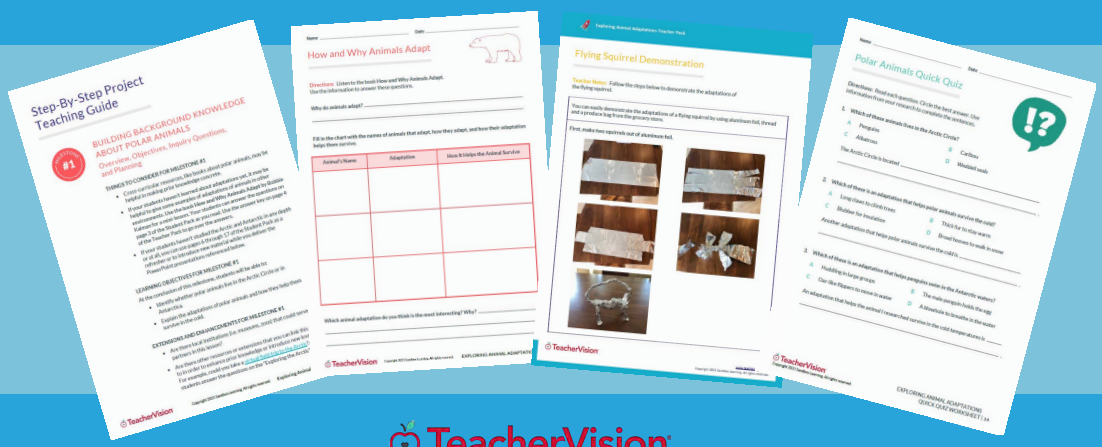
Exploring Animal Adaptations

Research Polar Animals

Science Project-Based Learning Grades 4-6

Create and Demonstrate an Adaptation
Research Unique Polar Animals
Experiment with Different Adaptations



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Lesson Plan: Exploring Animal Adaptations

ABOUT THIS PROJECT-BASED LESSON

This project-based learning unit is designed to teach and reinforce the concepts in an elementary science unit on animal adaptations and can be used in conjunction with existing curriculum materials.

The project is divided into 5 Milestones; each Milestone includes a self-contained student project activity. Done in sequence, the Milestones connect to enable students to produce a comprehensive capstone activity.

The minimum suggested duration for completing this project is 5 class periods. However, it is completely flexible and can be lengthened or shortened as necessary, based on available class time and interest level.

HOW TO USE THIS TEACHING GUIDE

Each Milestone for this project-based learning unit includes detailed daily activities presented in step-by-step order, with teaching notes, instructional guidance, and page references to resources and materials included in the Teacher Pack and Student Pack.

Daily activities are organized for you as follows:

- **Prepare (Bell-ringer/opener activity)**

  Use these short opening activities at the beginning of class.

- **Present (Lecture/model)**

  Use this portion of the lesson to deliver new subject material and project information, and to model any instructions or activity required for Produce or Participate elements.

- **Produce (Student project work)**

  Use this portion of the lesson to allow students to work independently or in small groups on activities and other project elements.

- **Participate (Student/group share)**

  Use this portion of the lesson to allow students to share out any project, research, or presentation materials.

- **Practice (Homework/assessment/independent)**

  Use this optional portion of the lesson, if desired, to give students homework activities.

Step-By-Step Project Teaching Guide

BUILDING BACKGROUND KNOWLEDGE ABOUT POLAR ANIMALS

Overview, Objectives, Inquiry Questions, and Planning

THINGS TO CONSIDER FOR MILESTONE #1

- Cross-curricular resources, like books about polar animals, may be helpful in making prior knowledge concrete.
- If your students haven't learned about adaptations yet, it may be helpful to give some examples of adaptations of animals in other environments. Use the book **How and Why Animals Adapt** by Bobbie Kalman for a mini-lesson. Your students can answer the questions on page 3 of the Student Pack as you read. Use the answer key on page 4 of the Teacher Pack to go over the answers.
- If your students haven't studied the Arctic and Antarctic in any depth or at all, you can use pages 6 through 17 of the Student Pack as a refresher or to introduce new material while you deliver the PowerPoint presentations referenced below.

LEARNING OBJECTIVES FOR MILESTONE #1

At the conclusion of this milestone, students will be able to:

- Identify whether polar animals live in the Arctic Circle or in Antarctica.
- Explain the adaptations of polar animals and how they help them survive in the cold.

EXTENSIONS AND ENHANCEMENTS FOR MILESTONE #1

- Are there local institutions (i.e. museums, zoos) that could serve as partners in this lesson?
- Are there other resources or extensions that you can link this project to in order to enhance prior knowledge or introduce new knowledge? For example, could you take a virtual field trip to the Arctic? Have the students answer the questions on the "Exploring the Arctic" printable

on page 4 of the Student Pack. Use the answer key on page 5 of the Teacher Pack to go over the answers?

STUDENT INQUIRY QUESTIONS FOR MILESTONE #1

- What do you already know about the animal you chose to research?
- What other information do you want to learn about your animal?
- How do polar animals survive in extremely cold environments?

ASSESSMENT FOR MILESTONE #1

- **Formative Assessment for Individual Activity**: Check each student's "Polar Animal Adaptations" printable on page 5 of the Student Pack. Use the "Polar Animal Adaptations Answer Key" on page 9 of the Teacher Pack to check their answers.
- **Formative Assessment for Group Activity:** Have each group share one thing they wrote in the "L" section of their K-W-L chart.
- **Summative Assessment:** Have the students complete the response printable on page 21 of the Student Pack for the Inquiry Question, "How do polar animals survive in extremely cold environments?"

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Project Activities for Milestone #1: Building Background Knowledge about Polar Animals

PREPARE (Bell-ringer/opener activity)

Kick off this project with a fun activity to identify which animals live in the Arctic Circle and which ones live in Antarctica.

Prior to this portion of the lesson, print the "Arctic and Antarctic Animals" cards from pages 6 and 7 of the Teacher Pack. Cut them apart. Print copies of the "Map of the Arctic and Antarctica" from page 8 of the Teacher Pack.

Put the students into pairs or groups of 3 and give each group an animal card and a copy of the map.

Have the students discuss whether the animal lives in the Arctic or in the Antarctic. When they have made a decision, they can tape their animal card to either the Arctic or Antarctic portion of the map. Tell the students that they will find out if they were correct in the next part of the lesson.

PRESENT (Lecture/model)

Use the Arctic and Antarctic PowerPoint presentations to explain the adaptations of the animals in each location. Students can follow along with the printable versions of the slides on pages 6-17 of the Student Pack.

Have the students use the "Polar Animal Adaptations" printable on page 5 of the Student Pack to take notes. Use the "Polar Animal Adaptations Answer

Key" on page 9 of the Teacher Pack to go over the answers.

Check where the students put the animals on the map during the "Arctic and Antarctic Animals" activity. Move any that were in the incorrect location.

Use the "Polar Powers Project Guidelines" on page 18 of the Student Pack to go over the expectations for the project.

PARTICIPATE (student/group share, group activity)

Divide students into groups of 3, and ask them to choose a polar animal and the adaptation they will investigate. (If possible, each group should choose a different adaptation to demonstrate.) Have them work together to fill out the top of the "Polar Powers" printable on page 19 of the Student Pack.

As students finish the top of the page, send them back to their seats to complete the "K" and "W" sections of the K-W-L chart individually.

Have them meet with their groups again and share what they know about their animal and its adaptations and what they want to learn about it. Show them the books you've gathered about polar animals. Use the "Books About Polar Animals" resource on page 3 of the Teacher Pack to find some suggested titles. Have them use the books and the Internet to find the answers to the questions they wrote in the "W" section of the K-W-L chart. They should record any new information in the "L" section.

If your students haven't done a lot of research, use the "How to Do Good Research" tips on page 20 of the Student Pack to review ways to use books and websites to find important information.

Formative Assessment: Have each group share one thing they wrote in the "L" section of their K-W-L chart.

PRACTICE (Homework/independent work/extensions)

Give each student the writing response template on page 21 of the Student Pack and ask them to write an answer to the inquiry question for this Milestone: "How do polar animals survive in extremely cold environments?"

ASSESSMENT

Formative Assessment for Individual Activity: Check each student's "Polar Animal Adaptations" printable on page 5 of the Student Pack. Use the "Polar Animal Adaptations Answer Key" on page 9 of the Teacher Pack to check their answers.

Formative Assessment for Group Activity: Have each group share one thing they wrote in the "L" section of their K-W-L chart.

Summative Assessment: Have the students complete the response printable on page 21 of the Student Pack for the Inquiry Question, "How do polar animals survive in extremely cold environments?"

UNDERSTANDING HOW ADAPTATIONS AID IN SURVIVAL

Overview, Objectives, Inquiry Questions, and Planning

THINGS TO CONSIDER FOR MILESTONE #2

- If the students didn't complete the "Learned" section of the K-W-L chart, they may need some time at the beginning of this milestone to research more information about their animals.
- You will need aluminum foil, thread, and a produce bag from the grocery store to demonstrate the flying squirrel's adaptations.

LEARNING OBJECTIVES FOR MILESTONE #2

At the conclusion of this milestone, students will be able to:

- Plan a way to demonstrate their animal's adaptation.
- Explain how adaptations help animals survive in their habitats.

EXTENSIONS AND ENHANCEMENTS FOR MILESTONE #2

- Could you have a local zoo bring in an animal that has special adaptations to demonstrate how the animal uses them to stay safe.

STUDENT INQUIRY QUESTIONS FOR MILESTONE #2

- How can my group perform a demonstration to show our animal's adaptations?
- How do adaptations help animals survive in their habitats?
- What adaptations does a giraffe have to help it find food and stay safe?

ASSESSMENT FOR MILESTONE #2

- **Formative Assessment for Individual Activity**: Check each student's "Demonstration Ideas" printable on page 22 of the Student Pack.
- **Formative Assessment for Group Activity:** Meet with the groups to approve their demonstration ideas.
- **Summative Assessment:** Have the students complete the response printable on page 23 of the Student Pack for the Inquiry Question: "What adaptation does a giraffe have to help it find food and stay safe?"

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Project Activities for Milestone #2: Understanding How Adaptations Aid in Survival

PREPARE (Bell-ringer/opener activity)

Show the students the "Sample Flying Squirrel Slide" on page 10 of the Teacher Pack. Read the paragraphs at the bottom of the page, and have the students listen to learn about the adaptations of the flying squirrel. Have them turn and talk about the flying squirrel's adaptations. Call on students to share their answers.

