penguins

Activity Guide for Grades K-3

by
Shedd Aquarium

Shedd Aquarium Activity Guide Series

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Penguins Activity Guide for Grades K-3

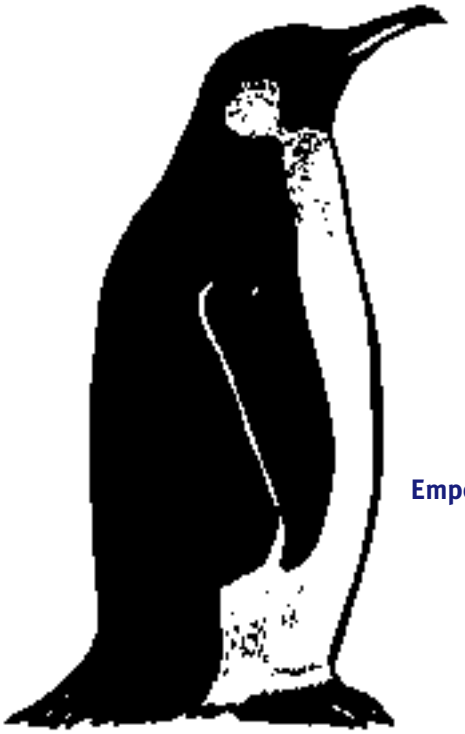
Objectives

This Activity Guide is designed to provide teachers with a resource for incorporating the study of aquatic science, specifically penguins, into their existing curricula. Each activity will help meet specific learning objectives. If all of the activities in this guide are completed, the following learning objectives will be met:

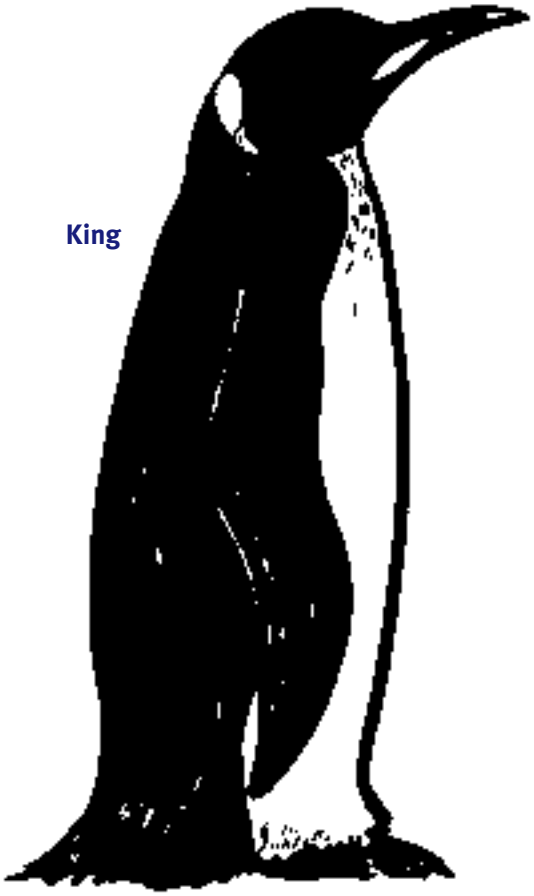
Illinois State Goals in Science: Goals 1 through 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A through G
5-8 Content Standards A through G

Goals

- to provide teachers with an interactive teaching tool and curriculum on penguins for grades K-3
- to build students' critical thinking skills and scientific literacy
- to approach the study of science in an interdisciplinary way
- to offer students a fun, hands-on learning experience



Emperor



King

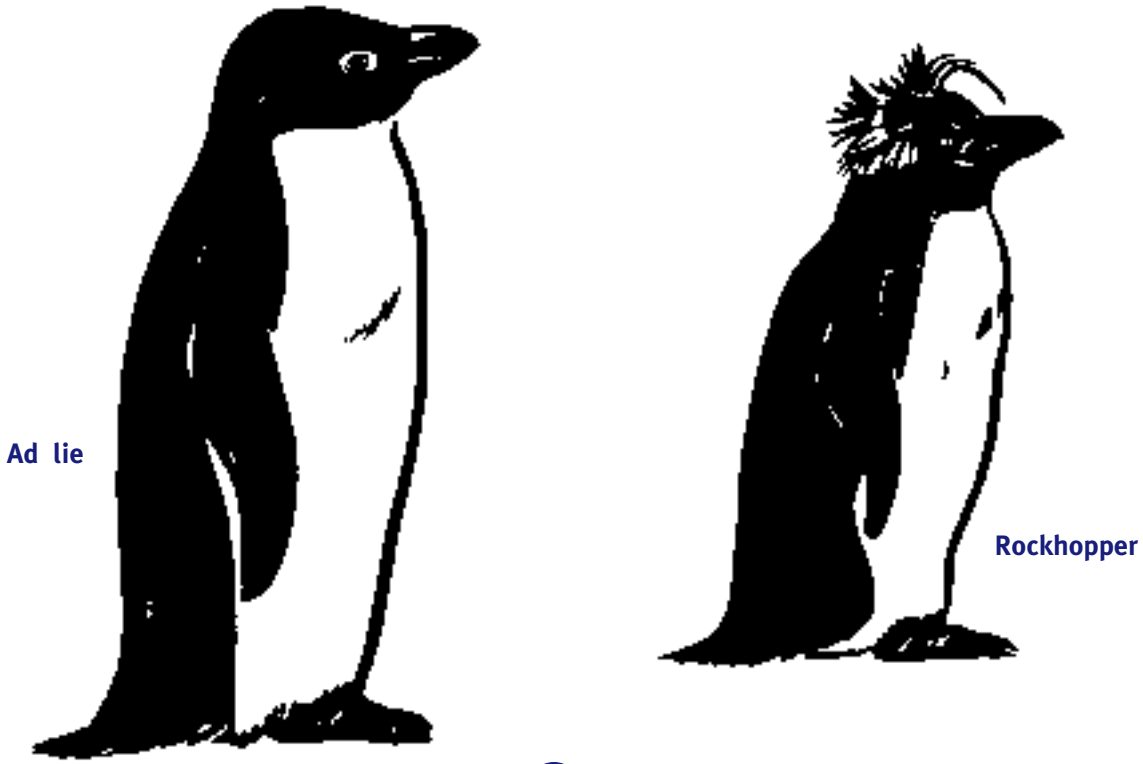
Using this Book: Guidelines for Teachers

Children are naturally intrigued by and curious about penguins. You can take advantage of this inherent interest as a springboard to scientific inquiry. Get in the habit, with your students, of wondering and then pursuing your questions by conducting research. For example, why are all penguins mostly black and white? How is it possible that some penguins nest during the coldest weather on Earth while others have to bury their eggs to keep them from becoming overheated? You can make guesses, but without researching penguins, they will be made with very little context. Because penguins are fairly inaccessible as a topic of direct observation, research will need to occur largely through books and videotapes. Observing live penguins in an aquarium or zoo is very helpful, but even that can be limiting because only a few species are represented.

General guidelines:

- Begin each activity with a review of previous topics studied and questions that will move the children towards the next topic of inquiry.
- Arrange the children in small cooperative groups at the beginning of your study and keep the groups consistent throughout the project.
- Throughout the experience, revisit major ideas to reinforce learning.
- Have students document their learning. Documentation can be in the form of writing they add to their journals, drawings, paintings, 3-D models, etc.
- It is also helpful for you to document the learning process about penguins through photographs, videotapes and transcriptions of student dialogues. Documentation will provide a history of the project and the students' progress.

The activities provided will give you a good base from which to begin, but they are not meant to be a strict formula to follow. There are many side roads upon which you can venture. Some will not be evident until you've already begun your journey. For example, you may find your study leads to an interest in other marine birds or in the places penguins live. This could result in an exploration of Antarctica or South America. We encourage you to be open to these interests as they evolve. It is not so important exactly what subject matter is "covered" but what mysteries are uncovered based on the genuine interests of your students. You will find many ways to adapt these ideas, and we encourage you to do so.



Introduction to Penguins

Dressed for dinner

With their upright, humanlike waddle and their black-and-white coloring, it is tempting to anthropomorphize penguins. They are often depicted as cute little men in tuxedos or as well-dressed waiters. Penguins are universally loved, but what do we know about them? Where exactly do they live? How do they endure extreme temperatures? What do they eat? How do they breed? These are just some of the questions you'll explore on your journey with your students through this book.

What is a penguin?

Penguins are birds but very different from those you see every day. They have the essential elements of a bird—beaks, feathers and wings—but they can't fly! Why? Because their bodies have become adapted to flying through the water rather than the air. They may look awkward on land, but to witness them underwater is to see an animal transformed. Penguins are most at home in the water and, in fact, get all of their food from the water. All penguins are carnivores with a diet consisting mostly of fish, krill, or squid.

Parade of penguins

Despite the singular image many of us have, there is a wide variety of penguins—17 species of different sizes, markings, nesting habits and habitats. The largest penguin, the emperor, can be as large as a 5-year-old child, while the smallest, the little blue, is smaller than a newborn baby. While all penguins are basically black and white, each species has distinctive markings that can sometimes include orange or yellow feathers. Penguin nests range from burrows in the ground to grass, sticks and rocks. In Antarctica, where even rocks are scarce, two species incubate their eggs on their feet under a fold of skin. All penguins live south of the equator, but not all live in the icy Antarctic. In fact, one species lives very near the equator.

