



**Subject:** Biomimicry

**Grade Level:** 4-8

**Topic:** Space Exploration, Engineering Design

**Time:** 60-90 minutes

## Learning Objectives

Students will:

- identify the challenges astronauts face in space.
- explain how space suits protect astronauts.
- analyze how organisms survive extreme environments.
- apply the engineering design process to create a biomimetic space suit concept.
- justify design choices using scientific reasoning.

## Materials

paper, markers, scissors, aluminum foil, bubble wrap, fabric scraps, cardboard, tape, craft materials, *Astronauts in Action Information Sheet*, *How Do They Survive?* handout.

## Procedure

**Engage:** To promote student curiosity, Ask: *What would happen if you stepped into space without a special suit?* Show students *Astronauts in Action* document. Ask: *What must a space suit do?* Record student responses. They should include: keep you warm, help you breathe, protect you from rocks, keep out dust, block radiation, allow movement

**Explore:** Help students build understanding by having students explore organisms that survive similar extreme conditions. Divide students into small groups. Give each group one of the organisms in the *How Do They Survive?* handout. If computer access is available, students can find their own organism. Give students time to discuss the organisms adaptations and how they can be used to design an astronaut's space suit.

**Explain:** Have students begin to show what they have learned by having students share with the class what they have learned about their organism's survival adaptations and how those adaptations can be the inspiration for a space suit feature.

**Elaborate:** Have students use what they have learned by designing a biomimicry space suit prototype. Students must:

- Label at least 1 nature-inspired feature
- Explain what each feature protects against
- Include a diagram

## Assessment

**Evaluate:** Evaluate student learning by having students answer the following.

- What problem does your suit solve?
- Which organism inspired you?
- Why is biomimicry useful in engineering?
- What would you improve?

## Extension Activities

- Research current NASA Artemis suits.
- Compare Moon vs Mars suit requirements.
- Investigate how engineers test suits.
- Create a commercial advertisement for your biomimicry suit.
- Build a 3D arm model section of the suit.

## NGSS Alignment

## Middle School

MS-LS1-1 - Conduct an investigation to provide evidence that living things are made of cells; cells contribute to structure and function.

MS-ETS1-1 - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.

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

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



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