PRESENT (Lecture/model)

Use the "Flying Squirrel Demonstration" on pages 11 and 12 of the Teacher Pack to model the demonstration part of the project.

Tell the students that in this portion of the project they will create their project slide and brainstorm ideas for their demonstration. Go over the directions for the "Demonstration Ideas" printable on page 22 of the Student Pack.

PARTICIPATE (Student/group share, group activity)

Have the students work with their groups to create a slide showing their animal and its habitat. They should work together to complete the "Demonstration Ideas" printable on page 22 of the Student Pack. Once each group chooses their best idea, have them share it with you so you can approve it.

Formative Assessment: Meet with the groups to approve their demonstration ideas.

PRACTICE (Homework/independent work/extensions)

Give each student the writing response template on page 23 of the Student Pack and ask them to write an answer to the inquiry question for this Milestone: "What adaptation does a giraffe have to help it find food and stay safe?"

ASSESSMENT

Formative Assessment for Individual Activity: Check each student's "Demonstration Ideas" printable on page 22 of the Student Pack.

Formative Assessment for Group Activity: Meet with the groups to approve their demonstration ideas.

Summative Assessment: Have the students complete the response printable on page 23 of the Student Pack for the Inquiry Question: "What adaptation does a giraffe have to help it find food and stay safe?"

DEMONSTRATING HOW ANIMAL ADAPTATIONS WORK IN NATURE

Overview, Objectives, Inquiry Questions, and Planning

THINGS TO CONSIDER FOR MILESTONE #3

- You will need small food items, bowls, clothespins, toothpicks, spoons, tweezers, and cups for the Bird Beak Adaptations Demonstration.
- Your students will need different materials to demonstrate their animal's adaptation. You can collect some commonly used items, like aluminum foil, soda bottles, and plastic bags, for them to use.

LEARNING OBJECTIVES FOR MILESTONE #3

At the conclusion of this milestone, students will be able to:

- Plan out the procedure and materials for their animal adaptation demonstration.
- Explain how they could set up a demonstration to show another animal's adaptation.

EXTENSIONS AND ENHANCEMENTS FOR MILESTONE #3

- Could you have a scientist or upper-grade science teacher come and talk to your class about how they design their experiments.

STUDENT INQUIRY QUESTIONS FOR MILESTONE #3

- What materials are we going to need to demonstrate the adaptations of our polar animal?
- What are the steps in the procedure to demonstrate that adaptation?
- How could you create a demonstration to show a pufferfish's adaptation to fill with water and air when it feels threatened by a predator?

ASSESSMENT FOR MILESTONE #3

- **Formative Assessment for Individual Activity**: Check each student's "Using a Bird Beak" printable on page 25 of the Student Pack.
- **Formative Assessment for Group Activity:** Meet with each group as they are working and discuss their materials and procedures. Make sure the students know where they are getting all the materials.
- **Summative Assessment:** Have the students complete the response printable on page 27 of the Student Pack for the Inquiry Question: "How

could you create a demonstration to show a pufferfish's adaptation to fill with water and air when it feels threatened by a predator?"

- **Summative Assessment:** Have the students complete the "Polar Animals Quick Quiz" on page 14 of the Teacher Pack. Use the "Polar Animals Quick Quiz Answer Key" on page 15 of the Teacher Pack to correct the quizzes prior to starting Milestone #4.

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Project Activities for Milestone #3: Demonstrating How Animal Adaptations Work in Nature

PREPARE (Bell-ringer/opener activity)

Use the "Bird Beak Adaptations Demonstration" directions on page 13 of the Teacher Pack to set up the activity. Have the students use their "bird beak" to gather food. They should answer the questions on the "Using a Bird Beak" printable on page 25 of the Student Pack. Have them discuss their answers with a partner who had a different type of beak.

PRESENT (Lecture/model)

Tell the students that in this portion of the unit they will plan the materials and procedure for their adaptation demonstration. Show them the materials and procedure for the "Bird Beak Adaptations Demonstration" on page 24 of the Student Pack as an example. Discuss how it clearly shows what you need to do the demonstration and the steps you need to follow.

Go over the directions for the "Materials and Procedure" printable on page 26 of the Student Pack. Tell the students that they will need the materials to conduct their demonstration for this portion of the unit. Show them the materials you have gathered for them to use. Tell them that if they need anything else, they will need to bring it from home.

PARTICIPATE (Student/group share, group activity)

Have the students meet with their groups to complete the "Materials and Procedure" printable on page 26 of the Student Pack. Meet with the groups as they finish to discuss the materials they need and where they are getting them.

Formative Assessment: Meet with each group as they are working and discuss their materials and procedures. Make sure the students know where they are getting all the materials.

PRACTICE (Homework/independent work/extensions)

Give each student the writing response template on page 27 of the Student Pack and ask them to write an answer to the inquiry question for this

Milestone: “How could you create a demonstration to show a pufferfish’s adaptation to fill with water and air when it feels threatened by a predator?”

ASSESSMENT

Formative Assessment for Individual Activity: Check each student’s “Using a Bird Beak” printable on page 25 of the Student Pack.

Formative Assessment for Group Activity: Meet with each group as they are working and discuss their materials and procedures. Make sure the students know where they are getting all the materials.

Summative Assessment: Have the students complete the response printable on page 27 of the Student Pack for the Inquiry Question: “How could you create a demonstration to show a pufferfish’s adaptation to fill with water and air when it feels threatened by a predator?”

Summative Assessment: Have the students complete the “Polar Animals Quick Quiz” on page 14 of the Teacher Pack. Use the “Polar Animals Quick Quiz Answer Key” on page 15 of the Teacher Pack to correct the quizzes prior to starting Milestone #4.

PLAN, DESIGN, AND CREATE AN ADAPTATION DEMONSTRATION

Overview, Objectives, Inquiry Questions, and Planning

THINGS TO CONSIDER FOR MILESTONE #4

- Your students are going to need space to practice their demonstrations. Try to spread the groups out around the classroom so they don't distract each other.

LEARNING OBJECTIVES FOR MILESTONE #4

At the conclusion of this milestone, students will be able to:

- Test their demonstration and make any adjustments necessary to show the polar animal's adaptation.
- Plan and practice their presentations with their groups.
- Explain the importance of perseverance if something doesn't work the first time.

EXTENSIONS AND ENHANCEMENTS FOR MILESTONE #4

- Could you extend this lesson by discussing social-emotional skills? You could read a book, like **What Do You Do With a Problem?**, to discuss perseverance and how to find a solution to a problem. Have the students complete the "What Do You Do With a Problem?" printable on page 28 of the Student Pack.

STUDENT INQUIRY QUESTIONS FOR MILESTONE #4

- Does the demonstration work well, and does it show the animal's adaptation well?
- How can we make adjustments to our demonstration to make it even better?
- How can we divide up the information in the presentation and present it clearly?
- Why is it important to persevere when you're conducting science experiments or demonstrations?

ASSESSMENT FOR MILESTONE #4

- **Formative Assessment for Individual Activity**: Check each student's "Demonstration Observations" printable on page 29 of the Student Pack.

- **Formative Assessment for Group Activity:** Meet with each group to discuss whether or not their demonstration was successful.
- **Summative Assessment:** Have the students complete the response printable on page 30 of the Student Pack for the Inquiry Question, "Why is it important to persevere when you're conducting science experiments or demonstrations?"

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Project Activities for Milestone #4: Plan, Design, and Create an Adaptation Demonstration

PREPARE (Bell-ringer/opener activity)

Give the students an example of a time when something didn't work for you the first time and you had to try again. For example, tell them about the first time you tried to ride a bike. Explain how you fell down but you got up and kept trying until you were able to do it.

Have the students turn and talk about a time when they kept trying because something didn't work the first time.

Tell the students that this happens a lot in science. Scientists try an experiment, but it doesn't work, so they have to make changes and try it again.

PRESENT (Lecture/model)

Tell the students that they are going to practice their demonstration in this portion of the unit. Remind them that if it doesn't work the first time, it's okay. They should make changes and try again until it works.

PARTICIPATE (Student/group share, group activity)

Have the students meet with their groups and get the materials they need for their demonstration. They should practice the demonstration and complete the "Demonstration Observations" printable on page 29 of the Student Pack.

The students should divide up their presentation and decide which team member is going to present each part of the demonstration. They should practice it.

Formative Assessment: Meet with each group to discuss whether or not their demonstration was successful.

PRACTICE (Homework/independent work/extensions)

Give each student the writing response template on page 30 of the Student Pack and ask them to write an answer to the inquiry question for this

Milestone: “Why is it important to persevere when you’re conducting science experiments or demonstrations?”

ASSESSMENT

Formative Assessment for Individual Activity: Check each student’s “Demonstration Observations” printable on page 29 of the Student Pack.

Formative Assessment for Group Activity: Meet with each group to discuss whether or not their demonstration was successful.

Summative Assessment: Have the students complete the response printable on page 30 of the Student Pack for the Inquiry Question: “Why is it important to persevere when you’re conducting science experiments or demonstrations?”

DEMONSTRATING AN ADAPTATION

Overview, Objectives, Inquiry Questions, and Planning

THINGS TO CONSIDER FOR MILESTONE #5

- If your students haven't done a lot of oral presentations, they may need a mini-lesson on good speaking skills, like making eye contact with the audience and using a loud, clear voice. Use the "Oral Presentation Mini-Lesson" tips on page 16 of the Teacher Pack to review these important skills.

LEARNING OBJECTIVES FOR MILESTONE #5

At the conclusion of this milestone, students will be able to:

- Actively listen to the other groups' presentations and judge the best adaptations.
- Present their project meeting all criteria on the rubric.

EXTENSIONS AND ENHANCEMENTS FOR MILESTONE #5

- Could you record the presentations and post them on the school website to share them with the community? This would allow parents and family members to see the presentations, too.
- Are other grades or classes at your school learning about animal adaptations, too? Your students could present their projects for those classes to help them learn more about the topic.

STUDENT INQUIRY QUESTIONS FOR MILESTONE #5

- Which animal adaptation is the most useful, the warmest, the most bizarre, and the best overall?
- If you were a polar animal, which adaptation would you want to have? Why? How would it help you survive?

