5.3a Eat Like a Bird (version 2)

Modeling Animal Adaptations

Overview

Students will model how adaptations affect what an animal is able to eat, and hypothesize the potential effects of dramatic habitat change on an animal's ability to survive.

Lesson Planner

Grade Level(s)	$3^{rd} - 6^{th}$
Time Required	30-40 minutes
Key Concepts/Terms	Adaptation, Niche, Habitat
Prerequisites	None
Setting	Indoors/Outdoors, Whole Class

Objectives

After completing this activity, students will be able to…

- Correlate an organism's adaptations with food preferences
- Explain how an adaptation may affect an animal's survival in the event of habitat change

Materials Required

- Crackable nuts (walnuts, pistachios, etc.). Peanuts are not recommended due to allergies.
- Small cups (6)
- Food coloring (to make colored water)
- Small measuring cups
- Cut log, like a piece of firewood
- Rice or sprinkles
- Gummi fish
- Bowl (for gummi fish)
- Plates or bowls (1/student)
- Slotted spoons (5)
- Tweezers (5)
- Nutcrackers (5)
- Plastic pipettes/eyedroppers (5)
- Forks (5)
- Bird identification guides (or other books about birds)
- Student data sheet
- Stopwatch/timer/watch with a second hand

Background Information

Adaptations

Adaptation is an evolutionary process through which a population of organisms become better suited to their environment over **MANY GENERATIONS**. A trait (like a longer neck or sharper teeth) that allows an individual to survive and reproduce is passed on to its offspring. As these offspring are also well suited to the environment, they have a greater likelihood to survive and pass the trait to future generations. Over time, more and more individuals in the population will have the trait.

Example of an adaptation

Hummingbirds drink nectar, a sweet substance produced by flowers to attract pollinators. Hummingbirds that had longer, more slender beaks were able to reach deeper into the flowers and get more food. Those individuals were more likely to survive and reproduce, and so the next generation of hummingbirds had more individuals with long, slender beaks. Over time, all hummingbirds came to have these beaks.

Note: This topic is an area of frequent misconception with students. It is important that they understand that evolutionary adaptation *does not* mean that one individual adjusts to a habitat. While humans can "adapt" to an environment by putting on clothes, building a house, etc., this is a different kind of adaptation than the process described above. Evolutionary adaptation takes place over generations and involves changes in a whole population of organisms, not one individual. It is an involuntary process that is caused by the survival (natural selection) of those individuals who are best suited to an environment.

Procedure   Follow the steps in the table below to conduct the activity. **Sentences in bold are suggestions for what teachers might say to students.** *Items in italics are possible teacher answers to questions.*

Phase	Step	Action
Engage	1	**Say: "Name the first thing you think of when I say each of the following animals."** The table below lists some animals you might choose, and common student responses: | Animal	Adaptation
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Giraffe	*Long neck*
Porcupine	*Spines/Quills*
Turtle	*Hard Shell*
Snake	*No Legs*	
	2	**"The characteristics you have just named are adaptations. An adaptation is a characteristic that an organism inherits from its parents that helps it fit into its habitat and survive. What advantage would the adaptations we have just discussed give to each organism?"** The table below lists some animals you might choose, and common student responses: | Animal adaptation	Advantage
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Giraffe's Long Neck	Allows the giraffe to reach food that is located higher than most other animals can reach
Porcupine Quills	Defense from predators
Turtle Shell	Defense from predators
Snake's Body Shape	Allows easy and very silent movement for sneaking up on prey, etc.	

Explore	3	<u>Setup for the next activity</u> To setup this activity, make four stations around the room, preferably not where the students normally sit. The four stations should have: | **Simulated Food Source**	**Materials**
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Nectar	Colored water in 6 small cups, 6 small measuring cups
Grubs	Rice placed in crevices of split log, 6 plates/bowls
Nuts	Uncracked nuts, 6 plates/bowls
Fish	Gummi fish in bowl of water, 6 plates/bowls	 The cups and plates/bowls are for students to collect their food, and should be placed around the food sources. Ideally, students will be able to sit around the food source.
	4	Divide students evenly into five groups.
	5	**"Each student is going to have a certain "beak adaptation" and we are going to see how successful an animal with that adaptation is in accomplishing a certain task.** Give the members of each group one of the 5 bird beak adaptations: the slotted spoon, pipette, fork, tweezers, or nutcracker. **Have students describe and draw a picture of their "beak" on their data sheet.**

