

Lesson 1: The Pecking Order

The Use of Various Tools to Explain and Show the Role of Adaptation in the Feeding of Birds

Overview: - Students will participate in a variety of “food gathering” activities in which various tools will simulate different kind of bird beaks, each with their own specialization. Students will also time the various activities and graph the results, comparing the results with their predictions.

Objectives (1-3): - To teach students through hands on exploration the advantages and necessity of animals adapting to fill specific niches in their respective environment.

Key Concepts: Food Webs, Predator-Prey Relations, Ecological Niches, Survival of the Fittest, Symbiotic Relationships, Biodiversity, Evolution

Subjects: Social Studies, Biology, Ecology, Geography, Ornithology

Duration: 2 class periods (80 minutes)

Setting: In the in the classroom and later in the field, outdoor natural landscape

Season: Year round, with field trip in Spring, Summer and Fall

Interdisciplinary Connections

Frameworks:

Mathematics: 6.1.1, 6.2.1, 6.4.1, 6.4.2, 7.1.1, 7.4.1, 7.4.2

Social Studies: 6.1.4, 6.1.5, 6.1.10, 7.1.4, 7.1.5, 7.1.10

Environmental Education @ the Cove River Site, and other coastal Connecticut settings.



Produced by the Graduate Students in Environmental Education EVE 546 Spring 2009



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Introduction (background): Adaptation to one’s environment is essential the individual’s survival as well as the survival of the species. In no place is this fact more evident then in the evolution of birds and their beaks.

A bird's beak is basically a lightweight, bony elongation of its skull. The beak is covered with skin that produces keratin, the same material found in human fingernails and hair. On most birds, the keratin condenses and dries, forming the beak's hard, glossy, outer covering. The tip and cutting edges of the beak are constantly renewed as they wear away, just as human nails are.

Bird beaks are multi-functional tools. Birds use them to weave nests, defend their territory, attack competitors, groom feathers, communicate, and most significantly, to gather or capture food.

Over the years, a wide assortment of bird beaks has evolved. Though many birds have straight beaks that are adapted to general feeding, some birds' beaks are examples of unique adaptations.

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: colored 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

Preparation / Set Up (if necessary): In front of the class, arrange:

1. A tall, thin vase filled with colored 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.

Engagement (Opening or Essential

Question: Why do birds adapt different beaks depending on their environment?

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?

Exploration: Tell students that each of these items at the various activity stations 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 (colored 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 there will be eight different group Activities, so divide students accordingly. Pass out "Activities" 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 Activities).

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.). 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

Activity #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 Activity 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.

Activity #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 Activity is to find out how many seconds it takes to remove the gummy worms from 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.

Activity #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 Activity 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.

Activity #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 Activity 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.

Activity #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 Activity 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.

Activity #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 Activity 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.

Activity #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 Activity 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.

Activity #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 Activity 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.

Explain:

Meet as a class to discuss the results of each of the activities. Ask them if their predictions were verified. Explain why each beak was the best tool for the job.

Elaborate:

Introduce or bring students to the Cove River site and have them observe the various birds or native wildlife. Instruct them to carefully observe the traits that make each bird unique. Have them extrapolate from their observations how the observed traits would give the birds an advantage in their environment.

Evaluate:

- Collect the bar graphs and averages as participation
- Have Students prepare a report on an exotic species (not found in CT) (this will help to give them a more expanded

exposure to environmental processes))
including the basics:

- Name
 - Both Common and Latin
- Appearance
- Location
- Physical Characteristics
- Niche
- Adaptations
- Reproduction
 - How many at a time?
 - Care
 - Recruitment age
- Status
 - Are they endangered?

Supplementary Material:

Forms of Bird Beaks:

http://fsc.fernbank.edu/birding/bird_beaks.htm

<http://www.ummz.lsa.umich.edu/birds/resources/anatomy/body/beaks.html>