



What is Biomimicry?

Subject: Biomimicry

Grade Level: 9-12

Topic: Biomimicry

Time: 40-60 minutes

Learning Objectives

Students will:

- define biomimicry and explain how it differs from simply copying nature.
- analyze biological adaptations and explain how they solve environmental challenges.
- evaluate real-world examples of biomimicry in technology and engineering.
- apply biomimicry principles to propose a nature-inspired solution to a modern problem.

Materials

projector or presentation slides, short video clip introducing biomimicry, chart paper or whiteboard, student notebooks, research devices (optional)

Procedure

Engage: To promote student curiosity, *Ask: If you had to design something that could survive extreme heat, freezing temperatures, high pressure, or limited resources—where might you look for ideas?"*

Introduce these examples:

- The nose of Japan's high-speed train was inspired by the beak of the Common Kingfisher, reducing noise and increasing efficiency.
- Adhesive technologies inspired by gecko feet.
- Self-cleaning surfaces inspired by lotus leaves.

Define biomimicry using the work of Janine Benyus, who popularized the term: Biomimicry is innovation inspired by nature's time-tested patterns and strategies.

Explore: Help students build understanding by working in small groups. Have students:

- Identify one natural adaptation (e.g., shark skin, termite mounds, cactus spines).
- Explain what problem does this organism solve?
- What environmental pressures influenced this adaptation?
- How might this inspire a human design?

Clarify the following key concepts:

- **Adaptation** – A trait that increases survival.
- **Form vs. Function** – Why structure matters.
- **Systems Thinking** – Nature works in interconnected systems.
- **Sustainability Principle** – Nature operates without waste.

Explain: Have students begin to show what they have learned by having the groups share discuss the natural adaptation they researched. Have them address form vs. function, systems thinking, and sustainability with regards to the adaptation.

Elaborate: Have students use what they have learned by having students participate in a quick design challenge. Have students select one of the following challenges and develop a biomimicry solution for it.

- Reducing heat in urban environments
- Conserving water in drought-prone areas
- Designing safer helmets

Students sketch a preliminary design inspired by a biological model and explain:

- The organism they selected
- The biological function
- How it addresses the design challenge

Assessment

Evaluate: Evaluate student learning by having students do one of the following:

- Participation in group discussion
- Design sketch with written explanation
- Short reflection paragraph
- Extension research assignment

Extension Activities

- Research a biomimicry innovation and present findings.
- Analyze sustainable architecture inspired by ecosystems.
- Compare biomimicry to bio-utilization and bio-assisted technologies.

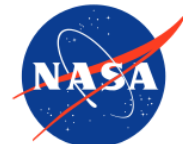
NGSS Alignment

Performance Expectations (HS Engineering Design)

HS-ETS1-1 – Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions.

HS-ETS1-2 – Design a solution to a complex real-world problem by breaking it down into manageable problems.

HS-ETS1-3 – Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs.



Created by the Ohio Space Grant Consortium