Penguins—past, present and future

For many millennia, penguins were relatively unaffected by humans because of the remote areas in which they lived. Over the last several hundred years, they have been exploited as a source of food and oil, but these practices are now outlawed. Despite this protection, penguins face more threats than ever. Human population growth has resulted in increased pollution and decreased resources for penguins, especially in terms of food and nesting sites. For the future, it is up to all of us to protect penguins and all wild animals. Learning about penguins is the first step and will help your students understand the importance of advocacy to keep the oceans safe for penguins and all marine life.

Galapagos

Little Blue

Activity 1

What Is a Penguin?

**Penguins are birds, but they "fly" in water instead of air.
Learn what makes penguins unique as you begin your exploration.**

Objectives

Students will:
- determine characteristics common to all birds
- be introduced to the characteristics shared by all penguins
- make comparisons between penguins and other birds

Goals and Standards

This activity meets:
Illinois State Goals in Science: Goals 1 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Vocabulary

krill: shrimplike creatures that are a major food source for penguins

Time

45 minutes

Materials

For each student:
white drawing paper
markers, crayons, or paints

For the class:
nonfiction penguin book to read aloud

Background

Like the robin or cardinal you might see in your backyard, penguins belong to the order birds. Yet penguins have evolved a number of adaptations that set them apart from other birds. Like all birds, penguins have beaks, wings and a body covered with feathers. What makes them different? Over thousands and thousands of years, penguins have adapted from flying birds to animals better equipped for the pursuit of prey underwater. They also have unique characteristics that help them survive the extreme temperatures of the Southern Hemisphere.

Penguins get all of their food from the water and prey on mostly *krill* and small fish. Because they are so well adapted for the water, they seem to prefer it and, in fact, only come ashore when necessary for breeding and molting. Despite the fact that most penguins spend many months of the year in the ocean, we know little about their behavior during this time because it is so difficult to observe them underwater. Most of what we do know is a result of observations of their time on land, when they breed, molt and raise their young.
A penguin's body is stockier than that of most birds and is shaped like a torpedo, built for speed in the water. The wings have evolved into powerful flippers that propel the bird's sleek body as it swims. Flying birds have

hollow, extremely lightweight bones, while penguins have evolved a solid, heavy skeleton to enable them to stay below the surface and dive for their prey.

Because they are warm-blooded like us, penguins can keep their bodies at a constant warm temperature no matter what the air or water temperature. They have an amazing system of insulation that allows them to withstand the coldest temperatures on Earth. In fact, they are the only animals that can winter in Antarctica. A combination of layers of feathers, trapped air and blubber keep them protected in almost any conditions.

All penguins live south of the equator, although not all live in the perpetually icy Antarctic as is commonly believed. In fact, one species, the Galapagos, named after the island chain, lives very close to the equator.

Bird and Penguin Bone Comparison

Other species live along the coasts of Australia, South America and South Africa as well as many other southern islands.

Procedure

1. Begin your study of penguins with a discussion of birds, focusing on those with which your students are familiar. Ask questions such as: *What kinds of birds have you seen in your neighborhood? What have you noticed about them? What do all birds have in common? How are they alike/unlike the birds we see every day? Can you think of ways they are like us? Have you ever seen a penguin? Where do they live in the wild? What do they eat? How do they keep warm?* Depending on the age and skill level of your class, you can choose to keep a list of their ideas on a large piece of paper or ask each child to write his or her own list. In either case you will be able to refer back to their ideas throughout your study of penguins.

2. As a preassessment to determine what ideas your students already have, ask them to draw a picture of a penguin. This should be done from memory so that you can determine what they already know about penguins and what misconceptions they may have.

3. During or after their drawing session, lead a discussion to further determine their current beliefs. Some questions to include: *What color are penguins?*

4. Inform your students that not all of these questions will be answered at this point, but that you will be embarking on a study of penguins in which you will explore these and other topics. Read one of the nonfiction books suggested in the bibliography so the children can begin to get a sense of the diversity of penguins and some of the shared characteristics.

5. Through this initial activity and discussion, the children should come away with a preliminary understanding of the important traits that distinguish penguins from other birds including:

- Unlike most birds, penguins cannot fly through the air but instead "fly" through the water. Their bodies are adapted for swimming in the ocean and catching food underwater.
- Like all birds, penguins have feathers. To withstand cold air and water temperatures, however, penguins have an elaborate system of insulation that includes feathers and an insulating layer of blubber.
- All penguins live south of the equator.

Extensions

To kick off your study of penguins, take a field trip to your local zoo or aquarium to observe them directly. Or show a video of penguins in their natural habitat.

Puffins have been called the "penguins of the north." Ask your students to research the relationship between puffins and penguins.

Additional Resources

Arnold, Caroline. *Penguin.* New York: Morrow Junior Books, 1988.

Johnson, Sylvia A. *Penguins.* Minneapolis: Lerner Publications Company, 1981.

Kalman, Bobbie. *Penguins.* New York: Crabtree Publishing Company, 1995.

Wexo, John Bonnett. Zoobooks: *Penguins.* San Diego: Wildlife Education, Ltd., 1988.

Activity 2

Birds of a Feather

Feathers aren't just for frill. Even though penguins can't fly, feathers are crucial for their survival. Learn how feathers keep penguins warm and dry even in a cold, wet environment.

Objectives

Students will:
- study the function of feathers
- explore the insulating and waterproofing properties of feathers

Goals and Standards

This activity meets:

Illinois State Goals in Science: Goals 1 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Vocabulary

barbs: the many parallel shafts that project from the main shaft of a feather
barbules: the tiny parallel shafts that project from the barbs of a feather
preen gland: gland at the base of a penguin's tail that secretes oil used for waterproofing feathers

Time

30 minutes

Materials

For each student:

one or more feathers
a few drops of vegetable oil
magnifying glass or microscope to share

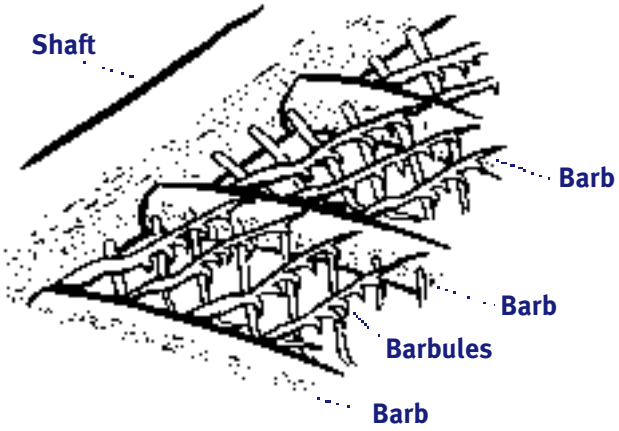
Background

Without feathers, a bird wouldn't be a bird but rather more like a reptile. In fact, birds are the only animals to have evolved feathers. Although we usually associate feathers with flying, they serve many purposes including protection from the elements. Because birds are warm-blooded like humans, they are able to keep a constant body temperature, which allows them to survive no matter what the temperature or humidity.

For many penguins, because they generally live in southern polar regions, this usually means feathers provide insulation and protection from the cold. Penguins have two types of feathers: short, tightly packed feathers on the outside for insulation and waterproofing, and a layer of fluffy down feathers underneath that are not waterproof and are primarily for warmth. The outer feathers are extremely fine, appearing almost like fur and are as dense as 70 per square inch (6.45 sq. cm.). They overlap like shingles on a roof, trapping a cushion of warm air underneath. For some penguins, especially those living farther north, heat can create more of a problem than cold. Because they are so well insulated, the birds can overheat even at 32°F (0°C). In this case, penguins fluff up their feathers to release the heat instead of trapping the warm air underneath their feathers.

Baby penguins are born with only down feathers, which are not waterproof, so the chicks are unable to enter the water until their juvenile feathers grow in. All penguins molt once a year, at which time they must stay on land until their new feathers come in. As a result, they are unable to feed during the several weeks that molting takes place,

since they get virtually all of their food in the water. Like all birds, penguins need to keep their feathers in good condition or the insulation will become ineffective. Each feather consists of a central shaft from which extend hundreds of smaller shafts called *barbs*. Branching out from each barb are hundreds of still smaller *barbules*. (See illustration.) When the barbs



or barbules get pulled apart, warm air escapes and cold water can pass through the feathers. In extreme temperatures this could be devastating to a penguin. In fact, these birds rely on their plumage for up to 80 percent of their insulation. Therefore, a penguin spends much time and energy preening or "zipping" the barbs back together with its beak and using oil from the *preen gland* to spread through its feathers to maintain waterproofing.

Procedure

1. Use the Background to lead a discussion about feathers. *Why do birds have feathers? What do you think might be different about penguin feathers?* Discuss the various types of feathers and their different purposes for birds.

2. Distribute one or more feathers to each of your students. Have them stroke the feather forward to see how the barbs of the feather become "zipped" and then backwards to "unzip" them and forward again. Provide a strong magnifying glass or microscope to allow a closer look at how the feather provides protection. Tell them to look for the tiny barbules that hook together and compare those that are zipped and unzipped.

3. Ask them to place a few drops of water on the feather. *What happens? Why doesn't the water fall through?* (Despite the fact that the feathers you have are probably dyed, they are real feathers and still have the bird's natural oil on them.) Discuss the preen gland and its function.

4. Ask the children to summarize what they have learned. *Why is it important for penguins to keep their feathers tight and oiled? What would happen if penguins didn't preen?* Discuss the ways we use feathers to help us keep warm, including down jackets or blankets.

Extension

Go on a nature walk in search of feathers. Bring the feathers back to school and conduct the same experiments. Ask the children to determine what kind of feathers they are, i.e., for flight or insulation. Use a field guide to try to determine from what type of bird they came.