	6	**"Using the field guides, try to find a bird that has a beak which is similar to the "beak" that you have."** Have students use the bird identification guides, or other books about birds, to find birds with beaks that might work in similar ways to theirs. Students should add this information to their data sheets. Some common birds with each beak type are: <table><tr><td>Slotted spoon</td><td>Pelican</td></tr><tr><td>Pipette</td><td>Hummingbird</td></tr><tr><td>Tweezers</td><td>Chickadee, robin</td></tr><tr><td>Nutcracker</td><td>Cardinal</td></tr><tr><td>Fork</td><td>Great blue heron</td></tr></table>
	7	**"The food sources we are going to use today are… Add these to your data sheet in the column that says food source."** Have students add the "food sources" you are going to use to their data sheets. Recommended food sources are gummi fish, rice, colored water, and unshelled nuts. Add other food sources if you like.
	8	**"Now you need to make a hypothesis about your beak. What do you think your beak is adapted for doing? What food source do you think you will collect the most of? Answer these questions on your data sheet."** Have students record their hypotheses.

	9	**"Now we are going to test our hypotheses by simulating how these birds might collect their food."** Describe how each station works: | Nectar	Transfer colored water to small measuring cup
Grubs	Transfer rice to plates
Nuts	Crack nuts open onto plate (students are allowed to use their other hand to pick up nuts). Nuts MUST be cracked.
Gummi fish	Transfer fish to plate	 Send students to each food station so that there are 1 or 2 students with each beak type at each station. **"You will have 15 seconds to collect food at your station. When time is up, record how much food you got on your data sheet. Ready? On your marks, get set, go!"** Time students for fifteen seconds. When time is up, have them record their data (volume of nectar, # of rice grains, # of cracked nuts, # of fish).
	10	**"Before we move to the next station, we need to reset the station for the next group."** All stations except for the nuts reset by putting the materials back where they came from: the rice goes back on the log, the fish go back into the bowl, and the colored water goes back into the cups. Cracked nuts should go in the trash, and more nuts added if necessary.
	11	**"Now rotate to the next station."**
	12	Repeat until all students have gone to all stations. When this is finished, students should return to their desks.

Explain	13	**"Now let's examine our results. Look at your data sheet. In the results section, write what food source you collected the most of and what you collected the least of."** **"Did your results match your hypothesis? Answer this question at the bottom of your sheet."**
	14	Lead students to analyze the data by asking the following questions: • **Did everyone in the group collect food in the same way?** • **What food was easy for you to collect? Why?** • **Which foods were impossible for you to collect? Why?** • **If the food at one of the stations disappeared, how would it affect your bird?** • **What food was there a lot of competition for?**
	15	**"What food sources in nature are represented by each station?"** Have students add this information to their data sheets: <table><tr><td>Colored water</td><td>Nectar</td></tr><tr><td>Rice</td><td>Grubs in a log</td></tr><tr><td>Nuts</td><td>Seeds or nuts</td></tr><tr><td>Gummi fish</td><td>Fish</td></tr></table> **"What would happen if these food sources were destroyed by pollution or another man-made disaster? Could your birds survive?"**
Elaborate	16	Choose a habitat and ask students to research animals that live there to determine each animal's niche. For example, in a forest, squirrels eat acorns, raccoons eat insects and crayfish, and deer eat leaves. All three animals live near each other, but usually don't compete for food since they are in different niches.

Vocabulary   Understanding of the following terms is required in this activity.

Term	Definition
Adaptation	A genetically determined characteristic that enhances the ability of an organism to survive in its environment. It also refers to the evolutionary process by which populations become better suited to their environments.
Forage	To search for food.
Habitat	A place that supplies all an animal needs to survive: food, water, shelter, and space in a suitable arrangement.
Niche	The role an animal plays in its environment including where it lives, what it eats, and what it does. It is the animal's "profession".