given marshmallows hanging from a string as your food source. You have also been provided sample beaks: 1) chopsticks, 2) tongs, and 3) a turkey skewer. Your challenge is to find out how many seconds it takes with each "beak" to remove five marshmallows from the strings. Try this several times.
Record your times in the data table. Try this several times. Calculate the average time for each "beak." Construct a bar graph of the averages.

Assessment:

Did students support or clarify whether or not they proved or disproved their predictions on which "beak" matched with a given food supply.

· Collect the data sheets for participation

· Collect the invented bird for concept understanding of birds' beak shapes in relation to their food supply.