Best Adapted Beak

Thank you for downloading the science and mathematics activity packet! Below you will find a list of contents with a brief description of each of the items. This activity packet contains all the information (including any handouts) you will need to run this activity in your own classroom or at a science festival.

Please note: some activities might require the need for a facilitator to be present to oversee the activity. Activities that require a facilitator will be clearly noted.

-Community Resources for Science

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ACTIVITY PACKET CONTENTS

1. Organizer Instructions for the person running the activity
    - Print suggestion: 1 for the facilitator
    - Includes information for setup prior to the event (e.g., materials prep)
    - Estimated cost for one set of supplies, excluding common household items
2. Supplemental Background Information for organizer/facilitator
    - This provides additional information for the organizer or activity facilitator regarding the science behind the activity
    - Potential questions to ask participants about their observations during the activity
3. What's Going On? (tabletop sign/printout)
    - Print suggestion: 1 to put in a plastic sign holder
    - Explains the science and background information behind the activity
4. Participant Instructions (tabletop sign/printout)
    - Print suggestion: 1-2 to put in a plastic sign holder
5. Questions to Think About
    - Print suggestion: 1 to put in a plastic sign holder
    - List of questions for participants to try and answer during the activity
6. Activity printouts for participants
    - Print suggestion: number of expected participants at event
    - Each printout sheet contains three tables for the activity
7. Take home ½ sheet for participants
    - Print suggestion: number of expected participants
    - Materials list and instructions for participants to try the activity at their homes

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ORGANIZER INSTRUCTIONS

Grade(s): K-5

Standard connections:

CCSS Math Practice MP5: Use appropriate tools strategically
CCSS.Math.Practice.MP2: Reason abstractly and quantitatively

Next Generation Science Standards:

Scientific and Engineering Practices

Using mathematical and computational thinking: Organize simple data sets to reveal patters that suggest relationships

Analyzing and interpreting data: Analyze and interpret data to make sense of phenomenon.

Objective: Use 3 different "beaks" to collect as many pieces of food possible in 10 seconds. Determine what size food each beak is best at gathering.

Activity Overview and background: Participants will collect and analyze data to learn about adaptation and evolution of bird beaks. Cotton swabs, tweezers, and binder clips will serve as beaks to gather different sizes of food.

This activity requires a facilitator to set the timer for each round

Estimated cost for activity supplies: $10-20

Materials:

- Tweezers ($1.5/each)
- Cotton swabs ($3)
- Binder clips ($3/pack of 12)
- Timer/clock with a second hand
- Several different kinds of seeds, grains, or nuts ($5-10)
  - It is best if you have a wide range of seeds that differ in shape and size
  - Keep seeds sorted separately by size
- Small dishes
- Data collecting tables printouts
- Pens or pencils
- Water

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Set Up:

1. Dampen the cotton swab slightly with water
2. Set out the three types of "beaks" (tweezers, binder clip and dampened cotton swab)
3. Place the three different sizes of "food" (small, medium and large seeds/nuts) in three separate piles (separated by size) on a surface
   - These three piles will represent different food types
   - For example, a hazelnut would be a mouse that a hawk might snatch and a grass seed would be a small drop of nectar a hummingbird might eat
4. Place the empty dishes within arm's reach of participants
5. Have someone ready to time the activity using the timer

Suggested Set Up:

- Have three separate food piles (sorted by size) set up with a few of each kind of "beaks" available for participants to use (i.e., cotton swabs, tweezers, binder clips)
  - This way several participants can do the activity at once
  - Have participants rotate through the food stations after each timer turn to see which beaks worked best for the different food sizes

http://www.scientificamerican.com/article/best-adapted-beaks-bring-science-home/

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SUPPLEMENTAL BACKGROUND INFORMATION

When you look at different bird beaks, you're seeing a great example of something called adaptation. Adaptations are traits that developed to perform a certain function and allow organisms to thrive in their environment. Although one adaptation might be very useful for a certain species in a specific environment, that same trait might not be useful for another species in a different environment.

To understand how adaptations arise, it helps to understand the process of evolution. Populations of plants, animals and other living organisms change over many, many generations. Scientists call this process natural selection. Natural selection happens in a species when individuals that have traits better adapted for their environment survive longer and have more babies. They pass on the beneficial adaptations to their offspring. So, over the generations these adaptive traits become more common in the population until nearly all individuals in a species have the adaptation.