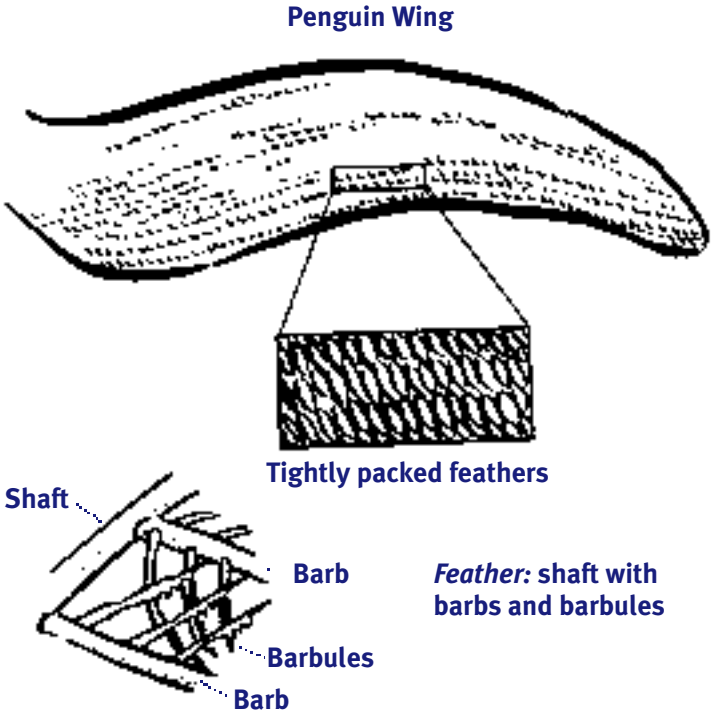
Additional Resources

Cole, Joanna. *A Bird's Body.* New York: William Morrow and Company, 1982.

Lepthien, Emilie U. *A New True Book: Penguins.* Chicago: Childrens Press, 1983.

McMillan, Bruce. *Penguins at Home: Gentoos of Antarctica.* Boston: Houghton Mifflin Company, 1993.

Wexo, John Bonnett. Zoobooks: *Penguins.* San Diego: Wildlife Education, Ltd., 1988.



Activity 3

Dress in Layers

For humans, keeping warm in cold weather is hard work and requires special clothing. How does a penguin survive without shelter? Try a simple experiment to find out.

Objectives

Students will:
- explore penguins' unique system of insulation for protection against the elements
- simulate penguin adaptations for surviving extreme temperatures

Goals and Standards

This activity meets:

Illinois State Goals in Science: Goals 1 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A, C and E

Time

40 minutes

Materials

For each small group (or for each child if possible):

bucket of ice water (as cold as possible) large enough to dunk hands in
child-sized mitten or sock (must be wool or other fabric and not plastic- or rubber-coated)
piece of bubble wrap packaging approximately 8 inches square
large rubber or vinyl work glove

Background

In Activity 2 you explored how a penguin's plumage serves to keep it warm and dry. But surviving an Antarctic winter requires more than feathers to allow them to maintain a body temperature of 110°F (43°C) even when the air is as cold as -75°F (-59°C).

On the outside of a penguin's body are many tightly packed feathers that overlap like shingles on a roof to keep out cold air and water. Trapped between the outer feathers and skin is a layer of air that is heated by the warmth of the bird's body. Below the skin is a thick layer of blubber. Penguins are the only birds that have a layer of blubber for extra insulation. In fact, some penguins have almost an inch (2 cm) thickness of blubber.

High metabolism also allows penguins to keep their body temperature high. But this means that they need to consume large quantities of food. For example, emperor penguins have been known to eat up to 30 pounds (13.6 kilograms) of food at one time. Penguins also need to eat a lot before nesting, as they need to live for days, or sometimes weeks, off their reserves.

Procedure

1. Begin the discussion by asking: *How can penguins survive in the extreme temperatures of the Antarctic? How do they protect themselves? What would humans need to survive there?* Inform them that they will be conducting an experiment to learn how penguins use insulation to keep warm and dry even in subzero temperatures. With input from the children, establish a definition of insulation such as "a material that keeps heat from escaping." Mention familiar insulators such as a thermos or a winter coat as examples.

2. Next, have the children work in small groups, providing the materials listed above to each group. Tell the children that they are going to turn their hands into penguin insulating machines to try to imagine how penguins protect themselves from the cold. As you work through the various layers, refer to the Background to help children understand the significance of each.

3. Have one child in each group put the mitten or sock on as you ask them to pretend that it is the penguin's layer of blubber underneath the skin. Next, with help

from another child, they can cover their mittens in bubble wrap to represent the layer of air between the blubber and feathers. Finally, they should insert their hand in the vinyl glove to symbolize the waterproof outside layer of feathers.

4. Ask the children if their hands feel different from one another. Have them predict how their hands will feel when they put them both in the icy water. *How long will they be able to keep each hand in the water?* Ask them to dunk both hands in and to keep each one in as long as is comfortable. Most likely, they will pull the unprotected hand out in a matter of seconds but will probably be able to keep the covered hand in for some time. This experience should help them get a sense of how it is possible for penguins to be warm even when it is bitter cold in their surroundings.

5. Now ask the children which layer they feel is most important in keeping penguins warm and dry. *What would happen if penguins only had one or two of these layers?* Have the children try each layer separately in the icy water. (You will need to have a mitten or sock for each child for this.) *Why is each ineffective by itself? Would the penguin survive without all three layers?* They should discover that the mitten will become wet, allowing the cold to come through, and that the cold will be felt through the bubble wrap and rubber glove without the extra protection of the mitten underneath.

6. Conclude with a discussion of how all the above adaptations are necessary to keep the penguin warm and dry. Without all three, the penguin would be unable to survive. Compare penguins' natural adaptations with human inventions for keeping warm and dry such as down jackets, igloos, divers' wetsuits, or even insulation used in buildings.

Extensions

Conduct a similar experiment using clothing to represent the various layers, i.e. sweaters, raincoats, etc.

Ask the children to research how other Antarctic (or Arctic) animals have adapted to withstand the cold.

Assign the children to further research how various types of human inventions for insulation work. For example, students could interview building contractors to learn how roofs, walls and floors are insulated and the role of air circulation in keeping a house warm in winter and cool in summer. Or they could find books or other resources that would explain how igloos keep people warm inside even though they are made of ice.

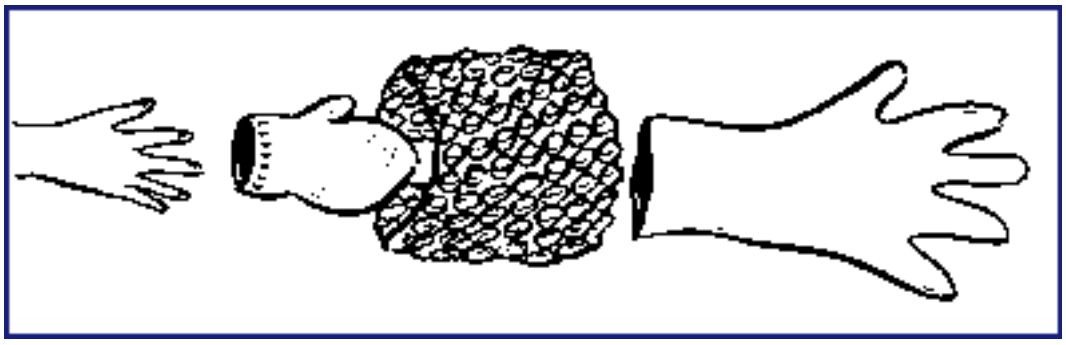
Ask the children to weigh the total amount of all the food they eat in a day. Ask: *How does it compare to just one meal for an emperor penguin?* Smaller penguins like rockhoppers eat 1-1/2 to 3 pounds of food a day. *Do you eat more than a rockhopper? How does it compare to your classmates?* You may want to use this information to make a graph for the classroom to encourage discussion and other comparisons.

Additional Resources

Kalman, Bobbie. *Penguins.* New York: Crabtree Publishing Company, 1995.

Love, John. *Penguins.* Stillwater, Minn.: Voyageur Press, 1997.

Patent, Dorothy Hinshaw. *Looking at Penguins.* New York: Holiday House, 1993.



Activity 4

Which Way to the Pool?

On land penguins seem awkward, but in water they swim with grace and speed. What is it about their size and shape that makes penguins such good swimmers?

Objectives

Students will:
- explore penguin adaptations for survival and success in the ocean
- demonstrate how the weight and shape of penguins are adapted for the water

Goals and Standards

This activity meets:

Illinois State Goals in Science: Goals 1, 3 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Vocabulary

porpoising: the act of leaping out of the water in order to breathe and quickly diving back in

Time

50-60 minutes

Materials

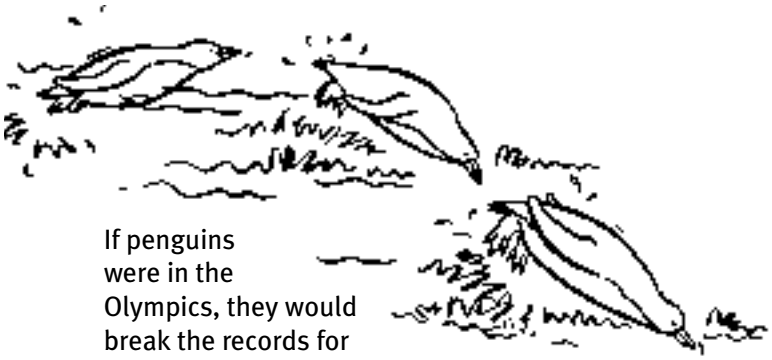
For each small group:

2 round balloons
tub of water—as deep and as long as possible
cardboard milk or juice carton
permanent marker
scissors
ruler
paper clips
string

Background

At one point in their evolution penguins could fly, but eventually their capacity for flight was sacrificed as adaptations for swimming took over. In other words, they need bodies that are too heavy and wings that are too small for flight. In fact, penguins do fly, but flying in water requires a different type of body than that for flying in air.

