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Title: Bird Beak Buffet – Lesson on Adaptation

Synopsis

The activity includes two distinct environments – shallow box of sand and rice and a deeper, opaque box to represent water. There are three different beak options to correlate with our three chosen birds. Tweezers for a Snipe, ladle for a Heron, and a deep measuring cup to represent the spoonbill of a Pelican. The goal is to find the correct “beak” and also to see how and why different beaks work better in different environments.

Audience

This activity is targeted at a younger audience to show a clear example of adaptation. However, the outreach proved that all ages are interested in this, especially when we extended the ideas to human adaptations during our follow-up questions to the groups (see guiding questions below).

Learning Goals

The audience should walk away with an understanding of how environment affects morphology; specifically, why abundance and type of food are so important in species evolution. Depending on whether or not there is access to pictures/videos of different birds they should also leave with a better understanding of the general differences throughout birds and their feeding styles. This activity also exemplifies a trial and error method and helps demonstrate how scientists test hypotheses, and then further develop and relate this to other topics throughout a subject.

Concepts

- Adaptation
- Morphology
- Evolutionary theory
- Environmental pressures
- Charles Darwin
- Introduction to vestigial vs. homologous structures
- The scientific method



Materials

Environment 1:

- shallow Tupperware- approx. 12x15”
- rice/sand mixture

Environment 2:

- Shipping Box- approx. 6x4x8
- playdough balls
- small wooden dowels
- foam animals (representing fish)

These can be replaced by other objects laying around, as long as they are hard to pick up with the tweezers but easier with the ladle and measuring cup.

Beaks:

- tweezers
- plastic ½ or 1/3 measuring cup
- ladle (long enough handle to reach outside of environment)

Media: snipe, heron, pelican pictures, and if access to a laptop or projector permits- a video of the different birds eating

Misc: Poster Board for signs

*This should all be able to be purchased for less than \$5; the only money will be spent on poster board, rice and sand. The other objects are modifiable and cost should not be a deterrent.

Preparation and Set-up

Environment 2 should be decorated to make it look like water (with paint, glitter, etc.), a poster board sign with the different birds and the birds’ names on them (if an older audience- could write the binomial nomenclature of each bird), poster to write the title “Bird Beak Buffet.” It is very helpful to have extra bird facts on hand (kept behind the table to keep the area neat) to help cue questions to extend and keep students engaged after the hands-on portion is done.



Guiding Questions

Prior knowledge assessment

- “Do you know why birds have different beaks?”
- “Have you ever seen (type of bird) eat?”
- “Do you know what this (point to picture of a bird) eats?”
- “What can you tell me about birds?”

Engage:

- “Do you want to try this?”
- “Can you think of a the bird beak (point to tools) that would best fit environment 1 or 2?”
- “How are you going to get this bird (point to bird on poster) with this beak food? Where do you think this bird lives based on size/beak/etc?”

Encourage/Extend:

- “What does this tell us about the importance of where we live and what we eat?”
- “What else do birds use their beaks for?” (Building nests, feeding young)
- “Where else do we see adaptations in birds? Why do they have feathers?”
- It is helpful to relate it back to ourselves as humans and find the differences in our eating behaviors. Specifically, you can discuss the differences between hetero/homodont dentition as related to being an omnivore or herbivore/carnivore. Ask about what a cat or dog’s teeth look like, then asking what they would eat (in the wild) and asking why our teeth, as humans, aren’t all the same in reference to what we eat.

Evaluation:

Asking where else we see adaptations, or what kind of beak would be expected if you saw shallow water or a bird that had to dig deep into something for their food, e.g. “Why do you think a hummingbird’s beak is shaped the way it is?” (Hummingbirds are easy because most people know they drink nectar.)

Teaching Strategies

This is really honing in on the engaging and extending portion of the learning cycle because the goal is to have the hands on part and then develop a discussion that provides further inquiry so they leave wanting to know more about adaptations.



Vocabulary

- Evolutionary Theory- the change of allele (genetic variant) frequency over time in a population. It is important to note that the term “theory” is used the same way we say gravity is a theory (different from colloquial use)!
- Natural Selection: Evolutionary mechanism; some variation is heritable, competition for resources leads to certain variants being more advantageous for reproduction (certain individuals have a higher fitness than others).
- Charles Darwin: Proposed theory of natural selection by looking at the variation in beaks in Galapagos finches as related to their different foods and environment.
- Homodont Dentition: all teeth are the same (single type of food)
Heterodont Dentition: teeth are different shapes and sizes for different types of food (omnivores)

Science Content Background and Additional Resources

<http://www.neok12.com/video/Natural-Selection/zX50624f5e5b6b6f63637a7b.htm> (Carl Sagan explaining natural selection)

<http://projectbeak.org/adaptations/start.htm>

<http://www.npr.org/blogs/13.7/2014/03/10/288656421/evolution-is-coming-to-a-storybook-near-you>

<http://www.nsta.org/about/positions/evolution.aspx> (The official stance on evolution in the classroom)

“But in delaying evolution instruction, we may miss an opportunity to leverage children's natural curiosity about the biological world, and to establish the foundations for a more accurate scientific understanding *before* misconceptions become deeply entrenched. So here's the challenge for educators (and parents): figuring out how to teach evolution to children in a way that's compelling and effective.”

- National Public Radio “*Evolution is Coming to a Storybook Near You*”