ASSESSMENT FOR MILESTONE #5

- **Formative Assessment for Individual Activity**: Check the students' "You Be the Judge" printable on page 31 of the Student Pack.
- **Formative Assessment for Group Activity:** Use the "Polar Powers Presentation Rubric" on page 19 of the Teacher Pack to assess the students' presentations.
- **Summative Assessment:** Have the students complete the response printable on page 32 of the Student Pack for the Inquiry Question, "If you

were a polar animal, which adaptation would you want to have? Why? How would it help you survive?"

- **Summative Assessment:** Give the students the "Polar Animals Summative Assessment" on page 17 of the Teacher Pack. Use the "Polar Animals Summative Assessment Answer Key" on page 18 of the Teacher Pack to correct the assessments.

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Project Activities for Milestone #5: Demonstrating an Adaptation

PREPARE (Bell-ringer/opener activity)

Show students the short video "Top 10: Ways Animals Survive the Winter," and discuss the adaptations animals have developed for wintering in North America.

PRESENT (Lecture/model)

Tell the students that they will present their demonstrations to the class in this portion of the unit. Review the "Oral Presentation Mini-Lesson" tips on page 16 of the Teacher Pack.

Remind the students that they should be good listeners when they are in the audience. Tell them that they are judging the Best Animal Adaptations Contest. They should complete the "You Be the Judge" printable on page 31 of the Student Pack.

PARTICIPATE (Student/group share, group activity)

Groups should share their presentations with the class. Allow 5-8 minutes per presentation.

Students at their seats should complete the "You Be the Judge" printable on page 31 of the Student Pack.

Formative Assessment: Use the "Polar Powers Presentation Rubric" on page 19 of the Teacher Pack to assess the students' presentations.

PRACTICE (Homework/independent work/extensions)

Give each student the writing response template on page 32 of the Student Pack and ask them to write an answer to the inquiry question for this Milestone: "If you were a polar animal, which adaptation would you want to have? Why? How would it help you survive?"

ASSESSMENT

Formative Assessment for Individual Activity: Check the students' "You Be the Judge" printable on page 31 of the Student Pack.

Formative Assessment for Group Activity: Use the "Polar Powers Presentation Rubric" on page 19 of the Teacher Pack to assess the students' presentations.

Summative Assessment: Have the students complete the response printable on page 32 of the Student Pack for the Inquiry Question, "If you were a polar animal, which adaptation would you want to have? Why? How would it help you survive?"

Summative Assessment: Give the students the "Polar Animals Summative Assessment" on page 17 of the Teacher Pack. Use the "Polar Animals Summative Assessment Answer Key" on page 18 of the Teacher Pack to correct the assessments.

Exploring Animal Adaptations

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Milestone #3 Resources

Milestone #5 Resources

Books About Polar Animals

Note for the Teacher: Gather as many books as you can about polar animals.

Suggested Books:

About Habitats: Polar Regions by Cathryn Sill and John Sill

All About the North and South Poles by Christina Mia Gardeski

Amazing Arctic Animals by Jackie Glassman and Lisa Bonforte

Animals of the Arctic Tundra: Polar Region Wildlife by Baby Professor

Arctic Fox (A Day in the Life: Polar Animals) by Katie Marsico

Arctic Fox: Fascinating Animal Facts for Kids by Tyler Grady

Caribou Are Awesome! (Polar Animals) by Jaclyn Jaycox

Narwhal (A Day in the Life: Polar Animals) by Katie Marsico

Narwhals Are Awesome (Polar Animals) by Jaclyn Jaycox

Polar Animals by Wade Cooper

Polar Animal Adaptations by Lisa J. Amstutz

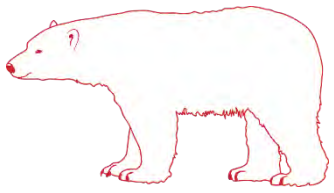
Reindeer (A Day in the Life: Polar Animals) by Katie Marsico

Snowy Owls Are Awesome (Polar Animals) by Jaclyn Jaycox

The Coldest Tundra!: Arctic and Antarctic Animal Wildlife by Baby Professor

Who Lives Here? Polar Animals by Deborah Hodge and Pat Stephens

How and Why Animals Adapt



Teacher Notes: Read the book **How and Why Animals Adapt** by Bobbie Kalman to help your students build background knowledge about animal adaptations. Have your students answer the questions as you read, and go over the answers together.

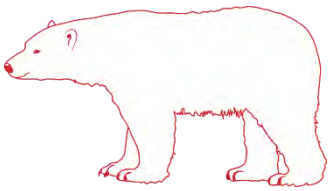
Why do animals adapt? *Animals adapt because there are big changes in their lives. They adapt to find food, survive extreme temperatures, and to escape danger.*

Fill in the chart with the names of animals that adapt, how they adapt, and how their adaptation helps them survive. *Sample Answers*

Animal's Name	Adaptation	How It Helps the Animal Survive
Arctic Fox	*Thick white fur and tiny ears*	*The fur keeps it warm in the ice and snow, and the ears keep heat inside its body.*
Tree Kangaroo	*Claws and pads on feet that grip tree bark, long tail for balancing*	*The adaptations help it climb trees and find more food.*
Camels	*Fat stored in humps on their backs*	*The fat provides energy for the camel when it can't find food or water in the hot desert.*

Which animal adaptation do you think is the most interesting? Why? *Answers will vary.*

Exploring the Arctic



Teacher Notes: Show your students the virtual field trip "Exploring the Arctic". Have them answer the questions as they watch. Discuss the answers as a whole class.

What causes the Northern Lights (or auroras) in the Arctic?

They are caused by charged particles from the sun that interact with the Earth's magnetosphere, exciting the gasses of the atmosphere until it glows.

What types of plants grow in the Arctic? How do they survive during the summer months?

Grass, moss, and shrubs grow in the Arctic during the summer months. They grow close to the ground and have shallow roots.

Why is the Arctic an important habitat for the trumpeter swan?

It provides a home for them that is safe from hunters so their population can recover from overhunting.

What are four other species of animals that live in the tundra? *Sample Answers:*

Fish, like salmon and cod

Bears

Eagles

Foxes

How do animals adapt to life in the cold Arctic temperatures? Give at least 2 ways and an example of each one. *Sample Answers:*

Some animals change color to blend in with the ice and snow. The Arctic fox has a brown coat in the summer and white fur in the winter. Some animals have thick skin or layers of fat to protect them from the cold. Walruses have skin that is 4 inches thick and a layer of fatty blubber to keep them warm in freezing Arctic waters.

Arctic and Antarctic Animals

Polar Bear

Arctic Fox

Emperor Penguin

Walrus

Squid

Sea Star

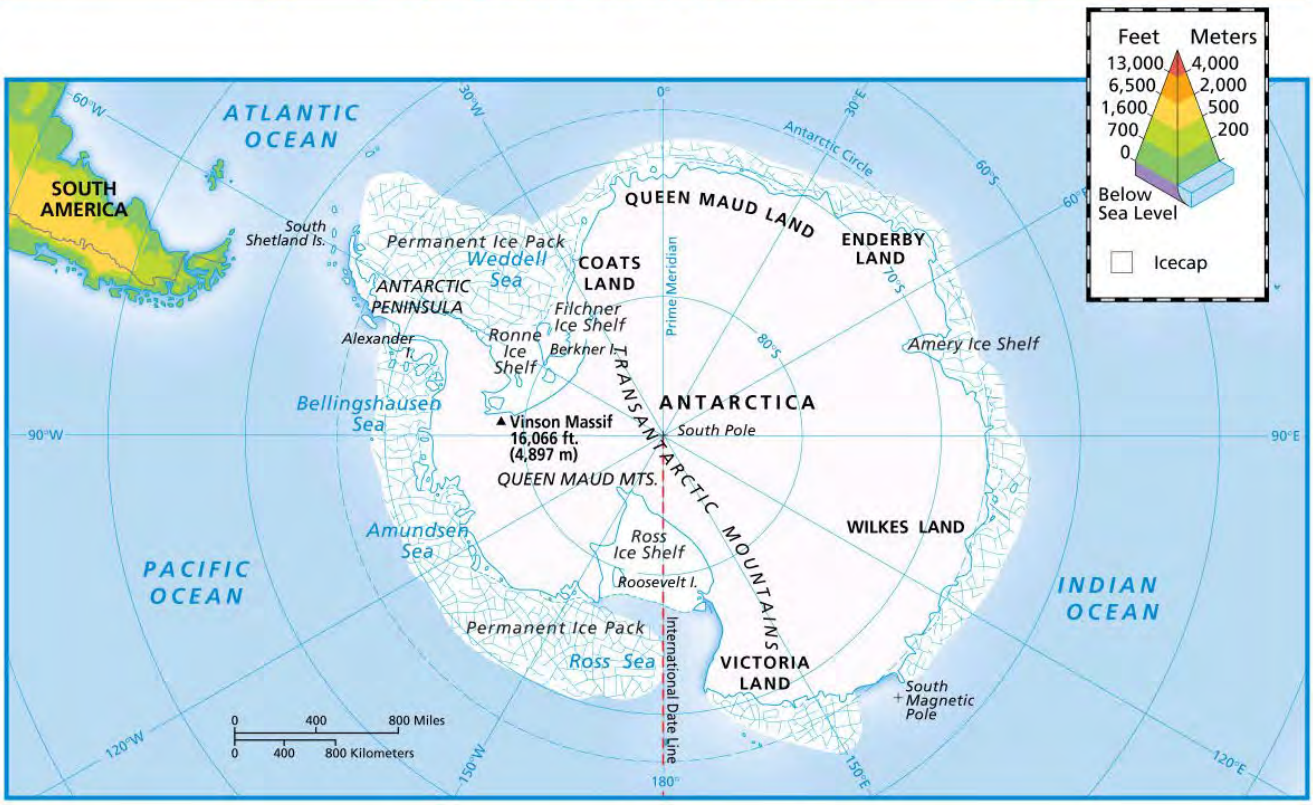
Weddell Seal

Reindeer

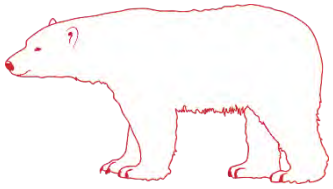
Gray Whale

Albatross

Map of the Arctic and Antarctica



Polar Animal Adaptations



Teacher Notes: Use the Arctic and Antarctic PowerPoint presentations to teach your students about animal adaptations. Have them take notes. Go over the sample answers with the class.