While other birds have hollow bones to keep their bodies as light as possible so they can take flight, penguins have developed solid, heavy bones that make them heavier and more dense so they can dive and swim below the surface. Their wings, driven by powerful pectoral muscles, have become short, stiff flippers totally unlike the large flexible wings of flying birds. (See illustration.) Their feet, tucked under the tail for streamlining, are used as steering rudders for making quick turns and for braking.



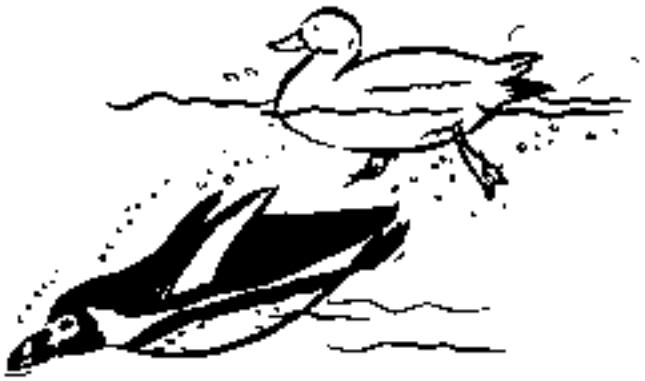
If penguins were in the Olympics, they would break the records for both endurance and speed in the water. Some penguins take long journeys across the ocean and may stay in the water for as much as five months at a time when they are not breeding or molting. They can swim at about 15 miles (24 kilometers) per hour—four times faster than the fastest human! Penguins also are accomplished divers. Each species feeds on different prey and therefore dives to varying depths, sometimes going hundreds of feet down and staying underwater for as long as 20 minutes. Like dolphins, penguins get air by *porpoising*, allowing them to swim without losing momentum.

Procedure

1. Start by asking the class: *Why are penguins such good swimmers?* Compare to another swimming bird such as a duck. *How are ducks different?* Ducks swim by floating on top of the water. *Why?* Penguins dive deep into the water. *Why?*

2. Tell the children: *Let's try to find out more by doing an experiment. If we fill a balloon with water, it will be heavy like a penguin's body.* Ask one child to fill a balloon from a faucet so that it is five or six inches in diameter. Supervision may be required to control the amount of water and to assist with tying the balloon. Tell the children that another balloon will be filled with air to represent a duck's lightweight body. Ask another child to fill up a balloon to the same size as that with water. Ask the children to place the two balloons in the tank of water. (The water should be deep enough so that the water-filled balloon is totally immersed.) What happens? The water-filled balloon should sink and the air-filled balloon will float.

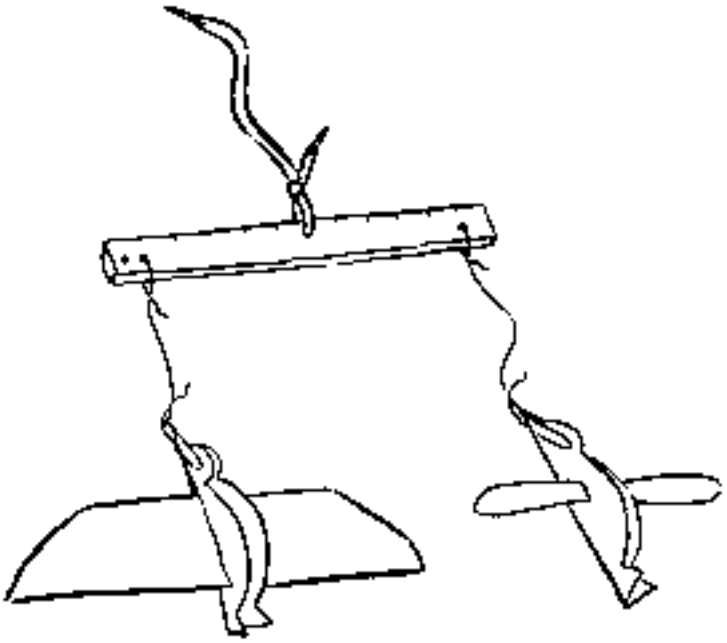
3. Invite students to hold each balloon by the knot and try moving them through the water under the surface pretending to dive for prey as penguins do. The "duck" is resistant to going underwater and is difficult to pull. The "penguin," because its density is similar to the water itself, moves easily underwater. Use the Background to lead a discussion about the difference in weight between the two birds and hollow vs. solid bones as factors in swimming abilities. Point out also that light birds, like ducks, float on top of the water and therefore can only use their feet to push forward. Penguins, swimming lower in the water because of their weight, use their powerful wings to propel them at a much faster pace.



4. To consider how the shape of a penguin's wing helps its maneuverability in the water (vs. the air), have the children use the pattern provided to cut two penguin bodies and two different wing types out of a cardboard juice carton. (See illustration.) Younger children will need help cutting and completing the following steps. Attach the wings to the penguin bodies as shown. Tie equal lengths of string to the two outer holes in the ruler and a third piece in the opposite direction to the center hole. Make a small knot in the end of the string to attach to the paper clip. Place the paper clip on the end of each penguin nose. Make sure that all the variables except for the wing size are equal. For example, the body shapes must be the same size, the string the same length, etc.

5. Have the children race the two shapes to test how well each "flies" in a tub of water. They should start with the ruler parallel to one wall (about one or two inches away from the edge) of the tub, with the penguin bodies floating freely, and then pull the ruler by the center string across the top of the water to the other end of the tub. Repeat the experiment a number of times to see if the results are consistent. You should find that the smaller wings meet with less resistance in the water and therefore will "win" the race.

6. Conclude the experience with some of the same questions with which you began. Children should understand that the water-filled balloon sinks and



moves easily through the water because it is similar in density to the water itself. Conversely, the air-filled balloon, like a duck, will float and, because it is less dense than the water, will meet with resistance in the water.

Extensions

Offer students the opportunity to experiment with the same principle above but substitute the water with air. *Which shape will fly better in the air?* Try the same penguins you made for this activity and add various designs of paper airplanes to try to determine the best types of wings for flight.

Research other flightless birds such as ostriches. *Are they flightless for the same reasons?* Take a look at other animals that dive in the ocean such as otters or whales. *Are they built like penguins? How are they different?* Compare the way penguins move in the water to the way humans swim. *How are we alike and different? Who can swim faster?*

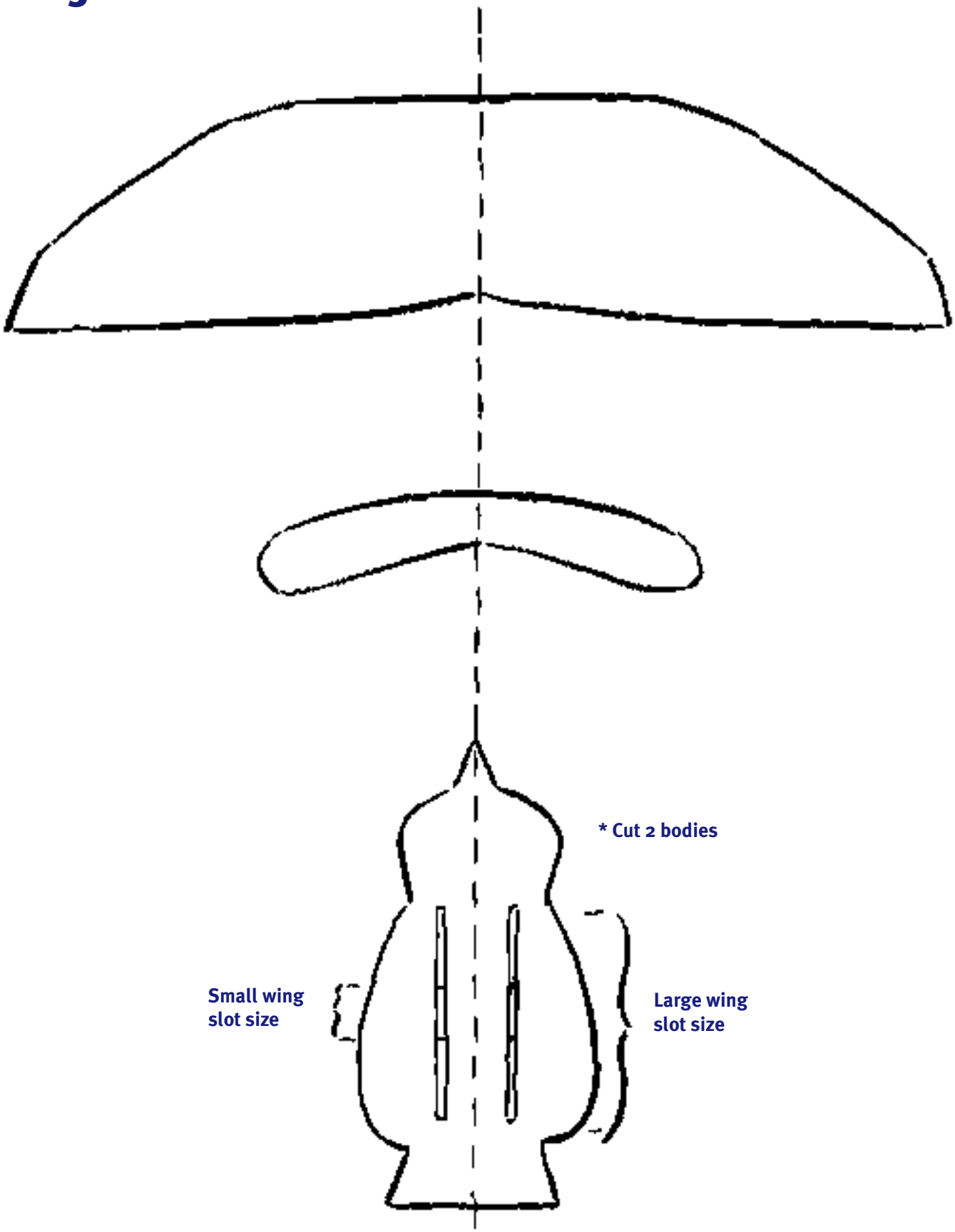
Additional Resources

Arnold, Caroline. *Penguin.* New York: Morrow Junior Books, 1988.