Observations and Results

Different birds have very different beaks. Over many generations, hummingbirds have evolved beaks that are long, thin and well adapted to reach into flowering plants and extract nectar. Hawks, on the other hand, have evolved beaks that allow them to tear meat and eat the prey found in their environment.

How did these two types of birds develop their different types of beaks? Natural selection and evolution usually happen very slowly. For hawks, individual birds that had sharp beaks were better able to catch and eat enough food to survive and reproduce in their environment and so, over time, this trait became common in the hawk population. The same thing goes for early hummingbirds trying to reach deep into flowers for nourishing nectar.

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If the environment were to change, how do you think it would affect which individuals are better able to gather food, survive and reproduce? Could this affect the kind of beak that becomes common in a population and a species? The famous scientist Charles Darwin, who wrote about evolution and natural selection, based some of his ideas on observations of the differently shaped beaks of finches he saw eating various foods on several islands.

Of course adaptation isn't limited to birds and their beaks. Examples of adaptation can be found in all living organisms. For example, if you compared the ear of an extinct woolly mammoth with that of an African elephant, you would see that an elephant's ear is much bigger! Why is this so? To understand why a creature is the way it is, you first must understand the environment in which it lives. Is it warm or cold where elephants live? How about woolly mammoths' old environment?

What's Going On?

Have you ever thought about the differences between a hummingbird and a hawk? They are both birds and yet they look nothing alike! Why do you think they look so different?

Aside from hawks being very big and hummingbirds being very small, these two birds exhibit other differences. Take their beaks, for example. A hawk's beak is razor sharp and can tear the flesh off the small animals it eats. A hummingbird's beak is long and thin, which helps it dip into the flowers to sip nectar (a sugary fluid the hummingbird uses for food). How can two species of bird have beaks that are so different?

Today we will explore how, in different environments with different food types, specific adaptations, or changes in physical features, are more beneficial than others. You will use common household items and seeds, grains and nuts to mimic how birds might use their beaks to pick up food.

Instructions

1. Set the timer to 10 seconds for each round
    - Return food pieces back to their pile after each round

2. Pick up the dampened cotton swab. With the “beak,” collect as many pieces of the biggest "food" as you can in 10 seconds
    - *How many pieces of food could you collect?*

3. Again using the cotton swab damp, repeat the 10-second "feeding" with the medium-sized food type
    - *How many pieces of food could you collect?*

4. Now try the damp cotton swab on the smallest type of food for 10 seconds
    - *How many pieces of food could you collect?*

5. Repeat these steps with the other two types of “beaks”—the binder clip and the tweezers
    - Record the results for each “beak” and food size
    - *Which beak did the best at feeding on which foods?*

Questions to Think About

- If only the smallest food were available, which birds in the environment would likely have the most success surviving and reproducing?
  - Would it be the birds with the tweezers "beaks," the cotton swab "beaks," or the birds with the binder-clip "beaks"?
- What if only the biggest food type were available?
- How would the tweezers "beak" do if the bird were eating nectar instead of seeds?
- What might happen to the different types of food if one type of bird were to become more common?

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ACTIVITY PRINTOUT FOR PARTICIPANTS

How many pieces of food were you able to collect?
Record the # in this table!

Beak	**Pieces of Food (by size)**		
	Small	Medium	Large
Cotton Swab			
Binder Clip			
Tweezers			

How many pieces of food were you able to collect?
Record the # in this table!

Beak	**Pieces of Food (by size)**		
	Small	Medium	Large
Cotton Swab			
Binder Clip			
Tweezers			

How many pieces of food were you able to collect?
Record the # in this table!

Beak	**Pieces of Food (by size)**		
	Small	Medium	Large
Cotton Swab			
Binder Clip			
Tweezers			

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TRY IT AT HOME!

Materials:

- Tweezers
- Cotton swab, dampened with water
- Binder clip
- Small dishes
- Pen or pencil
- Timer or clock with second hand
- Several different kids of seeds, grains, or nuts (sort by size)

Instructions:

1. Set timer to 10 seconds for each round
2. Using the cotton swab "beak," collect as many pieces of the smallest food as you can in 10 seconds and place the food pieces in the empty dish. Record the number and return food to pile
    - Repeat with the medium and large size food
3. Repeat this with the tweezers and binder clip
    - Which beak did the best at feeding on which foods?

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