Where is the Arctic Circle? *It's at the top of the Earth.*

List adaptations of each animal in the chart.

Polar Bear	*Small rounded ears, lose little body fat, hollow hairs trap warm air near body, non-slip soles help grip slippery ice*
Arctic Fox	*Thick white fur in winter, thin brownish gray fur in summer (camouflage)*
Caribou	*Large antlers, broad hooves act like snowshoes in snow and paddles in water*
Walrus	*Heavy skulls protect brain when walrus smashes ice, tusks used like ice picks to lift body out of water, thick skin on neck and shoulders offers protection during fights, blubber for warmth and padding*
Whale	*Blubber for insulation, flukes help move up and down in water, blowhole, baleen plates to filter food*

Where is Antarctica? *It's on the bottom of the Earth.*

List adaptations of each animal in the chart.

Undersea Stars	*Grow very slowly, sometimes grow larger, long life*
Albatross	*Large wingspan to fly long distances on ocean winds, webbed feet to act as air "brakes," large eyes to find prey in choppy oceans, razor sharp edge on bill to catch fish and squid*
South Pole Penguins	*Streamlined body for swimming, thick body fat for insulation, oar-like flippers propel through water, stiff tail with pointed feathers to use as rudder in water and support on land*
Emperor Penguins	*In the worst weather they huddle together in large groups to stay warm, taking turns on the outer circle, can hold breath for 20 minutes, male penguin holds egg for 2 months while female feeds in ocean*
Weddell Seals	*Streamlined for diving, blubber for insulation, stay underwater for 45 minutes, teeth used to break open air hole in ice if necessary*

Sample Flying Squirrel Slide

Have you ever heard of a squirrel that can fly? Actually, flying squirrels can't really fly, and they don't have wings. They glide from one place to another. Between their wrists and legs, flying squirrels have membranes of skin that stretch out, giving them the ability to glide far distances. Their long, flat tails also help guide where they are going.

Flying squirrels are typically found in the forests of Canada. The principal enemies of the flying squirrel are the owl, the hawk, and the domestic cat. Flying squirrels seldom go down to the ground. Being on the ground makes them vulnerable to predators. They use their strong climbing skills and their ability to glide from tree to tree to stay safe.

Flying Squirrel Demonstration

Teacher Notes: Follow the steps below to demonstrate the adaptations of the flying squirrel.

You can easily demonstrate the adaptations of a flying squirrel by using aluminum foil, thread and a produce bag from the grocery store.

First, make two squirrels out of aluminum foil.

Next, attach a section of the produce bag to one squirrel's legs using thread.

Drop both squirrels from a high location, like the top of a slide or staircase, to demonstrate how the membranes between the flying squirrel's legs help it glide.

Bird Beak Adaptations Demonstration

Teacher Notes: Follow the directions below to set up the "Bird Beak Adaptations" demonstration. When the students finish, have them answer the questions on the "Using a Bird Beak" printable on page 13 of the Student Pack.

Materials:

- ☐ A "stomach" for each student (plastic cups)
- ☐ A "beak" for each student (spoons, toothpicks, tweezers, clothespins)
- ☐ Bowls
- ☐ "Food" items (rice, cereal, marbles, dried beans, raisins, etc.)

Procedure:

Step 1: Put the "food" items into the bowls. You should have 1 bowl of rice, 1 bowl of marbles, etc.

Step 2: Get one "beak" (spoon, toothpick, tweezer, or clothespin) and one "stomach" (cup). Hold your "beak" in one hand and your "stomach" in the other hand.

Step 3: Set a timer for 3 minutes, and use your "beak" to gather as much food as you can.

Step 4: When the timer goes off, empty your cup and see which food items you were able to gather.

Name ..... Date .....

Polar Animals Quick Quiz

Directions: Read each question. Circle the best answer. Use information from your research to complete the sentences.

1. **Which of these animals lives in the Arctic Circle?**

   A Penguins
   B Caribou
   C Albatross
   D Weddell seals

   The Arctic Circle is located .....

   ..... .

2. **Which of these is an adaptation that helps polar animals survive the cold?**

   A Long claws to climb trees
   B Thick fur to stay warm
   C Blubber for insulation
   D Broad hooves to walk in snow

   Another adaptation that helps polar animals survive the cold is .....

   ..... .

3. **Which of these is an adaptation that helps penguins swim in the Antarctic waters?**

   A Huddling in large groups
   B The male penguin holds the egg
   C Oar-like flippers to move in water
   D A blowhole to breathe in the water

   An adaptation that helps the animal I researched survive in the cold temperatures is .....

   ..... .

Polar Animals Quick Quiz

Answer Key

Directions: Read each question. Circle the best answer. Use information from your research to complete the sentences.

1. **Which of these animals lives in the Arctic Circle?**

   A Penguins **B** *Caribou*

   C Albatross **D** Weddell seals

   The Arctic Circle is located *at the top of the Earth.*

2. **Which of these is an adaptation that helps polar animals survive the cold?**

   A Long claws to climb trees **B** *Thick fur to stay warm*

   C Blubber for insulation **D** Broad hooves to walk in snow

   Another adaptation that helps polar animals survive the cold is *Answers will vary.*

3. **Which of these is an adaptation that helps penguins swim in the Antarctic waters?**

   A Huddling in large groups **B** The male penguin holds the egg

   C *Oar-like flippers to move in water* **D** A blowhole to breathe in the water

   An adaptation that helps the animal I researched survive in the cold temperatures is *Answers will vary.*

Oral Presentation Mini-Lesson

- [ ] Use a loud, clear voice.
- [ ] Face front.
- [ ] Stand still.
- [ ] Don't hold any papers in front of your face.
- [ ] Make eye contact with your audience.
- [ ] Use your materials and follow the procedure to perform your demonstration.

Name ..... Date .....

Polar Animals Summative Assessment

PART A

Directions: Read each animal's name. Write "AC" on the line if that animal lives in the Arctic Circle or "An" if that animal lives in Antarctica.

.....	Walrus	.....	Polar Bear
.....	Penguin	.....	Arctic fox
.....	Undersea Stars	.....	Weddell seal
.....	Albatross	.....	Whale

PART B

Directions: Choose two of the animals from Part A. Write about each animal's adaptations and how they help the animal survive in the extreme cold.

Animal #1 - .....

.....

.....

.....

.....

Animal #2 - .....

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Polar Animals
Summative Assessment

Answer Key

PART A

Directions: Read each animal's name. Write "AC" on the line if that animal lives in the Arctic Circle or "An" if that animal lives in Antarctica.

AC	Walrus	AC	Polar Bear
An	Penguin	AC	Arctic fox
An	Undersea Stars	An	Weddell seal
An	Albatross	An	Whale

PART B

Directions: Choose two of the animals from Part A. Write about each animal's adaptations and how they help the animal survive in the extreme cold. *Answers will vary.*

Animal #1 - .....

.....

.....

.....

.....

Animal #2 - .....

.....

.....

.....

.....

Name ..... Date .....

Polar Powers Presentation Rubric

	4	3	2	1
Slideshow Information	The slideshow included the name and location of the animal and pictures to show them.	The slideshow included the name and location of the animal and a picture of the animal.	The slideshow was missing either the name and location of the animal or a picture of the animal.	The slideshow didn't have the animal's name, location, or picture.
Demonstration	The demonstration clearly showed how the adaptation helps the polar animal survive. The group had all necessary materials and clearly explained the procedure.	The demonstration showed how the adaptation helps the polar animal survive. The group had all necessary materials and explained the procedure.	The demonstration showed how the adaptation helps the polar animal survive, but it was missing some materials or the procedure wasn't explained.	The demonstration doesn't show how the adaptation helps the polar animal survive.
Observations	The group clearly explained their observations and how they used perseverance to make changes to their demonstration to make it better.	The group explained their observations and how they improved their demonstration.	The group explained their observations, but they didn't make changes to improve their demonstration.	The group didn't explain their observations or tell how they improved their project.
Oral Presentation	All group members participated in the presentation, and it was very organized and clearly presented.	The presentation was very organized and clearly presented, but not all group members participated.	The presentation was missing either organization or clarity when it was presented.	The presentation wasn't clear or organized.

Teacher's comments: .....

.....

.....

.....

Exploring Animal Adaptations

Student Pack

TeacherVision

Table of Contents

Milestone #1 Resources

Milestone #2 Resources

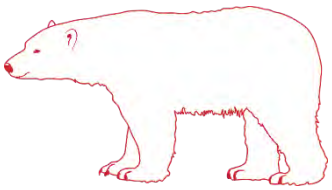
Milestone #3 Resources

Milestone #4 Resources

Milestone #5 Resources

Name ..... Date .....

How and Why Animals Adapt



Directions: Listen to the book **How and Why Animals Adapt**.
Use the information to answer these questions.

Why do animals adapt? .....

.....

Fill in the chart with the names of animals that adapt, how they adapt, and how their adaptation helps them survive.

Animal's Name	Adaptation	How It Helps the Animal Survive

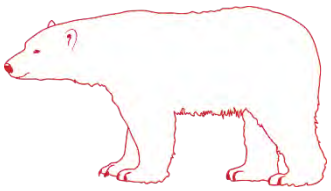
Which animal adaptation do you think is the most interesting? Why? .....

.....

.....

Name ..... Date .....

Exploring the Arctic



Directions: Watch "Exploring the Arctic". Answer these questions about the polar habitat.

What causes the Northern Lights (or auroras) in the Arctic?

.....

.....

What types of plants grow in the Arctic? How do they survive during the summer months?

.....

.....

Why is the Arctic an important habitat for the trumpeter swan?

.....

.....

What are four other species of animals that live in the tundra?

....

....

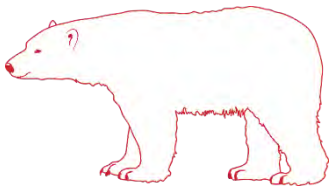
How do animals adapt to life in the cold Arctic temperatures? Give at least 2 ways and an example of each one.

.....

.....

Name ..... Date .....

Polar Animal Adaptations



Directions: Take notes about the adaptations of polar animals as you learn about them in the PowerPoint presentations.

Where is the Arctic Circle? .....

List adaptations of each animal in the chart.

Polar Bear	
Arctic Fox	
Caribou	
Walrus	
Whale	

Where is Antarctica? .....

List adaptations of each animal in the chart.