Love, John. *Penguins.* Stillwater, Minn.: Voyageur Press, 1997.

Peterson, Roger Tory. *Penguins.* Boston: Houghton Mifflin, 1979.

Penguin Bodies Pattern



Activity 5

A Hop, Skip and a Jump

You might think that all penguins walk the same way—with a waddle. But each type walks differently. Some trot, some sway, some jump, and some even toboggan!

Objectives

Students will:

- consider how penguins, with bodies designed for speed in the water, make adjustments for movement on land
- imitate the various ways penguins travel on land

Goals and Standards

This activity meets:

Illinois State Goals in Science: Goals 1 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Time

30 minutes

Materials

For each student:
rope or shoelaces

For the class:
resource books

Background

As the previous activities have illustrated, penguins are extremely well adapted for life in the water. In fact, penguins largely live in the water and only come ashore to breed and molt. This partially explains why they appear so awkward on land. But despite appearances, penguins are surprisingly agile and speedy whether traversing grassy fields, rocky cliffs, or even ice.

Many people think all penguins walk with the same slow, side-to-side waddle that is almost comical. Penguins, like most birds, walk on two legs, but because of the way their legs are positioned on their bodies, they walk with an upright posture like humans, using their flippers for balance. (See illustration on following page.) Perhaps this is why we find them so appealing. If penguins leaned over like other birds, they would fall forward because their center of gravity is different. If you observe penguins in a zoo or aquarium or in a videotape, however, you will notice many differences. The largest species, the king and emperor penguins, sway in an almost stately manner. Gentoos trot briskly and sometimes look like tightrope walkers as they climb up and down well-worn cliff trails to their nesting sites. Rockhoppers, true to their name, hop from rock to rock, jumping as much as 6 feet in a single hop.

Adélie tobogganing

Regardless of a short stride of just a few inches, many penguins can walk as fast as humans and can go even faster by tobogganing. When there is snow or ice on the ground they often fall on their stomachs and slide forward by propelling themselves with their flippers and feet. Penguins can toboggan for many miles.

Procedure

1. Begin by reviewing Activity 4, discussing the way penguins are able to move in water due to their body shape and how that affects how they move on land. Children might think that the way penguins walk is funny. Ask: *Why do penguins walk the way they do? How does it compare to the way other birds or animals*

Rockhopper hopping

or even humans walk? We've already learned what excellent swimmers penguins are because of the way their bodies have evolved. *What are the consequences for how they move on land? Do all penguins walk alike?*

2. Tell the children they are going to pretend to be penguins to see what it might be like to walk like a penguin. Use rope or shoelaces to loosely tie their ankles together to simulate the movement of penguins. Ask them to try moving as many different ways as possible and then describe the different possibilities. They might waddle, skip, hop, trot, sway, etc. You may want to keep a list on the chalkboard or have the children enter their ideas in their journals.

3. To consider how penguins balance, tell the children to try walking with and without the use of their arms. Make it more challenging by asking the children to walk on tiptoe to simulate the fact that penguins actually walk on their three front toes.

4. Use the Background and resource books to introduce the children to some of the ways that penguins actually move. If possible, visit a zoo or aquarium, or view a video of penguins. Your students should notice that a penguin's movement varies depending on the species and the terrain. Have them imitate the movements. Ask: *Why do penguins move differently? Is it because of their size? What about the type of land that they live on?*

5. Include a discussion of tobogganing and how it compares to sledding and cross-country skiing. Ask: *Why do you think penguins toboggan? Is it faster than walking or running? Is it easier?* To conclude, review the many ways that penguins travel both in and out of the water.

Extension

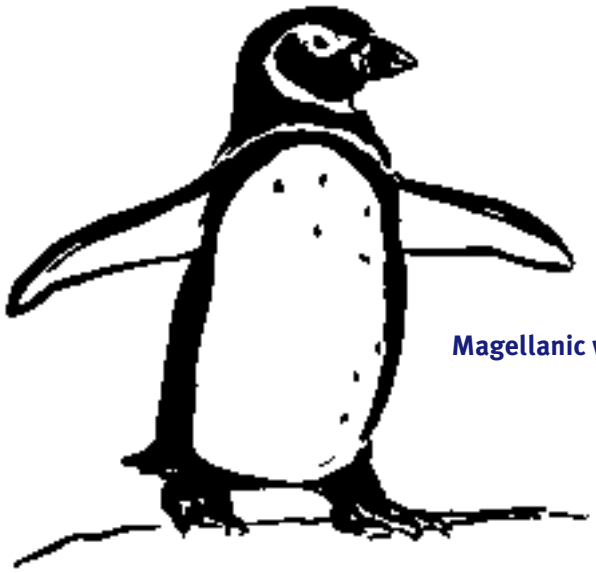
Look for resources that illustrate the differences between the skeletal structures of penguins and flying birds. Compare leg and talon shapes and sizes of various birds—from swimming birds such as ducks, to wading birds such as flamingos, to birds of prey such as eagles.

Additional Resources

Cole, Joanna. *A Bird's Body*. New York: William Morrow and Company, 1982.

McMillan, Bruce. *Penguins at Home: Gentoos of Antarctica.* Boston: Houghton Mifflin Company, 1993.

Wexo, John Bonnett. Zoobooks: *Penguins.* San Diego: Wildlife Education, Ltd., 1988.



Magellanic walking

Activity 6

Mr. Mom

Male and female penguins share the work of incubating eggs and feeding the young. Role-play an emperor dad resting the egg on its feet during an Antarctic winter.

Objectives

Students will:
- be introduced to the penguin breeding cycle
- learn about and role-play the unique incubation of emperor penguin eggs

Goals and Standards

This activity meets:

Illinois State Goals in Science: Goals 1 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Vocabulary

brood pouch: flap of skin in king and emperor penguins with which eggs and chicks are kept warm
crop: part of a bird's esophagus where partially digested food is stored

Time

45-60 minutes

Materials

For each student:

plastic or paper egg
paper
markers or crayons
scissors

For the class:

oscillating fan

Background

For many months of the year, penguins swim hundreds or thousands of miles in the ocean, feeding on krill, squid, fish, or other small prey. But no matter how far they roam, they invariably return to the same nesting site year after year. It is believed that this homing ability is achieved by using the position of the sun as a guide.

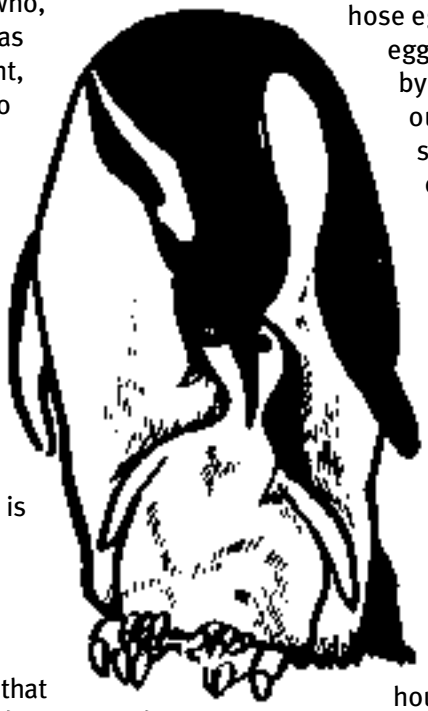
Penguins nest in large colonies, called rookeries, that range from a few birds to hundreds of thousands. Depending on the species, rookeries are located on the shore, near the shore, or far inland. In warmer habitats, penguins nest underground or in grassy fields. Other penguins nest in forests or caves, or on rocky shorelines and cliffs.

The emperor penguin, which lives in the perpetually icy Antarctic, has no materials to build a nest, so the parents use their feet to hold their egg and shelter it from the cold with their *brood pouch*. Soon after the mother lays the egg, she returns to the sea to feed for two months while the male takes over during the heart of the Antarctic winter. The egg is kept warm no matter what the weather, because the brood pouch includes a bare patch of skin on the male's lower belly that allows the

penguin's body heat to warm the egg while the skin fold insulates it from the cold.

Incredibly, the male more or less stands still in the dark for two months while the winds might blow at 120 miles per hour and temperatures plummet to 100 degrees below zero (-73°C). Instinctively, the female returns just as the chick is hatching, allowing the cold, half-starved male to return to the sea to feed himself and bring back more food for the chick. Emperor parents share equally in the responsibility of feeding the chick after it hatches.

Penguin parents store food in their *crop* and then regurgitate it for their young. The chick's first meal usually comes from its father who, after fasting for two months, has lost almost half his body weight, but has just enough food left to feed the chick. Soon after, the mother returns well fed with plenty of food for the chick in her crop. It is now the father's turn to feed in the sea and regain the weight he has lost during the long winter. The parents take turns feeding themselves and their chick until the young penguin molts several months later, grows adult plumage and is ready to fend for itself.



