1.2 Following the Taxonomic Trail

Overview

With so many organisms living on Earth, it is no wonder that scientists need a way to name, list, discuss, and identify all of them. The taxonomic system of classification helps scientists ask the right questions about a new organism, observe the most important differentiating features, and place the organism into the group in which it belongs. With the two-name system of binomial nomenclature, scientists can be sure that they are all discussing the exact same organism. Just as a set of rules and a high level of organization help you perform better in athletics or activities, rules and organization help scientists perform better as they keep track of the vast diversity of life on Earth.

Learning Objectives

- Taxonomy organizes the Earth's organisms into related groups.
- Binomial nomenclature accurately pinpoints the group to which an organism belongs and gives it a universally accepted name for worldwide conversation.

Student Activity 1.2: Following the Taxonomic Trail

Materials

Access to the Internet
Seven 3 x 5 notecards

Advance Preparation

Read Section 1.2: Taxonomy

Potential Misconceptions

- Taxonomic hierarchy is based on outward appearances alone.
- Two-part Latin names are too difficult to learn and not necessary for scientists to use to discuss the biodiversity on Earth.

Process and Procedures

1. Identify an animal for which you have a particular affinity. Perhaps it is your favorite animal or one that really fascinates you because it is so big, cute, gross, or otherwise interesting.

2. Perform your own taxonomic search for your animal. Find out into what group it belongs at all levels of taxonomy, from kingdom to species.

3. Prepare a notecard for each level of taxonomy. You will make seven notecards in total (kingdom, phylum, class, order, family, genus, species). On the notecard, write four things:

- Your name
- The common name of your animal
- The name of the taxon level to which it belongs (for example, Kingdom Animalia or Class Mammalia)
- The scientific, two-part name of your animal

4. As a class, work with the other students to make piles of cards that belong in the same taxonomic groups. Start by sorting all the kingdom cards into pile(s). Then move on to phylum cards. Continue in this way until you have made piles for class, order, family, genus, and species cards.

5. Discuss what you noticed. How many kingdom piles did you have? How did that compare to the number of piles you made as you went to more specific taxonomic groups? How many different cards did you have by the time you made piles for your species cards?

6. Read through the cards that ended up in the same piles. What relative of your favorite animal surprised you?

Assessment

As new species are discovered, do you think one will be found that does not fit a current phylum? Why or why not? Do you think a new species could be found that does not fit within the known genera? Explain your answer.

Students should each create a written response that supports their assertions with evidence. While responses may vary, according to the reading, "*scientists estimate that there are a staggering 8.7 - 10 million species waiting to be discovered. And this is not a matter of identifying only new unicellular organisms found deep in an ocean trench or in one square kilometer of a sulfur spring. There likely are large, macroscopic organisms with a backbone or spinal column (**vertebrates**) that the scientific community has yet to identify and describe.*" Student answers should use logic and reason that is based off of this information from the reading.

Extension

Because the Linnaean system of taxonomy is not necessarily based on evolution, scientists are moving to a classification system that reflects the organisms' evolutionary history. This phylogenetic classification system illustrates organisms that are descended from a common ancestor. Students should use their own words to convey that while both phylogeny and taxonomy are classification systems that group together organisms based on similarities, only phylogeny takes into consideration and reflects our understanding of an organism's evolutionary history.

Expected Outcomes

What's the take-away? The activity visually reinforces the notion that the lower the rank in the classification system, the more similarities there are among its members and the higher the rank in the classification system, the more varied its members will be.

This activity is also an opportunity to reinforce and connect to the concepts of divergent evolution and convergent evolution that were discussed in Chapter 1. For example, when animals such as a dolphin and a shark are sorted into the same phylum (chordata) students should be able to analyze if the traits that resulted in them being grouped together evolved from a common ancestor (divergent evolution) or from the need to adapt to a similar environment (convergent evolution).

What does the student work product look like?
Students should each produce 8 index cards that detail information about their chosen animal. See sample information to include on index cards for a walrus:

<u>Sample Information to include on all 8 cards:</u>

- common name: Walrus
- scientific name: *Odobenus rosmarus*

<u>Sample Information to include on one card each:</u>

- Card #1: Domain Eukarya
- Card #2: Kingdom Animalia
- Card #3: Phylum Chordata
- Card #4: Class Mammalia
- Card #5: Order Carnivora (suborder - Pinnipedia)
- Card #6: Family Odobenidae
- Card #7: Genus Odobenus
- Card #8: Species rosmarus

As students work together to sort the cards they should be able to observe that the groups of cards do not sort into evenly distributed piles. For example, since the directions for the assignment were to choose an animal, all the domain cards will be Eukarya since that is the domain in which all animals are grouped. As students move from domain to species, they will see that the number of groups they can sort into from each level of the taxonomic system will likely increase. For example, when sorting all of the cards in the class category, animals that were grouped together in previous categories (domain, kingdom, phyla), such as a dolphin and a shark, now will be grouped into separate piles - mammalia and chondrichthyes respectively. When students sort the cards from the last category - species - they should see that each individual animal will be sorted into its own group.