Undersea Stars	
Albatross	
South Pole Penguins	
Emperor Penguins	
Weddell Seals	

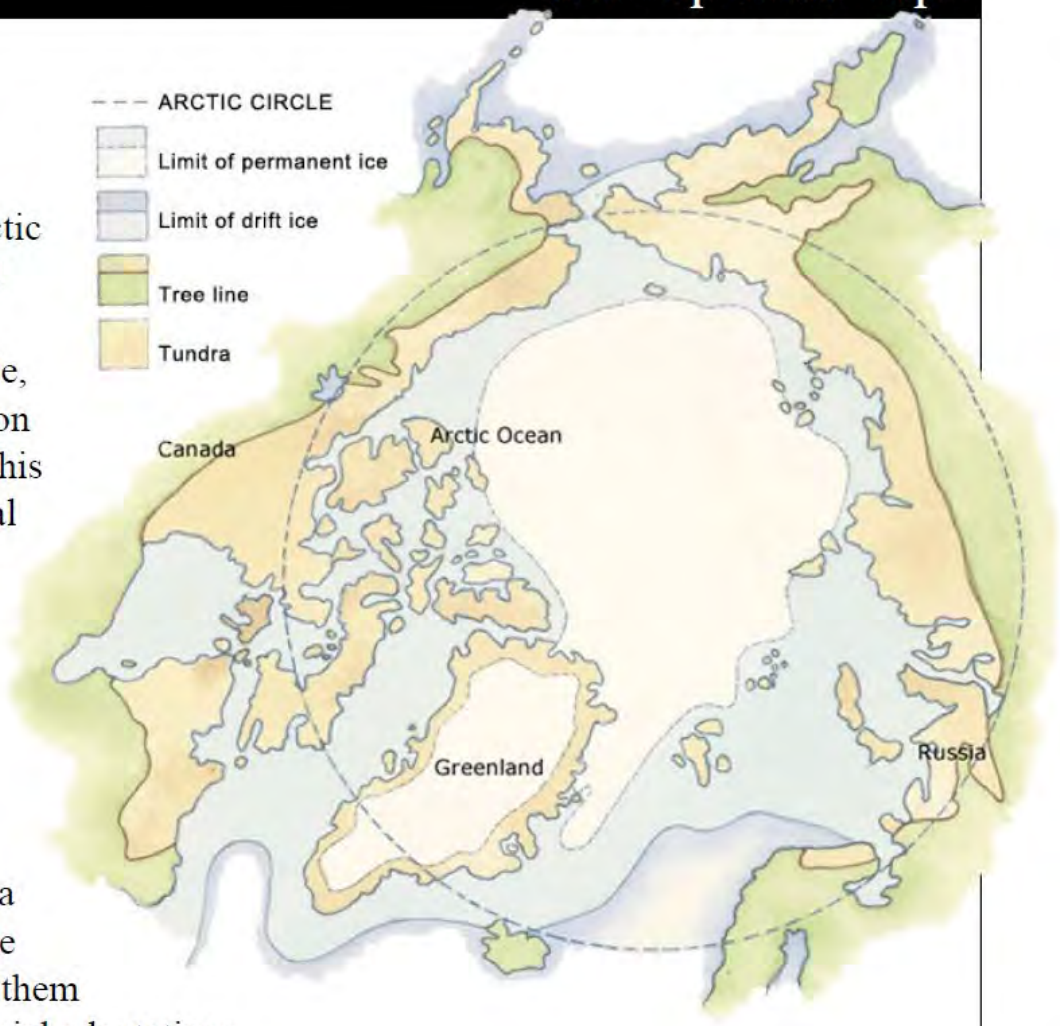
Learn About the Arctic and Antarctic

The Top of the Top!

If you picture the Earth as a spinning top, you'll find the Arctic Circle at the very top of the top!

In the middle of the Arctic Circle, a huge area of frozen ice floats on the Arctic Ocean. Surrounding this ice pack is land that has a special name. It's called *tundra*, which is a Russian word that means "treeless plain". In the true Arctic, no trees can grow because of the severe cold and winds.

Despite the harsh environment, a surprising variety of animals live in the Arctic. However, none of them could survive without some special adaptations.

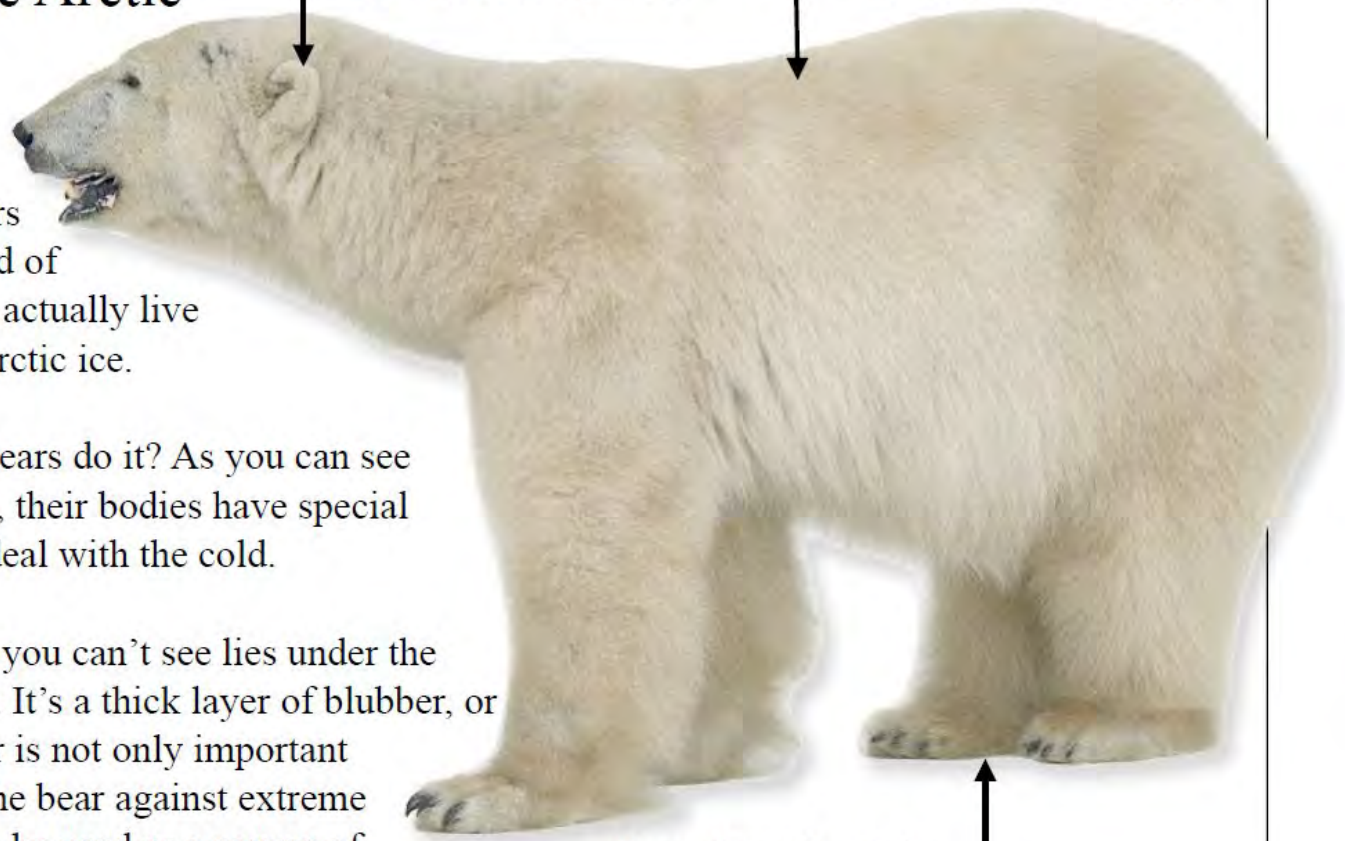


King of the Arctic

Polar bears! They are the Arctic's most powerful hunters and the one kind of animal that can actually live on the frozen Arctic ice.

How do polar bears do it? As you can see from this photo, their bodies have special adaptations to deal with the cold.

One adaptation you can't see lies under the polar bear's fur. It's a thick layer of blubber, or fat. The blubber is not only important for protecting the bear against extreme cold. It can also be used as a source of energy when food is scarce.