Procedure

1. Introduce this activity about breeding by reminding children that penguins need to return to land to nest and raise chicks. Discuss the homing ability penguins have to return to the same nesting sites regardless of how far they've traveled. Ask: *How do penguins find their way back? Why is it advantageous to return to the same place? Do other migrating animals find their way back to their birthplace? If you were hundreds or thousands of miles from home, how would you get back? What if you couldn't ask someone or use a map?*

2. Ask your students to think about some of the places they know penguins live. *What kinds of nests do you think they might have? What materials might be available? Have you seen any other bird's nests? What did they use for warmth and protection? What materials could you find to make a nest if you were a penguin in Antarctica? on a rocky shore? on a warm island?* Use the Background to discuss the various types of nests.

3. Where emperor penguins live there is virtually nothing around but ice. *How can they build nests to keep their eggs and chicks warm and dry?* Explain: They can't, so they have developed a unique system for incubating their eggs and keeping their newborn chicks warm. Use the Background to help the children understand the brooding process for emperors.

4. Inform the children that they will get an idea of what it's like to be a male emperor penguin as they act out a story you tell. They will pretend to be one of the males of a colony spending the winter incubating their eggs. (Optional: Tie their ankles together loosely as you did in Activity 5.) Each child will need to have an egg. The most realistic type of egg would be a Leggs® panty hose egg. If they are not available, a smaller plastic egg will work, or have the children make an egg by cutting two egg shapes several inches long out of paper, stapling around the edges and stuffing the inside with newspaper. Have each child make a paper baby chick and cut it out to place in the egg.

5. Have your students place the egg on their feet and then carefully move into a huddle for the story. Remind them that the egg is very fragile and could easily break if dropped, or freeze if left out in the cold for even a short time. To simulate the cold wind, set up an oscillating fan near an open window during the winter, if possible. Ask your students to think of ways that they can work together as a group to keep everyone warm and protect each other from the wind.

6. Set the scene by explaining about the 24 hours of darkness in winter, extreme winds and cold, and no food for weeks, not to mention that you are balancing a fragile egg on your feet for two months. Use the following as an outline for your story. Feel free to elaborate or improvise. If you want to dramatize the point further, have the students keep the eggs on their feet for even longer periods of time.

Just as the 24-hour darkness and Antarctic winter cold set in, the female emperor, your mate, lays an egg. Soon after the egg is laid, you take the egg from her using your beak to pull it away and scoop it onto your feet and tuck it into your brood pouch. Then the female goes back to sea to feed so that when the chick hatches, she will be able to provide it with food. You remain with the egg and are charged with keeping it warm and safe for the two months or so that it will take to hatch. Because the egg is fragile and balanced on your feet, you can only move a few steps at a time, and the more

you move, the more likely it is you might damage the egg. As the days pass, the Antarctic winter takes hold. Temperatures drop to as cold as 100 degrees below zero with winds up to 120 miles per hour. Your only hope of keeping your egg and yourself from freezing is to huddle with the other males who are also incubating their eggs. (Emperor penguins huddle together in groups of thousands, taking turns being on the outside of the group and on the inside, where it is significantly warmer.) (See illustration below.)

One day after eight weeks of no sun, no food and bone-chilling cold, you start to feel movement in your brood pouch. Your chick is about to hatch, but it will take two or three days so you still need to be patient. After much struggling, it is out of the egg! Instinctively your chick looks up at you for its first meal. You have just enough food left in you to regurgitate a meal. Then, amazingly, you notice with relief the line of females heading towards you across the ice. The chick's mother is back, ready to take over, and it's your turn to return to the sea to feed heartily and fatten up.

7. To conclude, get the children's ideas about what it would be like to be an emperor penguin. Remind them that they are the only animals to stay in Antarctica for the winter and that this is only possible because of their unique adaptations. Their large size, thick insulation and brood pouch are just some of the features that help them survive the worst weather on Earth.

Extensions

Have the children gather their own materials such as grass or rocks to make a penguin nest. Provide resource books for reference.

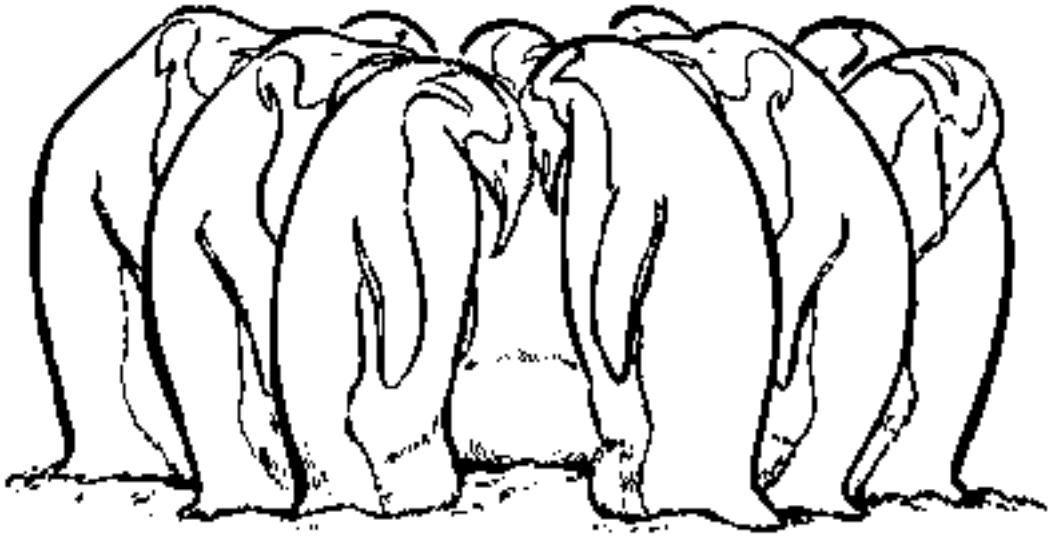
Ask your students to locate birds' nests in the neighborhood and try to determine what type of bird might use it. Caution them not to disturb nesting birds. If the nest is no longer in use, you might have them bring it to school to share with the class. Compare the nesting habits of penguins with that of other birds. *Are other male birds always as involved as male penguins in the care and feeding of the young?*

Additional Resources

Gorman, James. *The Total Penguin*. New York: Prentice Hall Press, 1990.

Paladino, Catherine. *Pomona: Birth of a Penguin*. New York: Franklin Watts, 1991.

Patent, Dorothy Hinshaw. *Looking at Penguins*. New York: Holiday House, 1993.



Activity 7

Are You My Mother?

How would you find your mother if you lived with thousands of relatives? Try an activity to see just how difficult it could be.

Objectives

Students will:
• explore penguins' ability to locate each other in rookeries of hundreds of thousands of birds

Goals and Standards

This activity meets:
Illinois State Goals in Science: Goals 1 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Time

20 minutes

Materials

For each pair of students:
blindfold

Background

Penguins are very noisy creatures. They make sounds to communicate many things from trying to impress a mate to displaying aggression. But they also make sounds to find each other in a rookery. They are able to distinguish each individual's call from another and use sound rather than sight to locate each other. This is why when humans happen upon a penguin colony they are often amazed by the decibel level and the incessant trumpeting, braying, or squawking.

Each species produces a distinctly different type of sound, and each individual within the species produces a sound varied enough for it to be recognized by another bird of its species. Black-footed penguins make a braying sound, which explains why they are also known as jackass penguins. The king penguins' "music" is often described as a trumpeting. Other species such as rock-hoppers and chinstraps make specific squawking sounds.

Procedure

1. Begin by asking: *What would you do if you were a baby penguin and you had to find your mother among thousands of birds that looked alike?* Tell your students that you are going to play a game called *Are You My Mother?* to try to imagine what it would be like.

2. To play the game, children are divided into pairs—one acting as the mother and the other as the baby penguin. Have each pair invent their own noise or calling sound (without using words) and practice it so they both learn it. Each "baby penguin" is then blindfolded and the mothers spread themselves around the room. Simultaneously, the whole class calls out loudly using only their invented sound. The baby must identify and locate its mother using only the sound they have learned together.

3. When all of the children have found their mothers, have them remove the blindfold. Repeat the game having the partners switch roles.

4. After all the children have had a turn at role-playing both the mother and the baby penguin, ask them to consider how it might be if they had to find their own mom or dad by sound only. *What if they were in a large crowd such as at a baseball game or an amusement park? What would the noise level be like in a real penguin rookery?* If possible, play an audio or video recording of penguin sounds.

Extensions

Repeat the activity but make it more challenging by recording the sound. Use a combination of live and taped sounds to play the game.

Research how other animals that live in large groups such as other birds, bats, or herding animals identify each other.

Additional Resources

Gorman, James. *The Total Penguin*. New York: Prentice Hall Press, 1990.

Love, John. *Penguins*. Stillwater, Minn.: Voyageur Press, 1997.

Video: Minasian, Stanley M. *Penguin Odyssey*. San Francisco: Marine Mammal Fund, 1988.

Activity 8

From Fairies to Kings

Little blue penguins are referred to as fairies, and kings are among the largest. But size isn't the only difference among species—take a closer look.

