Engaging Students in Phenomena Relevant to the Interdependence of Life: Feeding Interactions
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Abstract
Much of science involves finding patterns in observations and explaining them in terms of a small number of principles or ideas. For students to appreciate how science works, they need to have a sense of the range of observations (phenomena) that are used to form the patterns and the helpfulness of the principles or ideas in explaining them. Project 2061’s evaluation of science textbooks revealed that textbooks rarely engage students with phenomena relevant to important science ideas, rarely included phenomena that directly address the often incorrect ideas that students may already have, and rarely guided students in recognizing phenomena with scientifically accepted ideas (Resnick & Rosen, 2002; Stern & Roseman, 2004). We think the lessons from the National Science Education Standards and Benchmarks for Science Literacy (AAAS, 1993) and in National Science Education Standards (National Research Council, 1996) are easily ignored. In this poster we show an example of a set of phenomena that can be used to help middle school students gain an understanding of some of the concepts targeted by the key ideas. Animals may interact with other organisms for food in a variety of ways. From benchmarks for science literacy, GSS/LSS:

What Students Are Expected to Know
Most animals have multiple sources of food, but some are completely dependent on one or a few species of organisms for food.

Animals can obtain food from other organisms either by killing and eating them or by feeding off of them without killing them.

An animal that kills and eats another living animal is called a predator, and the animal that is killed and eaten is called its prey.

Students are expected to know the terms producer, consumer, parasite, or host. Nor are they expected to know how organisms such as plants, which do not depend on other organisms for food, produce their own food.

Ideas Students Have
“Feeding on” means to physically swallow. A consumed organism is eliminated (Reiner & Elam, 2001).

A food chain is seen as a bead chain that can always be rejoined if one bead is lost. If a population in a food chain is lost, another organism will always take its place (in that environment) or its predator will always find another food source (Reiner & Elam, 2001).

The relative size of an organism determines what it eats. For instance, smaller organisms are incapable of eating other or larger animals, so they eat plants (Gallegos et al., 1994, Reiner & Elam, 2001).

Predators are always big and ferocious (Gallegos et al., 1994).

Prey are always smaller and weaker (or more passive) than predators (Gallegos et al., 1994).

Implications for Instruction
It may be helpful to ask students to keep track of predator/prey relationships or feeding relationships that they see in the National Geographic video by writing them down as they watch. It may also be useful to ask students to write down their general impressions of the organisms involved in the interactions prior to watching the National Geographic video.

Students should be introduced to multiple strategies for predation that include active hunting vs. trapping, organisms hunting alone vs. groups of organisms working together, etc.

Students should be shown a variety of predator/prey interactions and exposed to organisms that illustrate different types of predators and prey that fit and defy the stereotypes.

Key Idea
Animals may interact with other organisms for food in a variety of ways. (From Benchmarks for Science Literacy, GSS/LSS)

Evidence of Predator/Prey Interactions
What is an Owl Pellet?
An owl pellet is undigestable material—fur, feathers, and bones—that an owl regurgitates after it has consumed its prey.

This is a video clip of a Snowy Owl regurgitating an owl pellet. © Nick Bonomo 2000

This is a video clip of a Snowy Owl regurgitating an owl pellet. http://www.cnb.ca.edu/bio125/birds/pellet/josh/josh1.HTM

Dissecting Owl Pellets
What is an Owl Pellet?

Benchmarks for Science Literacy (AAAS, 1993) and in National Science Education Standards (National Research Council, 1996) in this poster we show an example of a set of phenomena that can be used to help middle school students gain an understanding of some of the concepts targeted by the key idea. Animals may interact with other organisms for food in a variety of ways. From benchmarks for science literacy, GSS/LSS:

Purpose and Hypothesis:
I took apart ten barn owl pellets. I found bones of voles and rats. I found more vole bones than any other kind of bones. The littlest pellet I checked had the bones of only one vole. All but two pellets had two or three animals in them.

About these examples:
- Photos and descriptions show that American black bears have several sources of food, but their relatives, the giant panda bears, have essentially one source of food.
- Additional evidence may be needed to convince students that the giant panda bear is dependent on one or a few species of organisms for food.

Analysis of Data:
I took apart ten barn owl pellets. I found bones of voles and rats. I found more vole bones than any other kind of bones. The littlest pellet I checked had the bones of only one vole. All but two pellets had two or three animals in them.

Dependence on Many & Few Species for Food
American black bears have many sources of food, including clover, dandelions, berries, acorns, fish, and insects. They occasionally eat other animals and have been known to search for food in human garbage.

http://www.americanbear.org/faq.htm

These examples include active hunting vs. trapping, organisms hunting alone vs. groups of organisms working together, etc.

Additional evidence may be needed to convince students that the giant panda bear is dependent on one or a few species of organisms for food.

About these examples:
- American black bears have many sources of food, including clover, dandelions, berries, acorns, fish, and insects; they occasionally eat other animals and have been known to search for food in human garbage.

Guiding Student Observation:
To ensure that students make the expected observations, it may be helpful to have them write descriptions of feeding relationships that they see as they watch the video.

Feeding Interactions
- Predators are always big and ferocious (Gallegos, Jerezzans, & Flores, 1994). Students associate the word “predator” with a stereotypically large, ferocious animal such as a lion. They do not recognize that a predator is defined by the act of killing and eating another animal, not by its relative size or perceived ferocity.
- Prey organisms are always smaller and weaker (or more passive) than predators (Gallegos et al., 1994).
- Students should be shown a variety of predator/prey interactions and exposed to organisms that illustrate different types of predators and prey that fit and defy the stereotypes.

National Geographic News Video: Desert Babies Face Harsh Childhood

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