



Bioblitz Skillbuilders: Learning and Applying the Skills of a Naturalist

Skillbuilder 3: How Diverse is Biodiversity?

Key Question

How diverse is biodiversity?

Objectives

- Students will **hypothesize** the number of animal species and **compare** to scientific estimates
- Students will **explore** the various groups of animals

Grades: 6-8

Time: 20 minutes

Location: Classroom

Materials

- Post-it Notes
- Whiteboard or butcher-block paper
- Pens or pencils
- Biodiversity worksheet and answer key (attached)
- 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 or white board, make a column for each animal group that is listed on the worksheet and label. Do not hang the paper or reveal board 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?

Next Generation Science Standards

Performance Expectations

MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Science and Engineering Practices

- Asking Questions and Defining Problems
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions



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Animal Diversity Worksheet

| Groups | Guess Number of Species | Scientifically Described Species |
|-----------------------------------------------------------|--------------------------------|-----------------------------------------|
| Squid, octopus, 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 | Guess Number of Species | Scientifically Described Species* | Total Estimate* (unknown species not yet described) |
|--------------------------------------------------|-------------------------|-----------------------------------|--------------------------------------------------------|
| 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 |
| Other Invertebrates (optional to use) | | | |
| 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 |
| 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