Objectives

Students will:
- identify and compare a number of penguin species
- design a new species of penguin and assign it characteristics
- create a 3-D model of a penguin

Goals and Standards

This activity meets:

Illinois State Goals in Science: Goals 1 and 3
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Time

60-90 minutes (can be divided into two or three shorter time segments)

Materials

For the class:

resource books that include photographs of the five species of penguins discussed in the Background
large pieces of black and white paper
2-liter soda bottles
recyclables or other materials to make 3-D penguins
scissors
glue
markers or paints
scale
measuring tape
stapler

Background

The 17 penguin species, divided into 6 different genera, share many characteristics that have already been presented in the previous activities. But each type of penguin has developed special adaptations for its specific climate, terrain and available food sources. To illustrate this diversity, take a look at a sampling of penguin species:

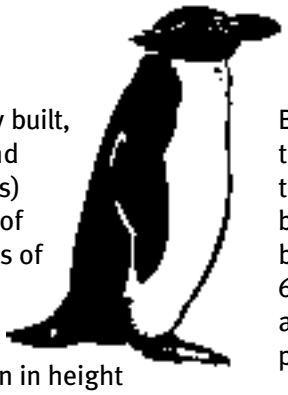
• **Little blue** (Eudyptula minor)

The smallest of all penguins, they stand only about 40 centimeters (16 inches) high and weigh less than 1-1/3 kilograms (three pounds). They are perhaps the only species that needs to worry about dogs, cats and cars: They live in Australia and New Zealand, where tourists can observe them parade from the sea to burrows across the beach. Little blues feed on small fishes and make nests in underground burrows with sticks, leaves, seaweed and grass.

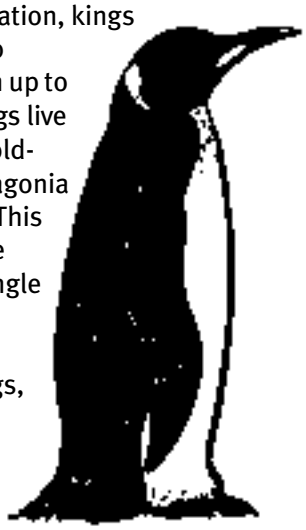
• **Macaroni** (Eudyptes chrysolophus)

These penguins get their name not from the pasta but from a term used to describe 18th-century London playboys who wore outrageous hairdos. You are probably familiar with the term from the song "Yankee Doodle Dandy." Like the other five crested penguins, macaronis have unique bright-colored feathers on their heads. With a diet of

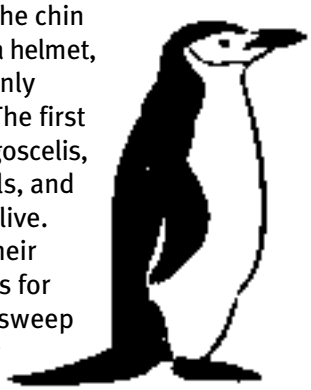
krill, fish and squid, they are solidly built, weighing 6 kilograms (13 pounds) and standing 72 centimeters (28 inches) high. They live on the steep terrain of subantarctic islands and make nests of small stones, mud and grass.



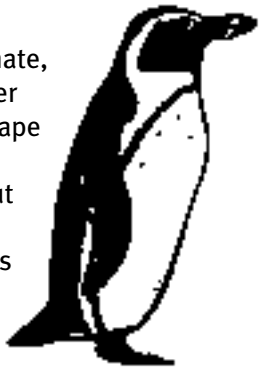
• **King** (Aptenodytes patagonicus)
Second only to the emperor penguin in height and diving abilities, the king is named for its size and stance. Similar in appearance to the emperors but with brighter yellow coloration, kings stand somewhat shorter at 90 centimeters (3 feet) and weigh up to 18 kilograms (40 pounds). Kings live mostly on subantarctic and cold-temperate islands–not in Patagonia as their Latin name suggests. This is one of only two species (see Activity 6) that incubates a single egg on the feet under a brood pouch. King penguin parents take turns incubating their eggs, but unlike their cousins, the emperors, they establish a nesting territory and fight for it vigorously.



• **Chinstrap** (Pygoscelis antarctica)
Because their black-and-white markings include a black line under the chin reminiscent of the strap of a helmet, these penguins are commonly referred to as chinstraps. The first part of their Latin name, Pygoscelis, refers to their brushlike tails, and antarctica tells where they live. Chinstraps, like others in their genus, use their brushy tails for balance and sometimes to sweep their nests. Feeding largely on krill, they grow to a length of 75 centimeters (30 inches) and weigh about 4 kilograms (9 pounds). To keep off the cold ground and avoid flooding from melting snow or ice, chinstraps build a nest made of many small pebbles.



• **Jackass** (Spheniscus demersus)
Named for the sound it makes, which is similar to that of a donkey braying, the jackass (also known as black-footed) penguin belongs to the genus Spheniscus, which means "wedge-shaped" and refers to the shape of the powerful wings. Jackass penguins are found on the coast of South Africa and on nearby islands.



Because they live in a relatively warm climate, they have fewer feathers and less blubber than penguins living farther south. To escape both the heat and predators, they nest in burrows or under bushes. Standing about 63 centimeters (25 inches) and weighing about 3.5 kilograms (7 pounds), jackass penguins live mostly on small fishes.

Procedure

1. Tell your students: Now that you've studied some of the many characteristics common to all or most penguins, you're ready to take a closer look at some of the differences among individual species. Provide the children with paper as well as markers, colored pencils, or crayons. By now, they probably understand that all penguins are basically black and white but that some have yellow or orange markings as well. Present the following penguin species to the children and ask them to imagine how a penguin with each of the following names might look:

- Little blue (also known as fairy)
- Macaroni
- King
- Chinstrap
- Jackass

2. Have them write the species name on their paper and draw their ideas. They may draw one or more species as you choose or as time allows.

3. After they have completed their drawings, present photos of the real penguins and tell stories of the origins of the names. Explain that scientists use many ideas to name species of animals. The name of a species might give us clues about how it looks, how it sounds, what it eats, or who is credited with discovering it. However, what is most important about the differences in species identification is what makes it unique and why each type developed the adaptations that it did.

4. Encourage the children to devise their own questions and/or ask them to consider: *Why do some penguins have yellow or orange feathers on their heads? Why are little blue penguins so small? Why do penguins have black-and-white coloring? Why do penguins have different types of nests?* Provide the children resource books so you can do research together. You may be unable to answer some of the questions. Let the children know that even scientists who have studied penguins for many years don't have all the answers.

5. To further stimulate their imaginations in regard to animal species, have the children design, draw and name a species of their own to present to the class. They should be thinking about where it is found, who discovered it, what unique features it has, etc. Encourage them to think creatively but also to have some logical reasons for the characteristics they assign their penguins.

6. Working in pairs or in small groups, the children can make a 3-D penguin of any of the five species presented above. Work with the children to strive for accuracy as much as possible in terms of size, weight, coloration, etc. Supply a scale and measuring tape. Provide as many photographs and as wide a variety of materials as possible to assist in this process. For example, smaller penguins can be represented by a 2-liter soda bottle, which is similar in shape to an actual penguin. To approximate the weight of a real penguin, ask the children to fill it with sand or water. Use construction paper to wrap the bottle and to add the details such as fins, beak and feet. For larger penguins, it may be impractical to simulate the actual weight, but accuracy in size and shape can be accomplished by stuffing a paper shape with newspaper and stapling the sides together.

Extensions

Create a mural or diorama showing the appropriate species in the corresponding habitat with penguins both in and out of the water. You might like to have the children work in small groups, each creating a different habitat such as icy Antarctica, the rocky islands of the southern oceans and warmer grassy islands and coastlines. Provide resource books with photos for reference.

Let the children compare the height and weight of various penguins to themselves, using a scale and measuring tape to find the species they are closest to in size. For species that are much smaller than your students, comparisons could be made with smaller siblings and/or other animals.

Use the chart at right to take a look at all penguin species. Expand this activity by researching other species.

Find a penguin in a newspaper, magazine, or comic book and try to identify which species it most closely resembles.

Make a time line that illustrates when penguins evolved compared to other familiar animals. Research extinct species.

Additional Resources

Arnold, Caroline. *Penguin.* New York: Morrow Junior Books, 1988.

McMillan, Bruce. *Penguins at Home: Gentoos of Antarctica.* Boston: Houghton Mifflin Company, 1993.

Sparks, John and Tony Soper. *Penguins.* New York: Facts on File Publications, 1987.

Species of Penguins	
Aptenodytes forsteri	Emperor
Aptenodytes patagonica	King
Pygoscelis antarctica	Chinstrap
Pygoscelis papua	Gentoo
Pygoscelis adeliae	Ad lie
Megadyptes antipodes	Yellow-eyed
Spheniscus magellanicus	Magellanic
Spheniscus humboldti	Peruvian or Humboldt
Spheniscus demersus	Jackass or black-footed
Spheniscus mendiculus	Galapagos
Eudyptula minor	Little blue
Eudyptes chrysolophus	Macaroni
Eudyptes crestatus	Rockhopper
Eudyptes sclateri	Erect-crested
Eudyptes pachyrhynchus	Fiordland
Eudyptes schlegeli	Royal
Eudyptes robustus	Snares-crested

Activity 9

Protecting Penguins

Most penguins live in remote areas and are well protected by law, but they are still vulnerable. Simulate an oil spill to learn about one of the dangers facing them.

Objectives

Students will:
- discuss the future of penguins and the many factors that help and hinder their survival
- participate in a simulated oil spill to explore the consequences for penguins

Goals and Standards

This activity meets:

Illinois State Goals in Science: Goals 1, 2 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A, C, E and F

Time

30 minutes

Materials

For each student:

paper
black permanent marker

For each small group:

shallow glass or clear plastic container
water
motor oil

Background

More than most animals, penguins have been protected by the fact that they tend to live in very remote areas and, additionally, are protected by law. Unfortunately, this does not mean that they are safe from human impact. For example, humans are harvesting more and more krill, a major food source for penguins, for their own consumption. Climate changes possibly caused by human pollution are affecting penguin habitats in ways we don't yet understand.