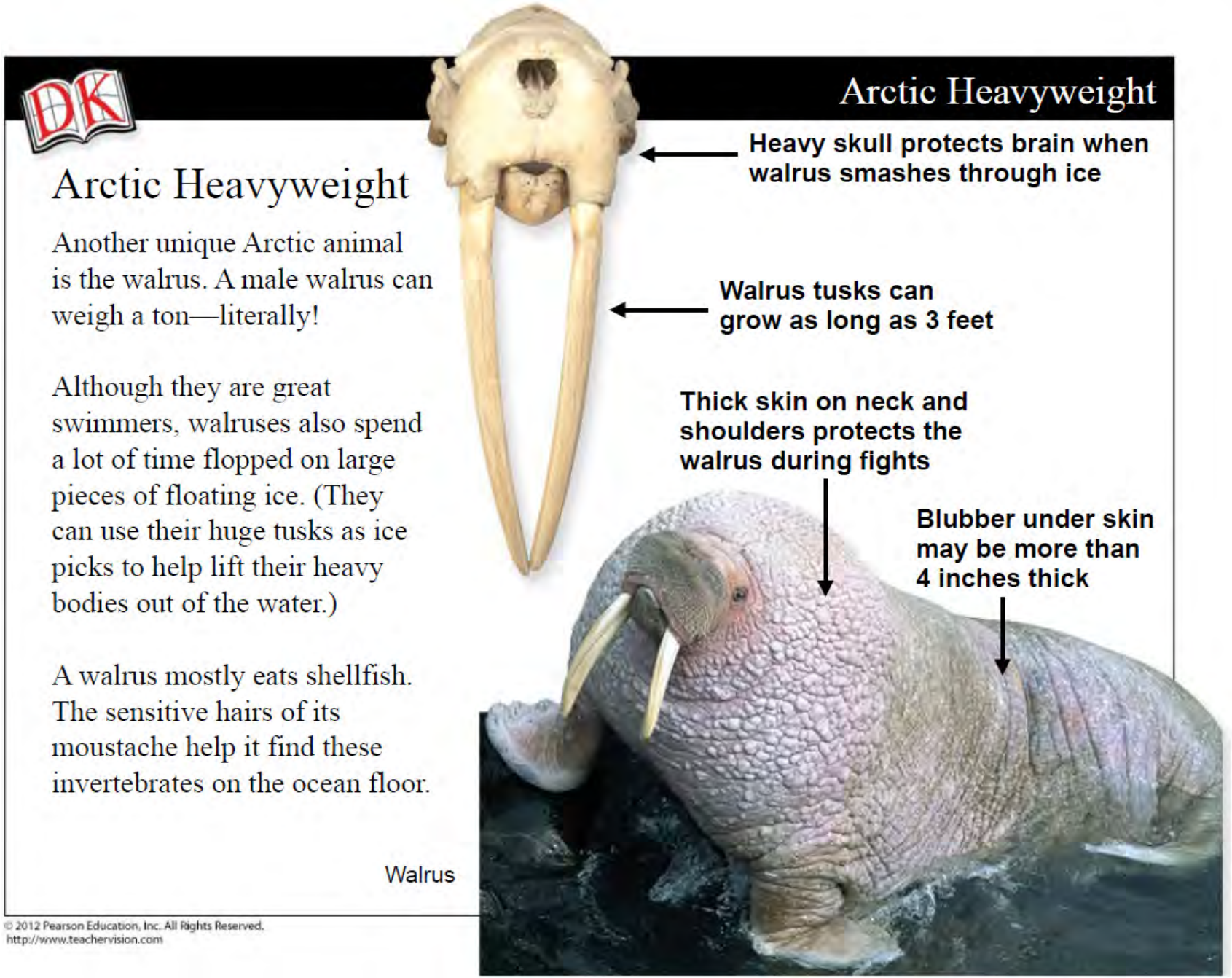
Title Fight

Caribou or reindeer? They're the same type of animal but people use different terms to describe them based on where the animals are found and what the animals do. (Some people refer to these animals in the wild as "caribou" while domestic animals are called "reindeer.")

Caribou locking horns

Caribou are known for their large antlers. But their broad hooves are important, too. In winter, they act like snow shoes to help the animals walk. In summer, they act like paddles to help the caribou swim across rivers and sounds.

Caribou hooves



Giants of the Sea

Whales are well-suited to the cold Arctic seas. A thick layer of blubber keeps these large mammals warm. It also helps them remain buoyant…or afloat!

The gray whale you see here feeds by diving to the ocean bottom and drawing water and sediments into its mouth. When its mouth closes, the watery mix is forced through the baleen plates in its mouth and food is trapped.

The Bottom of the Top!

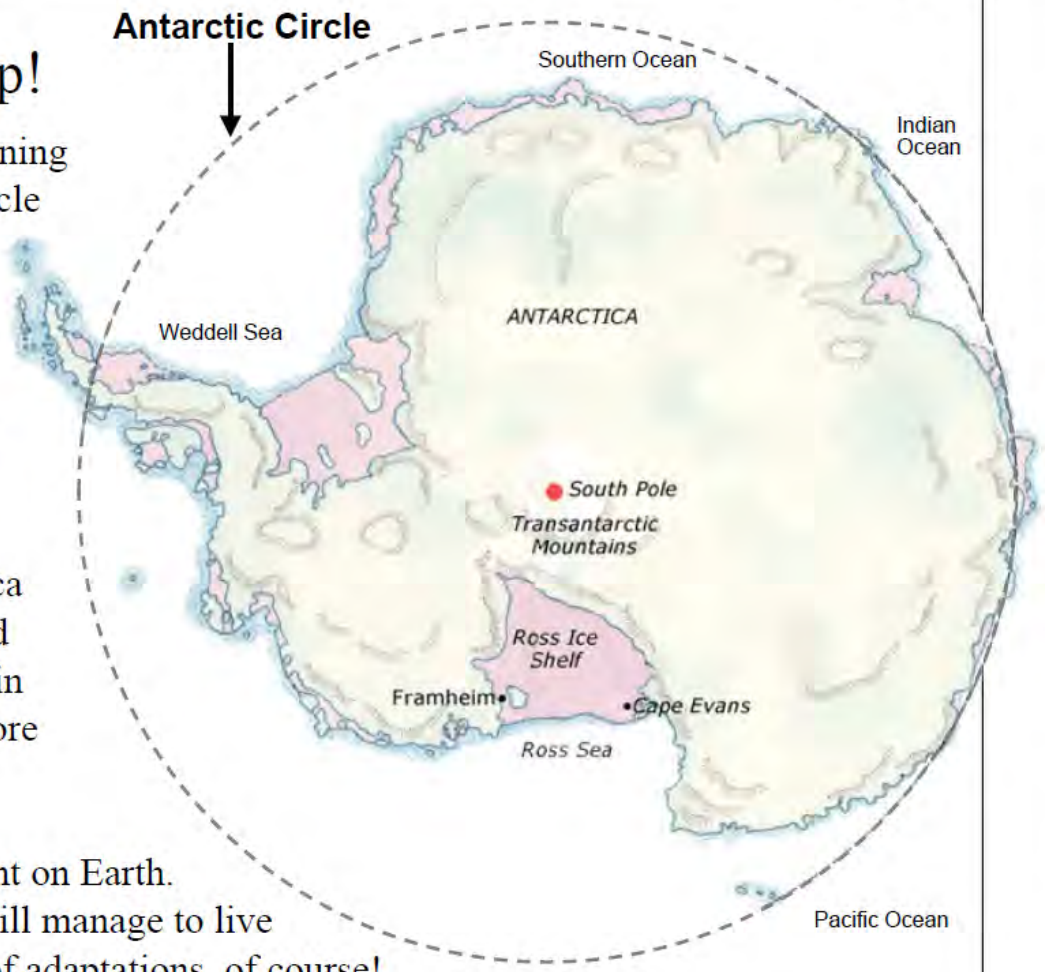
The Bottom of the Top!

If you picture the Earth as a spinning top, you'll find the Antarctic Circle at the very bottom of the top!

The continent of Antarctica is included in this region. So are the surrounding ocean seas and icebergs.

The whole continent of Antarctica is only half the size of the United States. But 98% of it is covered in ice. (In some places the ice is more than 2.5 miles deep!)

Antarctica is the coldest continent on Earth. However, some hardy animals still manage to live and breed there—with the help of adaptations, of course!

