

Feathers As Insulation



Topics

Feathers, Adaptations

Grades

PreK-2

Site

Indoors

Duration

20 minutes

Materials

- Ice cubes in zipper lock baggies
- Ice chest
- Feathers in zipper lock baggies
- Notebook
- Lamp
- Vegetable oil
- Paint brush or paper towels
- Dishpan
- Liquid detergent (the brand "Dawn" works best)

Vocabulary

adaptation, insulation

National Science Education Standards

Science as Inquiry (K-4)

Abilities to do scientific inquiry

Physical Science (K-4)

Properties of objects and materials

Life Science (K-4)

Characteristics of organisms

Organisms and their environment

Overview

Do feathers really help keep birds warm? Could feathers help keep birds cool when it is hot outside? Experiment with ice cubes and feathers to test their insulating properties and discover what happens to feathers that get oily.

Objectives

Students will be able to:

- Explain the importance of feathers.
- Understand how feathers help to insulate birds from heat and cold.
- Identify effects of oil on a bird's feathers.

Background

All birds have feathers that provide a lightweight and flexible body covering. Feathers are an **adaptation** that provides insulation and helps some birds to fly. No other animal has been proven to have feathers in evolutionary history. Even birds that can't fly have feathers. Feathers protect birds from the cold and provide a smooth, streamlined covering for flying or swimming. Feathers also offer protection from the sun. Birds can rotate and fluff their feathers to release or trap heat.

There are different kinds of feathers on a birds. *Contour* feathers are the large, stiff flight feathers that cover the body, wings and tail. These "zip" together to provide a streamlined shape and trap body heat. Under an electron microscope, tiny hooks are visible on the branches of the contour feathers. These hooks unite the feather for flight and can be zipped by the bird's beak.

Down feathers lie close to the bird's body under the contour feathers. These feathers cannot "zip" because they have no tiny hooks. Down feathers are excellent at trapping the bird's body heat and provide **insulation** for birds.



VOCABULARY

Adaptations: body parts and behaviors that help an animal survive

Insulation: to retain body heat or prevent overheating



ELL TIPS

Students are a great support network for each other. Cooperative learning allows students to build knowledge together. For extra support, pair English Language Learners with high level students with strong leadership skills.

Oil spills are a danger to birds because oil makes feathers stick together, and they can no longer capture air and body heat to keep the bird warm. Not all oil comes from large spills. The majority of oil found in the ocean comes from individual sources like automobile leaks. Oil in streets and driveways can wash into storm drains and subsequently reach the ocean. People can help reduce this risk by fixing vehicle oil leaks and disposing of motor oil in proper receptacles.

Teacher Preparation

1. Prepare sets of zipper lock baggies for each group. A set consists of one empty baggie, one with clean feathers in it, one with "oily feathers" and one with ice cubes in it. Make oily feathers by using an old paintbrush or paper towel to spread a bit of vegetable oil on each feather before you put it in the bag. Store the ice cube baggies in the ice chest.

Procedure

1. **EXPLORE PRIOR KNOWLEDGE ABOUT INSULATION.**

With the class, discuss why people put on sweaters and jackets to keep warm. *How do feathers help insulate birds and keep them warm?* You may choose to introduce the word "adaptation." *All plants and animals have special body parts that they use to stay alive. How do feathers help birds stay alive? (protect from heat and cold, help with flight) What adaptations do people have? (hands for opening and writing)*

2. **STUDENTS CREATE A DATA COLLECTION SHEET.**

Have the students make a T- chart in their notebook. Label one column "no feathers." Label the other column "feathers."

3. **IN PAIRS, STUDENTS CREATE A BASELINE FOR DATA USING ICE AND EMPTY BAGGIES.**

Working with a partner, the students put an empty baggie on the palm of their open hand. As their partner places the ice cube baggie on top of the empty baggie, the students start counting aloud. Have them stop counting as soon as they feel the cold of the ice cube. Put the ice cube aside. Students record that number in their chart in the "no feathers" column.

4. **STUDENTS USE FEATHER BAGGIES TO CONTINUE GATHERING DATA ABOUT INSULATING PROPERTIES.**

Repeat the process using the feather baggies. This time the students place an ice cube baggie on top of the feather baggie in their hand and start counting aloud. They stop counting as soon as they feel the cold of the ice cube. Have them record that number in the "feather baggie" column on the chart. *Did they notice any difference?* Repeat the process so that both partners have a chance to try the experiment.

5. **STUDENTS DISCOVER HOW OILY FEATHERS AFFECT A BIRD'S SURVIVAL.**

Have students make another column labeled "oily feathers" on their data collection sheet. Pass out the baggies of "oily" feathers. Try the same test as before. Have students record their data. *How does the oil affect feather insulation? How might oil get on bird feathers? Is there a way to clean the feathers?* You may choose to pass out Dawn liquid detergent and dishpans. Challenge students to clean an oily feather in a dishpan and make it look and feel the same as before the "oil spill." Compare the cleaned feather to an unaffected feather. What differences do students notice?

6. DISCUSS THE IMPORTANCE OF FEATHERS AS A CLASS.

Do feathers make good insulators? Why? Are there ways people can help keep birds' feathers clean? (parents can dispose of oil properly, fix oil leaks, keep other trash out of the streets) Have students share their results with their family or friends.

Extensions

- Make connections between insulation and protection from heat. How do feathers help birds in hot climates? Have students hold a baggie of feathers near a lamp and an empty baggie in their other palm near a lamp. Which hand feels the heat faster?
- Examine a feather. How does it feel? Is it the same or different than another student's feather? You may point out that some feathers are contour ones found on a bird's body, wings and tail. Others are down feathers that feel fluffy and soft. These lie close to a bird's body under the contour feathers.

Resources

Website

Monterey Bay Aquarium. www.montereybayaquarium.org

Find information about birds and watch blackfooted penguins and other animals on exhibit web cams.

Recommended Books

Amazing Birds. Parsons, Alexandra. Alfred A. Knopf, 1990.

Birds in Your Backyard. Herkert, Barbara. Dawn Publications, 2001.

Eyewitness Books: Bird. Burnie, David. Alfred A. Knopf, 1988.

Standards

California Science Standards

Grade K: 1a; 2a, c; 4a, e

Grade 1: 2a; 4b, c

Grade 2: 2c; 4a, d, e, g

(<http://www.cde.ca.gov/re/pn/fd/documents/sci-stnd.pdf>)

California Language Arts Standards

Reading

Writing

Written and Oral English Language

Conventions

Listening and Speaking

(<http://www.cde.ca.gov/re/pn/fd/documents/elacontentstnds.pdf>)



CONSERVATION TIPS

Oil spills are especially damaging to birds because their feathers lose their insulating properties. Not all oil in the ocean comes from spills, it also flows from streets through storm drains. Be sure to dispose of your motor oil properly.

Head Start Framework

Science

- Begins to use senses and a variety of tools and measuring devices to gather information.
- Increases ability to observe, discuss, compare and contrast common properties among objects and materials.
- Begins to participate in simple investigations to test observations and draw conclusions.
- Develops abilities to collect, describe and record information.
- Expands knowledge of and abilities to observe, describe and discuss the natural world and living things.
- Develops growing awareness of attributes of time and temperature.

**THE MISSION OF THE
MONTEREY BAY
AQUARIUM
IS TO INSPIRE
CONSERVATION OF THE
OCEANS.**

