

# 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.

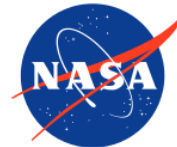
MS-ETS1-1 -Define the criteria and constraints of a design problem.

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.



Created by the Ohio Space Grant Consortium