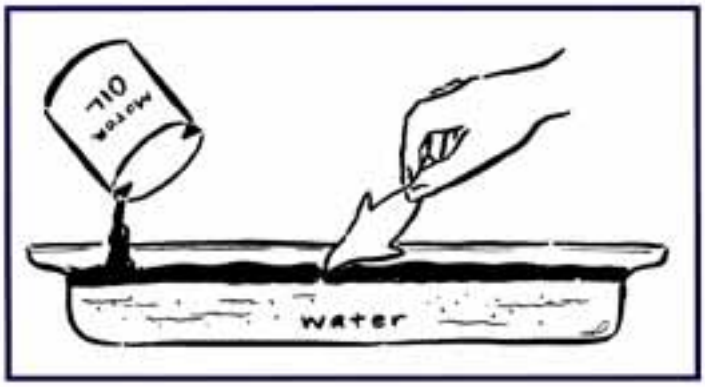
Historically, native peoples and explorers from Europe hunted penguins as a food source, but this did not significantly impact their numbers. Later, they were exploited, their blubber used as a fuel oil, but the practice eventually was outlawed. Now, as human populations encroach on penguin habitats and the oceans become more polluted, as technology allows for more research near nesting sites and as tourism becomes more widespread, penguin populations are being threatened. This is especially true for more populated areas such as the South American and South African coasts.

Of the many threats to penguin survival, among the most devastating are oil spills. Some penguins nest near busy sea passages where many tankers transport oil. Because oil floats on the surface of the water, penguins are unable to avoid it as they dive in and out for food. Once they are coated with oil, their feathers can no longer protect them from the cold. If they try to clean off the oil, they may swallow it and be poisoned.

Procedure

1. Use the Background to begin a discussion about whether or not penguins are endangered. Some questions to ask: *What is it about penguins that might protect them from some of the dangers other animals face? What might threaten the survival of penguins?* Discuss the idea that most penguin species are doing well thanks to their remote habitats and protection by law, but they still face many dangers.

2. Next, organize the children into small groups. Ask: *What do you think would happen to penguins if there were an oil spill in the water where they feed?* Tell them that they are going to make a small penguin to test what might happen. Have them draw and cut out a penguin using white paper and a black permanent marker. The accuracy of the penguin is unimportant for this activity.



3. To simulate an oil spill, ask the children to place about an inch of water to represent the ocean in a shallow glass or clear plastic container. Have them pour a small amount of motor oil (enough to make a layer across the top) into the water to depict the spill. *What happens?* Have them view the container from the side. *Why does the oil float?* (Because it is less dense than water.) Ask them to imagine what might happen to the oil in the open ocean. *How would the waves affect it?*

4. Ask: *What would the impact of the oil spill be on penguins who feed in this water?* Ask them to place their paper penguins in the water to find out. *Is there any way to avoid the oil? What will happen as the penguin swims jumping in and out of water filled with oil like this? What will happen if the penguin swallows the oil?*

5. Explain to the children that humans have a natural layer of oil on their skin just as penguins make their own oil to keep their feathers conditioned. *But what about motor oil? What if we swam in a pool of oil? Could we survive?* Conclude by making a list of steps people can take to help ensure the future survival of penguins.

Extension

Have the children look for news stories about real oil spills such as the Exxon Valdez or more recent spills and their effect on wild animals. *Can they think of any solutions for avoiding future spills?*

Additional Resources

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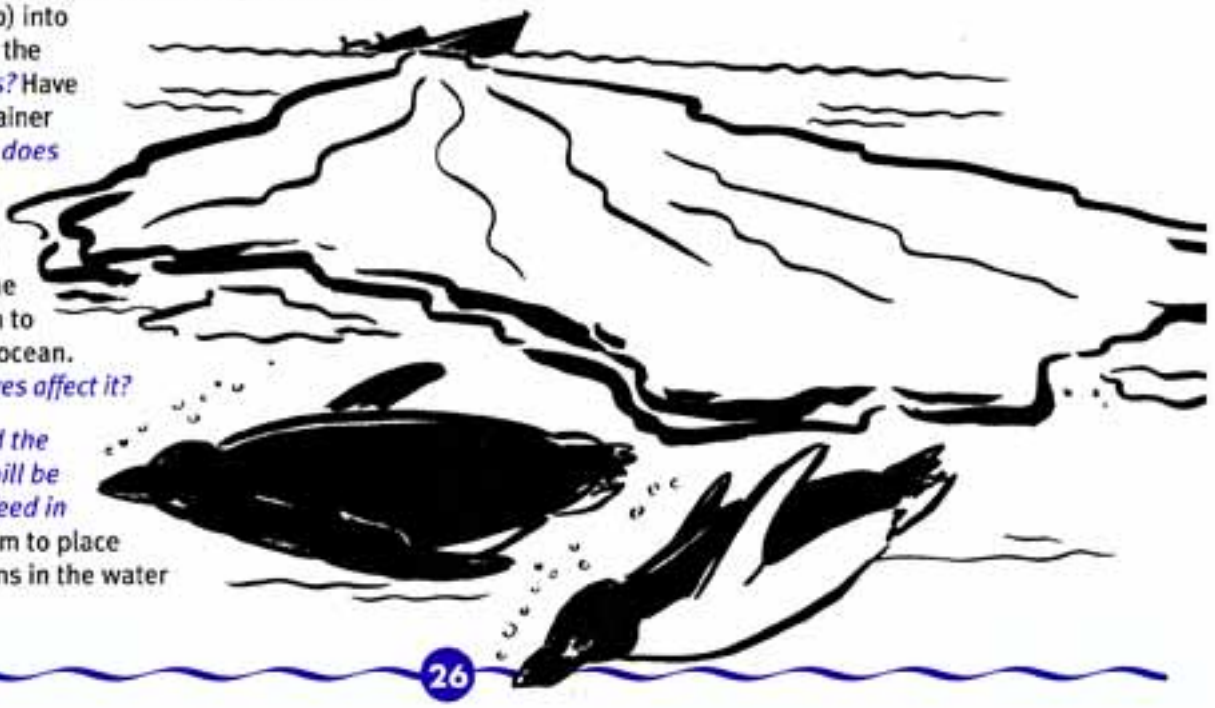

Activity 10

Penguins: Fact or Fiction

**What's true about penguins and what's not?
You'll be put to the test as you read and write about penguins.**

Objectives

Students will:
- review what they have learned about penguins
- distinguish between fact and fiction while listening to and creating penguin stories

Goals and Standards

This activity meets:
Illinois State Goals in Science: Goals 1 and 4
National Science Education Standards:
Unifying Concepts and Processes Standard
K-4 Content Standards A and C

Time

30-60 minutes

Materials

For each student:
white drawing paper
markers, crayons, or paints

For the class:
variety of fiction and nonfiction penguin books

Background

At this point in your study, your students will know quite a lot about penguins and should be able to determine whether the literature they read is true to fact or is fictional. Use the Backgrounds of previous activities as well as resource books to check for accurate information.

Procedure

1. Conclude your study of penguins as you began by having the students draw a picture of a penguin. Most likely, you will see much more accurate and diverse depictions. Have the children compare their new drawings to their original ones, noting all the new information they have. Refer back to the list you made (or the children kept in their journals) during Activity 1 of the children's ideas about penguins. Remind the children of their original answers and ask them to update the list.

2. Tell the students that you want to challenge them to a game, to see if they can tell the difference between a true story about penguins and one that is made up. Also challenge them to figure out which parts of a story are true and which are false.

3. If your children are nonreaders, you can conduct this activity in a full class group, or in small groups if your students are readers. A fictional story is read (by the teacher or a child) and the children are asked to determine what is accurate/inaccurate about the story. You will find there are many nonfiction books available with varying degrees of accuracy about penguins. For example, a penguin might be depicted with clothes. A story might even include both a penguin and a polar bear, but this would not occur in nature because polar bears live only in the Arctic. Encourage your students to discuss the answers and come to an agreement. If there are facts in question

about which you or they are unsure, look together for the answers in the reference books suggested in the bibliography.

4. Ask the children to write their own penguin stories in groups, using accurate and inaccurate details. Share these stories with the class and again challenge the group to figure out what is fact or fiction.

5. Use this activity as a postassessment to determine what the children have learned about penguins as well as how well they understand research and how to pursue answers to their questions.

Extensions

Have your students read the stories they have written to other groups of children as a way for them to share their penguin knowledge.

Repeat this activity writing books about other subject matter the children have studied.

Have the children take the stories home to test their parents' penguin knowledge.

Additional Resources

Refer to the bibliography on page 29 for fiction suggestions as well as nonfiction books for reference.

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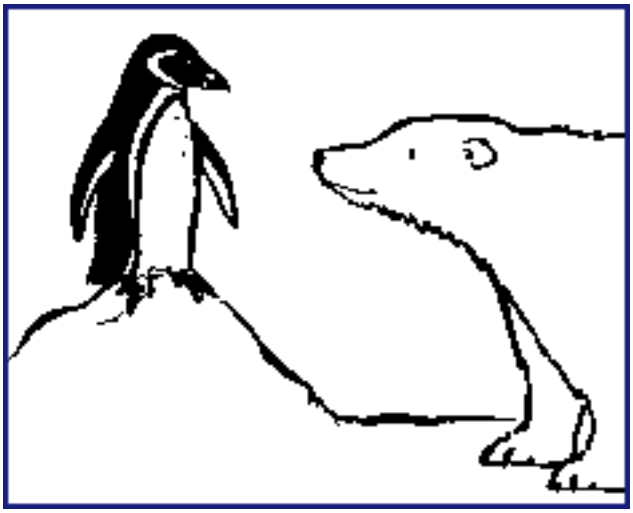
Fact



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