

INSPIRED BY THE SEA

Subject: Biomimicry

Grade Level: 5-8

Topic: Science, Engineering, STEM, Environmental Science

Time: 60-90 minutes

Learning Objectives

Students will:

- define biomimicry and explain why engineers study nature.
- describe adaptations of selected ocean organisms.
- analyze how structure relates to function in marine life.
- apply the engineering design process to create a biomimicry-inspired solution.

Materials

images or short video clips of ocean animals, chart paper or whiteboard, Paper, pencils, markers, cardboard, straws, tape, foil, sponges, computers with internet access

Procedure

Engage: To promote student curiosity, show students one of the following videos:

[▶ Get cozy and settle in for 10 minutes of soothing scenes from the deep](#)

[▶ 10 minutes of fascinating deep-sea animals | Into The Deep](#)

Ask: *Why might the ocean be a good place to look for engineering ideas? What challenges do ocean animals face? (pressure, darkness, predators, movement, temperature).* Explain that biomimicry is designing solutions to human challenges by learning from and mimicking nature's strategies.

Explore: Help students build an understanding by having students work in small groups to conduct simple research about one of the following:

- Sharks - Drag Reduction
- Octopus - Camouflage and Flexibility
- Humpback Whale - Efficient Movement

Explain: Have students begin to show what they have learned by having a class discussion. *Ask: How does structure help the organism survive? Why are ocean animals especially good inspiration for technology? How could your invention benefit society? Could it help protect the ocean?*

Elaborate: Have students use their new knowledge by having students complete an ocean-inspired design challenge using the engineering design process.

Scenario:

- Engineers need solutions for underwater exploration or environmental protection.
- Students choose one creature and design a solution inspired by it.

Design Options:

- Create a submarine that moves efficiently (whale-inspired).
- Design hospital materials that resist bacteria (shark-inspired).
- Develop a search-and-rescue robot that can squeeze into tight spaces (octopus-inspired).
- Invent adaptive clothing for extreme environments.

Design Process Steps

- Ask: What problem are you solving?
- Imagine: How does the ocean creature solve a similar problem?
- Plan: Sketch your design. Label adaptations.
- Create: Build a simple prototype or detailed model.
- Improve: Test and refine (peer feedback).

Assessment

Evaluate: Evaluate student learning by having students do a brief presentation about their design. Allow time for peer evaluation and feedback.

Extension Activities

- Research bioluminescent organisms and lighting design.
- Explore coral reef structures and earthquake-resistant architecture.
- Debate: Should humans always copy nature, or are there limits?
- Investigate how climate change affects ocean organisms and innovation.

NGSS Alignment

Middle School

MS-LS1-1 - Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-LS4-4 -Construct an explanation based on evidence that describes how genetic variations of traits increase some individuals' probability of surviving and reproducing.

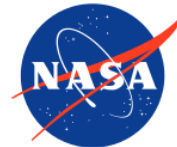
MS-ETS1-1 -Define the criteria and constraints of a design problem.

MS-ETS1-2 - Evaluate competing design solutions using a systematic process.

MS-ETS1-3 -Analyze data from tests to determine similarities and differences among design solutions.

5-LS1-1 -Support an argument that plants and animals have internal and external structures that function to support survival.

5-LS2-1 -Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.



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