



SURVIVING THE COLD

Subject: Biomimicry

Grade Level: K-3

Topic: Science, STEM, Engineering Basics

Time: 45-60 minutes

Learning Objectives

Students will:

- understand that animals have special features that help them survive.
- identify at least three adaptations of a polar bear.
- explain how polar bear features relate to survival in cold environments.
- design a simple solution inspired by polar bears.

Materials

pictures or short video of polar bears, clear cups or small plastic jars, shortening (Crisco), plastic gloves, ece water in a large bowl, paper, crayons, markers, cotton balls, white paper, glue, optional: aluminum foil, felt, fabric scraps

Procedure

Engage: To promote student curiosity, show students pictures of polar bears.

Ask: Where do polar bears live? Is it warm or cold there? How do you think they stay warm?

Introduce the idea that biomimicry means learning from nature to solve problems. Tell students that today they are going to learn how polar bears survive in the cold — and how they can use what they learn to help people survive the cold.

Explore: Help students build an understanding by having students complete/watch “How Does Blubber Keep Animals Warm?” activity.

- Fill a large bowl with ice water.
- Have several student briefly place a gloved hand into the ice water.
- Next, coat the outside of a glove with shortening (to represent blubber).
- Place the coated glove into the ice water.

Ask: Which hand felt colder? What did the “blubber” do?

Explain to students that polar bears have a thick layer of blubber (fat) that keeps them warm.

Explain: Have students begin to show what they have learned by starting off with a class discussion about the following polar bear adaptations:

- **Thick blubber** for warmth
- **Dense fur** that traps heat
- **Black skin** that absorbs heat (they will be surprised their skin is black and not white)
- **Large paws** that help walk on snow and swim

Ask: How does thick fur help? Why are big paws helpful in snow?

Help students connect structure to function (Body part → What it does)

Elaborate: Have students use their new knowledge by having students complete polar bear-inspired challenge. Have students imagine it is very cold outside. *Ask: How can we design something that keeps people warm using polar bear ideas?*

Students may choose to design:

- A warm winter coat
- Warm boots for snow
- A tiny Arctic house
- Special gloves for cold weather

Requirements:

- Draw their invention
- Label the polar bear feature that inspired it
- Explain how it keeps people warm

Younger students may create with cotton balls, foil, fabric scraps, and paper.

Have students present their designs. *Ask: What polar bear idea did you use? How does it help solve a problem?*

Assessment

Evaluate: Evaluate student learning by having students complete Exit Questions (oral or written depending on grade). Ask: *How do polar bears stay warm? What is biomimicry? What did you design and why?*

Extension Activities

- Compare polar bears to penguins (both live in cold climates).
- Explore how Arctic animals camouflage in snow.
- Read a nonfiction book about Arctic animals.
- Discuss why protecting Arctic habitats is important.

NGSS Alignment

Kindergarten

K-LS1-1 - Use observations to describe patterns of what plants and animals (including humans) need to survive.

K-2-ETS1-1 - Ask questions, make observations, and gather information about a situation people want to change to define a simple problem.

K-2-ETS1-2 - Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function.

Grade 1

1-LS1-1 - Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

K-2-ETS1-2 / K-2-ETS1-3 - Develop and compare simple solutions.

Grade 2

2-LS4-1 - Make observations of plants and animals to compare the diversity of life in different habitats.

K-2-ETS1-1-3 - Engineering design process through defining problems, creating models, and improving solutions.

Grade 3 (Extension Alignment)

3-LS4-3 - Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-5-ETS1-1 - Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints.



Created by the Ohio Space Grant Consortium