

BIOMIMICRY

YOUTH DESIGN CHALLENGE

The Language of Biomimicry

How do biomimicry designers talk about biomimicry and biological models?

Biomimicry designers—and tools created for them, such as AskNature—use terminology that blends biology and design. In this lesson, students will work individually or in groups to analyze AskNature Biological Strategy pages and practice applying biomimicry terminology to describe their components and core concepts.

Duration: 45 minutes

Objectives: Students will use biomimicry terminology and conceptual understanding to describe organisms (biological models) and biomimicry innovations.

Materials: Student notebook and writing utensils, [Biomimicry Definitions and Key Terms](#) - one copy per student or group, Individual devices or projector

Standards Addressed: Next Generation Science Standards (NGSS)

Disciplinary Core Ideas:

- MS-LS1.A: Structure and Function: In multicellular organisms, the body is system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs taht are specialized for particular body functions.
- HS-LS1.A: Structure and Function: Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

Science and Engineering Practices:

- Constructing Explanations and Designing Solutions

Crosscutting Concepts:

- Structure and Function
- Patterns



Background

The biomimicry design process requires designers to be comfortable using the language of both biology and design. Biomimicry designers must be able to identify functions within their design problem. They can then look for inspiration at how nature has addressed the same functions. In order to identify potential biological inspiration, biomimicry designers must be able to identify and describe the functions of organism traits (structures or behaviors), and how they work (strategies).

Activity

1. On an individual, or a projected classroom device, visit the AskNature Biological Strategy page "[Baleen Plates Filter Food: Blue Whale](#)". Ask students to read through the content of the page.
2. Ask students the following questions one at a time, and have them discuss their ideas in pairs, triads, or a full group.
 - **What have baleen whales evolved to do well?** (filter food from seawater)
 - **What body structures help them filter food from seawater?** (baleen)
 - **How, specifically, does their baleen help them filter food?** (The whale's upper mouth is lined with baleen. The whale takes in a mouthful of seawater containing krill. It then closes its mouth and forces the water out through the brush-like baleen, keeping food inside.)
 - **How have engineers used the whale's baleen as a model for designing technology?** (self-cleaning water filtering system cleans without chemicals)

Biomimicry Term	
Organism	
Trait	
Function	
Biological strategy	
Human design application	
<p>_____ [is / could be] a biological model for the design of _____.</p>	



3. Create a 2-column table for class discussion and have students do the same in their notebooks.
4. Hand out [Biomimicry Definitions and Key Terms](#) to each student if they don't have a copy already. Work through the chart together, using the handout to determine definitions of the biomimicry technology. Review the words that students may already be familiar with (organism, ecosystem, trait, function). Discuss terms that are new. Work as a group to decide what to put in the Baleen whale column for each term.

Biomimicry Term	
Organism	<i>Blue Whale</i>
Trait	<i>Baleen (brush-like keratin structure in the whale's mouth)</i>
Function	<i>Filters food</i>
Biological strategy	<i>When a baleen whale consumes a huge mouthful of krill, small fish, and water, it partially shuts its jaws and then presses its tongue against its upper jaw to force the water through the baleen, leaving the krill and fish on the inside of the filter for the whale to swallow.</i>
Human design application	<i>Water filter</i>
<i>Baleen is a biological model for the design of water filters.</i>	

5. Next, ask students to navigate the [AskNature Biological Strategy page about Jackrabbits](#). Work with students to break down the statement about the Jackrabbit to fill in the first sections of their chart.
6. Have them create a table, like the one for the baleen whale, that matches the terms with descriptions of the rabbit.

Biomimicry Term	
Organism	<i>Jackrabbit</i>
Trait	<i>Large ears</i>
Function	<i>Cooling</i>
Biological strategy	<i>Radiating heat via an extensive network of blood vessels in the large ears.</i>
Human design application	



7. Students will notice that there is not a page for an Innovation as there was for the whales. Ask students to think about problems they might solve using the cooling function of the rabbit's ears, and come up with ideas for a human design application that utilizes the same function.
8. Ask students to navigate to the home page of the [AskNature website](#). Explain that this website describes over 1,700 biological strategies and nearly 200 technology innovations, all organized by function. The key terms they have been practicing will help them understand the content on the website.

Evaluate

Have students independently choose another Biological Strategy page and complete a similar chart.

Extension Opportunity

Have students review brief articles or videos about biomimicry innovations and practice identifying the biological strategy that was mimicked and applying biomimicry terminology to describe them.