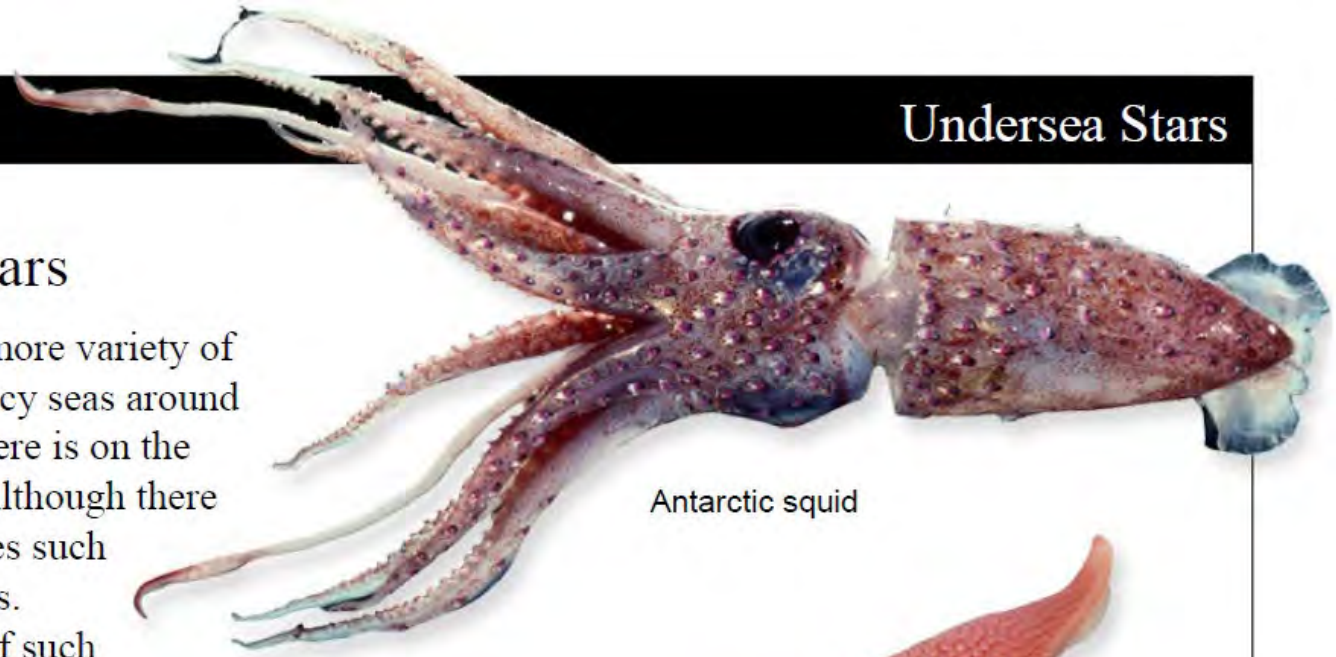


http://www.teachervision.com

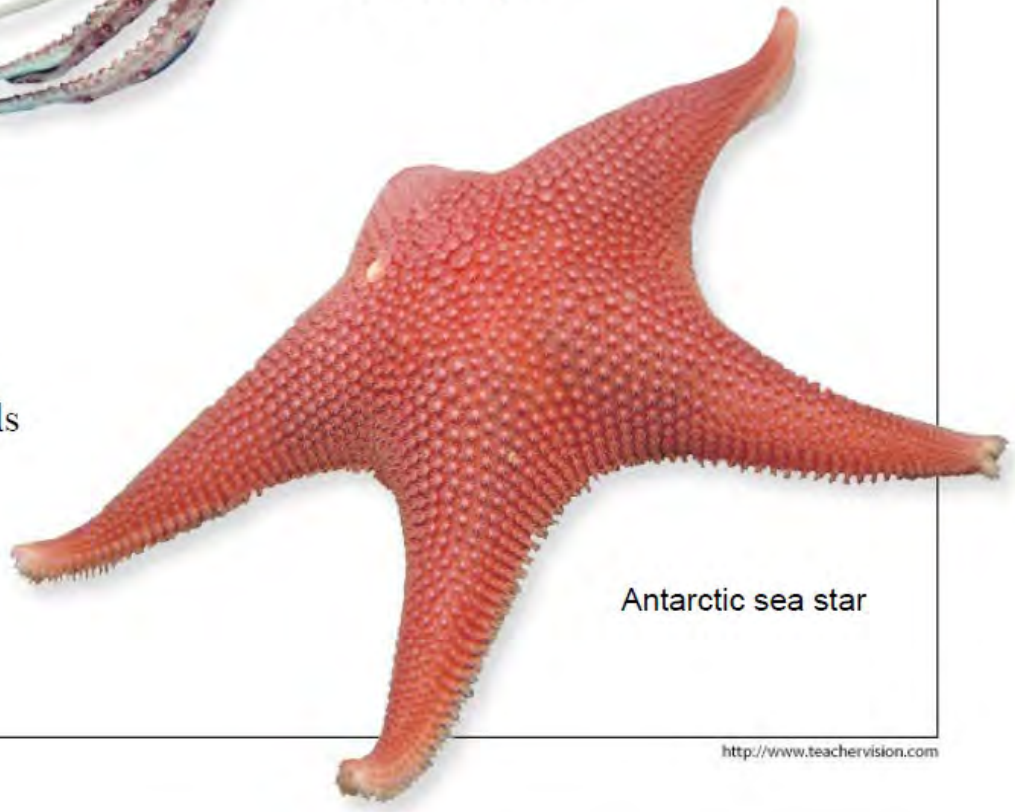
Undersea Stars

There is actually more variety of animal life in the icy seas around Antarctica than there is on the continent itself. Although there are no invertebrates such as lobsters or crabs. There are plenty of such creatures as sea urchins and sea stars—and even large underwater sea spiders.

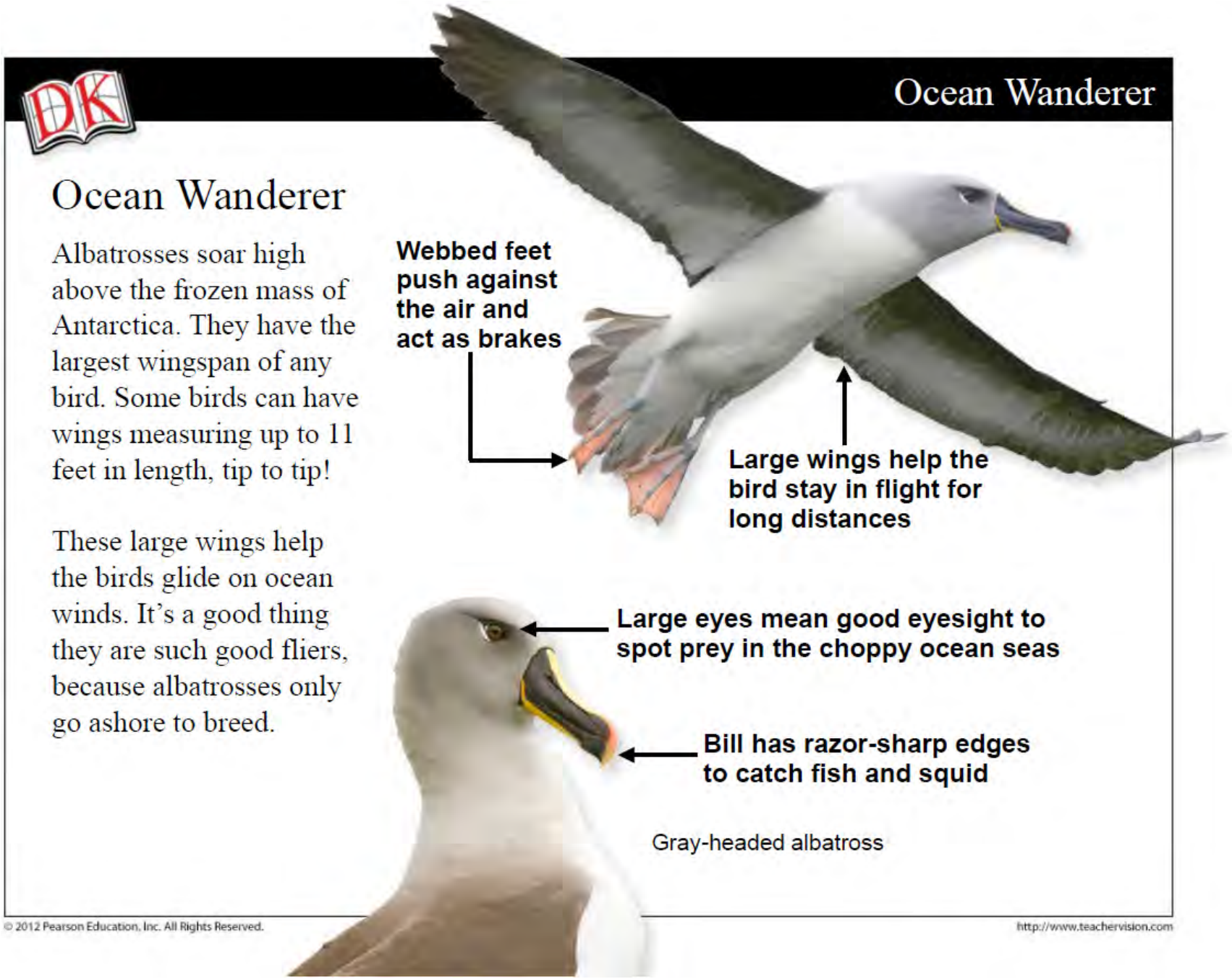
Because of the very cold temperature of the water, many underwater animals grow very slowly. This means they may grow larger. It also means that they may live a long time. One Antarctic sea star is known to have survived for 39 years!

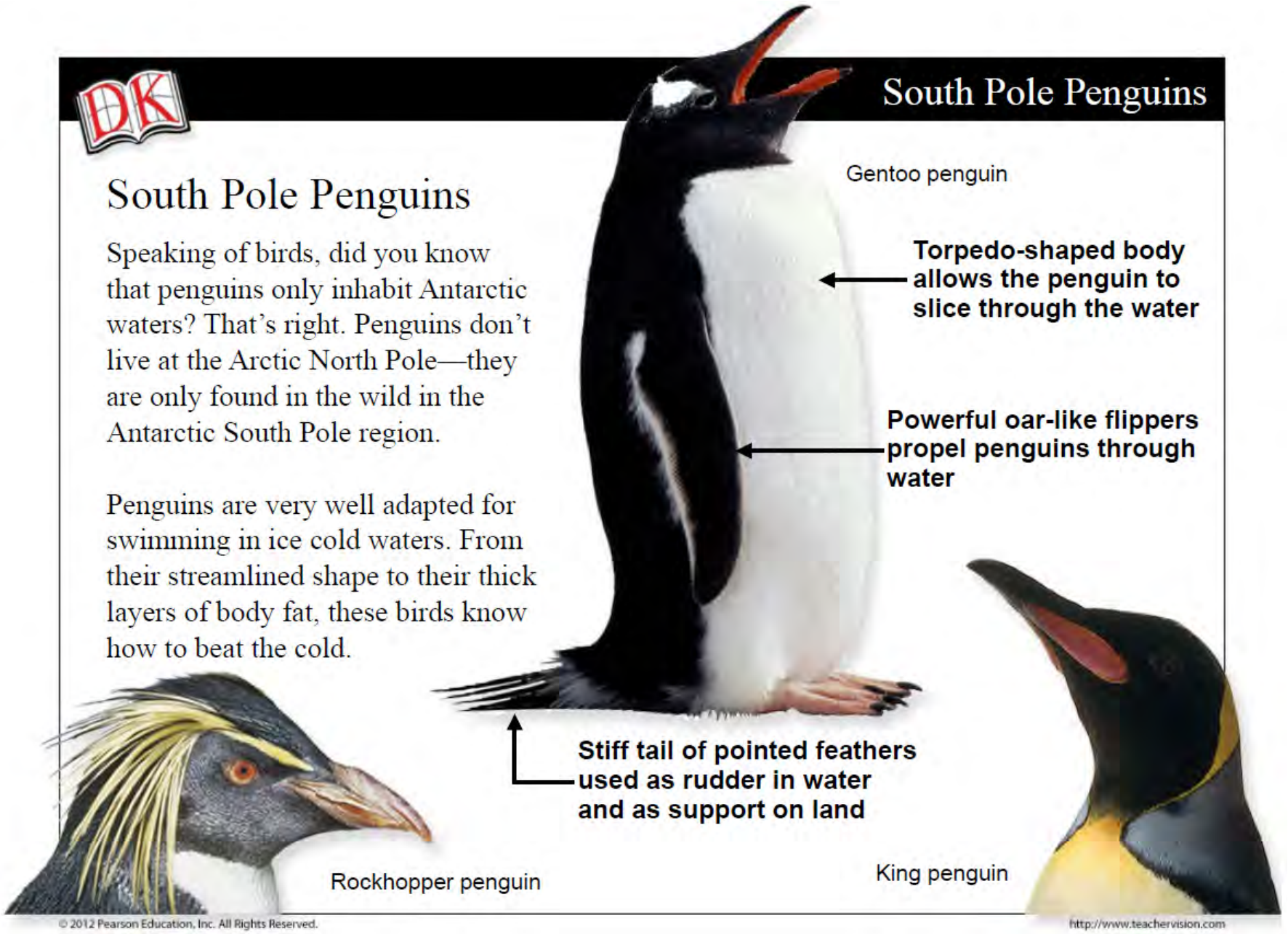


Antarctic squid



Antarctic sea star





Feet Heat

The Emperor penguin, the largest of all living penguins, is one of the few birds that doesn't migrate away from Antarctica's open ice in the winter. In the worst weather, these birds huddle together in large groups. Then they take turns moving from the colder outer circle to the warmer inner circle.

Emperor penguins can stand 4 feet tall and weigh over 60 pounds. They can also hold their breath for about 20 minutes when they dive for food.

The male penguin holds a newly laid egg on its feet and keeps it warm under a special flap of skin (called a brood pouch)—for two months! During this time the mother goes to feed in the open ocean. But when she returns, it's her turn to balance the chick in her own brood pouch. Baby Emperor penguins stay under cover for about eight weeks straight.

