1.4.1 Create Your Own Ocean Critter

Overview

Invertebrates are everywhere! Ninety-seven percent of all known species are invertebrates, and many of them live in the marine environment. Not having a backbone is a characteristic they all share. There are many more characteristics that differentiate them. Understanding the physiological and developmental differences among invertebrates helps scientists classify them. For beginning invertebrate biologists like you, focusing on a few of the major differentiators will help you categorize these diverse organisms.

Learning Objectives

- To identify invertebrates, scientists look at physiological characteristics, such as tissues, symmetry, and style of body cavity.
- Behavioral characteristics are additional differentiators that scientists observe, such as feeding habits, movement, reproduction, and social behavior.
- Scientists classify living things based on their shared characteristics.

Student Activity: Create Your Own Critter

Materials

Access to the Internet
Drawing paper
Colored pencils or markers
Modeling clay or playdough (alternatively, salt dough)

Advance Preparation

Read Section 1.4; Life in the Ocean: Invertebrates
Divide into teams of 2 to 3 students

Process and Procedures

In Class:

1. With your class, discuss the invertebrate phyla presented in the reading. Spend time looking at the taxonomic chart in Section 1.5 and the description of questions asked by taxonomists in Section 1.5a.

2. Gather with your team. Practice identifying characteristics of known invertebrate organisms that help place them into their respective taxonomic groups. To do this, use the library or a computer to search for an organism and do the following:
    - observe pictures of the invertebrate

- determine physiological features such as its symmetry, digestive cavity, and external appearance
- read about the invertebrate's behavior and the environment in which it lives
- find out the taxonomic groups into which your invertebrate is placed

3. Repeat Step 2 with at least one more organism so that everyone in your team feels comfortable identifying and discussing characteristics used to classify invertebrates.

On Your Own

1. Create an imaginary invertebrate that displays the defining characteristics of the phylum into which you want it to belong. Draw your organism on drawing paper. Be colorful and detailed!

2. On the back of your drawing, write a paragraph that describes your invertebrate's physiology (what it looks like, even inside), development pattern and behavior. Do not include any reference to the phylum to which your invertebrate belongs.

3. Bring your drawing to class.

In Class

1. Find a partner with whom to exchange drawings.

2. Use your partner's drawing and written description to determine the phylum to which the organism belongs. Check with your partner, the creator. Did you figure out the correct phylum?

Assessment

Find (via search through the course or internet) a marine invertebrate that is unfamiliar to you. Identify the phylum of the invertebrate you observed. If possible, determine the taxonomic classification to species. Explain the reason for your classification and/or where you had to stop because you did not have enough information.

Extension Ideas

From the drawing, have students create a 3D model of their invertebrate using modeling clay or playdough. Complete the exercise using the 3D model.

Using their drawings or 3D models, divide the class in half and have students create a dichotomous key that includes all specimens in their group. See the Dichotomous Key Guide below.

Expected Outcomes

What's the take-away? Scientists categorize living things based on their shared characteristics. These characteristics can be both seen (scales, fur, gills) and unseen (internal body structures and systems, feeding habits, social behavior). Using organizational systems helps scientists communicate information about the natural world with consistency.

What does the student work product look like?

Work product #1: Drawing and Written Description

Students should each create a drawing of an imaginary invertebrate that displays the characteristics of one of the invertebrate phyla presented in the reading. Look for the written descriptions to not only further explain what is depicted in the drawing but also to detail what the image cannot, such as internal structures or behaviors that are significant to the classification of the organism.

Work product #2: Dichotomous Key

Student groups should each produce a dichotomous key that can be used to identify the phylum for each of the imaginary invertebrates in their group. The key will include a series of at least 5 yes/no questions that can be used to divide the set into two subgroups after answering each question.

Assessment

Students should each choose an invertebrate to classify. For example, the Spanish dancer is a nudibranch. (scientific name: Hexabranchus *sanguineus*)

- Domain: Eukaryote
- Kingdom: Animalia
- Phylum: Mollusca
- Class: Gastropoda
- Order: Nudibranchia
- Family: Hexabronchidea
- Genus: Hexabronchus
- Species: H. sanguineus

Look for students to explain why their animal fits in each classification. For example, students may assert that their nudibranch belongs in the phylum Mollusca because, like all mollusks, it has a muscular foot that is used for movement. Students may not be able to classify their animal in every category (depending on available resources/information). When students are unable to classify their animal, they should state the reason. For example, students may have not been able to determine the class for the Spanish dancer because they needed more information about the animal's body plan to determine if it fits with the gastropods even though it has no hard outer covering like other animals in the gastropod class.

Dichotomous Key Guide

1. Observe the specimens in your group. Note the characteristics or attributes that define the individual invertebrates. Create a list of the characteristics observed.

2. What doesn't belong or look like the others? Observe the exclusions, or the characteristics that are shared only by a few specimens. From your list identify, or record new, the characteristics that are shared by a few invertebrates.

3. A dichotomous key is based on increasingly specific distinctions between specimens. Identify the most general characteristics shared by the invertebrates. From your list of observations, identify the attributes that are most common to least common across specimens.

4. Identify the questions or statements that will differentiate the steps of your dichotomous key. Each question or statement can only divide the group being observed into two parts. List identifying statements or questions that might useful.

> For example: The invertebrate specimen has eyes. (In the form of a question: Does the invertebrate specimen have eyes?). This statement will divide the collection being observed into two groups, those with eyes and those without. Each statement or question can only divide the group into two.

5. Begin differentiating the invertebrate specimens based on the statements or questions generated in step 4. The first division should be the broadest and divide the entire collection into two subgroups. Record the first statement or question on the worksheet provided.

6. Observe the two subgroups. Reference your statements and questions from step 4 and apply one to the first group and one to the second group. Remember, each subgroup can only be split into two. Record the statement/question applied to each subgroup.

7. Continue subdividing your groups based on statements/questions from step 4. You may create new statements/questions as you move along. Be sure to record the statements/questions used to subdivide each group along the way, ensuring that the subgroups are only divided into two at any step. When you reach the point where you have two specimens to differentiate into a group of one, your dichotomous key will be complete.

8. Give it a test run. Remove one of the specimens from its final designation and start at the beginning. Do you end up in the same spot? Swap specimens with another group. Where does the novel specimen end up in your dichotomous key? Where does your specimen end up in theirs?

Group Title:

2. Statement/Question:

1. Statement/Question:

3. Statement/Question:

2. Statement/Question:

3. Statement/Question:

3. Statement/Question:

3. Statement/Question: