Encyclopedia of Life
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Bioblitz Skillbuilders: Learning and Applying the Skills of a Naturalist

Skillbuilder 3: How Diverse is Biodiversity?

Key Question

How diverse is biodiversity?

Objective

Students **explore misconceptions** about biodiversity by hypothesizing the number of animal species and comparing to scientific estimates.

Grades 3-8 Time 15 minutes Location Classroom

Materials

Post-it Notes
Whiteboard or butcher-block paper,
Pens or pencils
Biodiversity worksheet and answer key
Projector (optional)

Preparation

- Cut Post-it Notes into small strips and prepare sets of 10 Post-its for each student.
- On a large piece of butcher block paper, make a column for each animal group that is listed on the worksheet and label. Do not hang the paper until students have completed step 1 of the activity.

- Print one diversity worksheet for each student and an answer key for the teacher.

Recommended Reading

Organisms are organized into different groups based on shared characteristics - both observable and genetic. We are able to classify organisms into a hierarchical system called taxonomy based on these characteristics. Worms have a certain set of shared characteristics, while sponges have another, as do all other groups of organisms. Visit the following EOL pages to learn more about animal diversity and taxonomy:

- *Biodiversity Articles*
- *What is an Animal?*
- *What is Biological Classification?*
- *What is Biodiversity?*
- *What is a Species?*
- *Biodiversity Educational Resources*

Directions

1. **Engage**: Hand out Post-its and writing utensils to students. Tell students they have TWO minutes to write down the names of 10 animals, one on each Post-it. At the end of two minutes, hang up butcher-block paper on wall or whiteboard.
2. **Explore**: Ask students, a few at a time, to bring their Post-its to the board and place the each animal in a column that best describes it. After all students have participated, ask a few questions:
    a. *What patterns do you see? (In most cases, mammals has the highest number of entries, followed by birds, fish, or reptiles)*
    b. *Did we represent all of the groups? If not, what groups did we NOT represent?*
3. **Explain** that organisms are organized into different groups based on shared characteristics. We are able to classify organisms into a hierarchical system called taxonomy based on these characteristics, from broad (kingdom) to specific (species). As humans, it is easy to characterize animals as the ones we see most often, but there is much animal diversity we don't pay attention to in the same way in everyday life. Earthworms have a certain broad set of shared characteristics, while sponges have another, as do all other broad groups (or phyla) of organisms.
    a. Project (or pass around images of) examples of worms, echinoderms (sea stars, urchins), sponges (porifera), jellies and anemones (cnidaria). These are examples of different *phyla*, that are diverse groups of organisms that share a certain broad set of traits.
4. **Elaborate**: Now that students understand each animal group/phyla, ask them to fill out the "hypothesis" column of their diversity worksheet. How many SPECIES do they hypothesize, based on what they know already, belong to each phylum/group? After 3 minutes, ask different students to share their hypotheses and reveal taxonomists' estimated numbers.
5. **Evaluate**: Lead discussion about animal diversity:
    a. Which groups did students under-estimate, and which did they over-estimate?
    b. Were any students close to the true number for a group?
    c. What were students most surprised about?
    d. Which of these animal groups do they think they could find in the schoolyard? Their backyards? The beach? Where else?

NGSS Standards/Benchmarks

Elementary School

3-LS3-1: *Heredity: Inheritance and Variation of Traits:* Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

4-LS1-1: *Structure, Function, and Information Processing:* Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Middle School

MS-LS4-1, MS-LS4-2: *Nature of Science: Scientific Knowledge Assumes an Order and Consistency in Natural Systems:* Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.

Common Core Standards

CCSS.ELA-LITERACY.RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

FL Standards/Benchmarks

SC.3.L.15.1 Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.
SC.6.L.15.1: Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

Animal Diversity Worksheet

Groups	Hypothesis of Species	Scientifically Described Species
Sponges (Phylum Porifera)		
Jellies, Corals, Anemones (Phylum Cnidaria)		
Earthworms (Phylum Annelida)		
Sea stars and urchins (Phylum Echinodermata)		
Squid, bivalves, and snails (Phylum Mollusca)		
Crustaceans (Phylum Arthropoda)		
Arachnids (Phylum Arthropoda)		
Insects (Phylum Arthropoda)		
Fish (Phylum Chordata)		
Amphibians (Phylum Chordata)		
Reptiles (Phylum Chordata)		
Birds (Phylum Chordata)		
Mammals (Phylum Chordata)		
Total		

Animal Diversity Worksheet Answer Key

Groups	Hypothesis of Species	Scientifically Described Species*	Total Estimate* (unknown species not yet described)
Sponges (Phylum Porifera)		6,000	18,000
Jellies, Corals, Anemones (Phylum Cnidaria)		over 9,700	Unknown
Earthworms (Phylum Annelida)		over 16,700	30,000
Sea stars and urchins (Phylum Echinodermata)		7,000	14,000
Squid, bivalves, and snails (Phylum Mollusca)		85,000	200,000
Crustaceans (Phylum Arthropoda)		47,000	150,000
Arachnids (Phylum Arthropoda)		Over 102,000	600,000
Insects (Phylum Arthropoda)		Over 1,000,000	5,000,000
Fish (Phylum Chordata)		Over 31,000	40,000
Amphibians (Phylum Chordata)		Over 6,500	15,000
Reptiles (Phylum Chordata)		Over 8,700	10,000
Birds (Phylum Chordata)		9,900	10,000
Mammals (Phylum Chordata)		5,487	5,500
Total			

*Estimates gathered from: Chapman, A. (2009). *Numbers of living species in Australia and the world* (2nd ed.). Parkes, ACT: Australian Govt., Dept. of the Environment, Water, Heritage, and the Arts

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