Antarctic Icebreaker

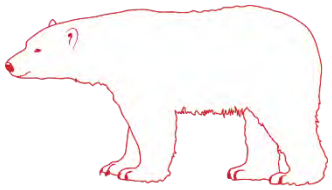
Another interesting animal spends the whole winter below the Antarctic ice. Weddell seals are streamlined for diving and "blubber-wrapped" for warmth! They can dive 2,000 feet down and stay underwater for up to 45 minutes.

When it's time to surface for a breath, the seal will look for natural openings. But if there are none, it will use its teeth to break open an air hole in the ice.

Weddell seal taking a breath at an icy hole

Name ..... Date .....

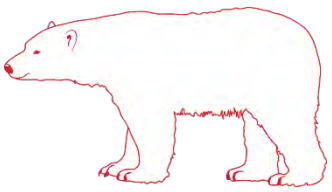
Polar Powers Project Guidelines



- [ ] Research a polar animal adaptation.
- [ ] Design and conduct an experiment demonstrating the value of the adaptation.
- [ ] Put together a presentation including:
  - [ ] A slide with a picture of the animal and its location.
  - [ ] The type of adaptation you researched.
  - [ ] A demonstration of the adaptation and an explanation of the materials and procedures you used.
  - [ ] An explanation of the adaptation and how it helps the animal.

Name ..... Date .....

Polar Powers



Directions: Work with your group to fill in the top of this page. Then, go back to your seat and complete the "K" and "W" sections of the K-W-L chart to tell what you already know and what you want to learn about your polar animal and its adaptations.

Polar Animal: .....

Type of Animal (bird, mammal, etc.): .....

Animal's Location: .....

Adaptation: .....

How the Adaptation Helps the Animal: .....

K	W	L

How to Do Good Research

Follow these steps when you are doing research in a book.

1. Choose a book about your topic.
2. Use the table of contents to find the chapter that has information about the question you are trying to answer.
3. Go to that chapter and read until you find the information you need. Put the answer in your own words. You can't just copy what the author wrote. This is called plagiarism, and it can get you in trouble.
4. Go back to the table of contents and find the chapter that will answer your next question.
5. Repeat these steps until you find all the answers you need.

Follow these steps when you are doing research online.

1. Open your search engine and type in your keywords. These should be as specific as possible. For example, type in the specific name of your animal. You can also add the words "for kids" to your keyword (ex. polar bear facts for kids). This will give you articles that are easier to read.
2. Click on the top link. Read the article and look for useful information to answer your questions.
3. When you find an answer, put the information in your own words. You can't just copy what the author wrote. This is called plagiarism, and it can get you in trouble.
4. Keep reading the first website to find more information you need.
5. When you get to the end of the article, click the back arrow to go back to your search results. Click on the second article and read it to find the answers to more of your questions.
6. Repeat these steps until you find all of the answers you need.

Name ..... Date .....

Milestone #1 Inquiry Question

Directions: Use what you learned in this milestone to answer the question.

How do polar animals survive in extremely cold environments?

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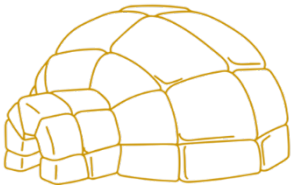
Name ..... Date .....

Demonstration Ideas



Directions: Follow the steps below to start your Polar Powers Project.

Step #1: Make a slide with your animal's name, its habitat, and some pictures.

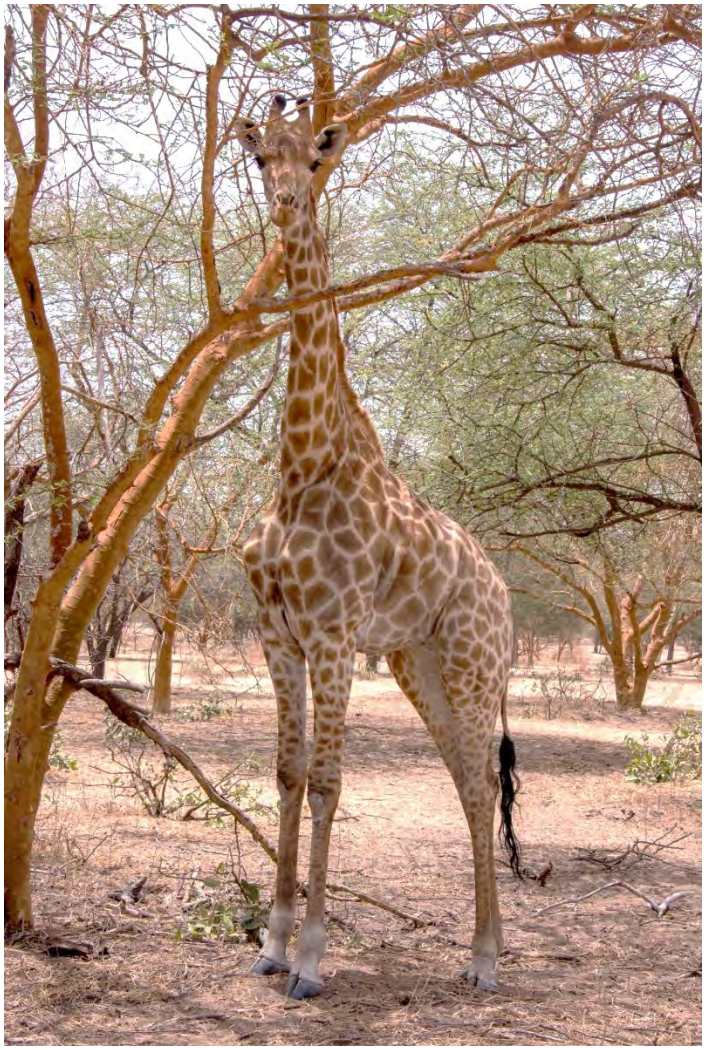
Step #2: Brainstorm some ways you can demonstrate your animal's adaptation. List them below.

Step #3: Select the **best choice** and describe it in detail below. Meet with your teacher to get the "green light" on your demonstration idea.

Name ..... Date .....

Milestone #2 Inquiry Question

Directions: Use what you learned in this milestone to answer the question.



What adaptations does a giraffe have to help it find food and stay safe?

.....

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Bird Beak Adaptations Demonstration

Materials:

- ☐ A "stomach" (plastic cup)
- ☐ A "beak" (spoons, toothpicks, tweezers, clothespins)
- ☐ Bowls
- ☐ "Food" items (rice, cereal, marbles, dried beans, raisins, etc.)

Procedure:

Step 1: Put the "food" items into the bowls. You should have 1 bowl of rice, 1 bowl of marbles, etc.

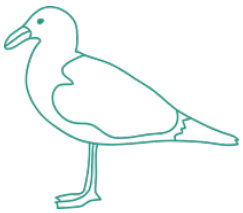
Step 2: Get one "beak" (spoon, toothpick, tweezer, or clothespin) and one "stomach" (cup). Hold your "beak" in one hand and your "stomach" in the other hand.

Step 3: Set a timer for 3 minutes, and use your "beak" to gather as much food as you can.

Step 4: When the timer goes off, empty your cup and see which food items you were able to gather.

Name ..... Date .....

Using a Bird Beak



Directions: After you complete the "Bird Beak Adaptations" demonstration, answer these questions.

What tool did you use as a beak? .....

Describe the bird's beak that looks like your tool. Can you think of a bird that has that type of beak?

.....

.....

.....

Which food items were easy to pick up with your "beak"? .....

.....

.....

Which food items were difficult to pick up with your "beak"? .....

.....

.....

What types of food would a bird with that type of beak eat in the wild? .....

.....

.....

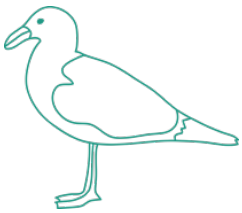
What type of beak would you want if you were a bird? Why? .....

.....

.....

Name ..... Date .....

Materials and Procedure



Directions: Write down all the materials you need to do your demonstration. Describe the step-by-step procedure you will follow to conduct your demonstration.

Materials:

....

....

....

....

Procedure:

Step 1: .....

.....

Step 2: .....

.....

Step 3: .....

.....

Step 4: .....

.....

Decide where you will get your materials. If you need things from home, bring them to school tomorrow.

Name ..... Date .....

Milestone #3 Inquiry Question

Directions: Use what you learned in this milestone to answer the question.

How could you create a demonstration to show a pufferfish's adaptation to fill with water and air when it feels threatened by a predator?

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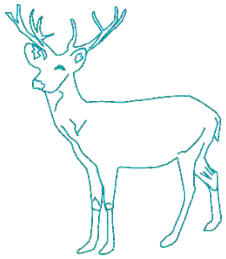
Name ..... Date .....

What Do You Do With a Problem?



Directions: Listen to the book **What Do You Do With a Problem?** In the box, draw a picture of a time when you persevered to solve a problem. Write about it on the lines at the bottom of the page.

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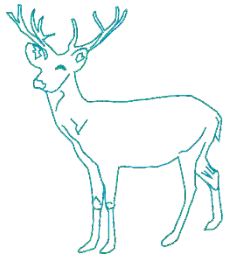
Name ..... Date .....

Demonstration Observations



Directions: Work with your group to try your demonstration. Answer these questions about it.

What happened when you tried your demonstration? Did it work?

.....

.....

.....

If it didn't work, what do you need to change to make it better?

.....

.....

.....

Make necessary changes and try again.

If you are satisfied with your results, write your observations.

What did you observe when you completed your demonstration?

.....

.....

.....

How does it demonstrate your animal's adaptation?

.....

.....

.....

Name ..... Date .....

Milestone #4 Inquiry Question

Directions: Use what you learned from this milestone to answer the question.

Why is it important to persevere when you're conducting science experiments or demonstrations? Give a specific example of a time when you didn't give up in science class.

.....

.....

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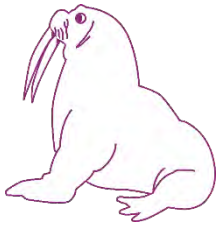
.....

.....

Name ..... Date .....

You Be the Judge



Directions: Listen to the other groups' presentations. If you were a judge in a contest for the "Best Polar Adaptation," which adaptation would win each of these awards? Why?

Award	Adaptation	Why?
Most Useful 		
Warmest 		
Most Bizarre 		
Best Overall (Your Favorite) 		

Name ..... Date .....

Milestone #5 Inquiry Question

Directions: Use what you learned in the presentations to answer the question.

If you were a polar animal, which adaptation would you want to have? Why? How would it help you survive?

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