



POLAR BLAST!

**TEACHER IDEA PACKET
PITTSBURGH ZOO & PPG AQUARIUM**

Polar Blast!

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Background Information

A Journey to the Ends of the Earth

The polar regions are some of the most extreme and unique places on earth. For as long as their existence has been known, they have held our fascination. In the 4th century BC, Pytheas (Massilia) discovered what he believed to be the legendary land of "Thule" (possibly Iceland, Norway, or the Shetland Islands). This was the earliest recorded exploration of the polar regions. Here is a brief chronology of polar exploration:

Arctic

- 10th century AD – Eric the Red (a Norseman) landed on western coast of Greenland and founded a colony
- 1500's – mid 1800's - exploration mainly focused on a finding a trade route from Europe to Asia across the Arctic Ocean; known as the Northwest Passage
- Late 1800's – 1900's - A push to be the first to the pole. Many attempts made, many controversies, notably the Frederic Cook/Robert Peary dispute over who was first to the pole. Cook made the run in 1908, but was delayed a year in returning. Peary made the run in 1909, arriving back before Cook. He loudly denounced Cook's claims, and has been the acknowledged "first" to the north pole.
- Today - Most expeditions are for geological or ecological research

Antarctica

- 1739 Jean Bouvet (France) finds Bouvet Island.
- 1772-75 James Cook (Britain) circumnavigates Antarctica.
- 1820's – early 1900's – A period of discovery by many explorers, whose findings often bear their names. These include James Weddell, Ernest Shackleton, James Clark Ross, and Jean B. Charcot. During this time, Charles Wilkes proved that Antarctica was a continent, and Shackleton located the magnetic south pole, which Roald Amundsen was the first to reach in 1911.
- 1920's – 1960's – Most of the continent was mapped. Adm. Richard Byrd was the first to fly over the South Pole in 1929. After that, many air expeditions followed, most claiming land for their respective nations. It was soon established that there was little to gain from this new continent but scientific knowledge. In 1948, Australia established the first permanent observation station, with 12 nations following suit in the mid 1950's.
- Today – Most expeditions to the Antarctic are for scientific research, but a few still show the intrepid spirit of the early explorers. In 1993, Erling Kagge of Norway traveled 810 miles across Antarctica on foot, alone, to the South Pole.

How Cold is Cold?

When asked to describe polar climate, the first thing anyone says is **COLD!** Because of the tilt of the earth's axis, the poles are each tipped away from the sun for half the year. This results not only in very cold winters, but also earns them the nickname "lands of the midnight sun." In the summer, the north pole is tilted toward the sun, giving it constant sunlight. The south pole is in darkness. In the winter, the south pole is tilted toward the sun, and the north pole is in darkness. This happens at about 66° latitude, which defines the polar regions.

Another phenomenon unique to this area is auroras, also known as the Northern Lights (aurora borealis) and Southern Lights (aurora australis). These appear as dancing curtains or sheets of brilliantly colored light in the night sky. Many folk tales and traditions have arisen regarding these lights. They are caused when charged solar particles thrown out by the sun's magnetic field are pulled in by the earth's magnetic field at the poles. These particles hit the atmosphere

and react with the gases to release energy in the form of colored light. The many colors are caused by reaction with different gases at different altitudes between 60 and 185 miles above the earth.

Within the arctic circle, there is only tundra and the Arctic Ocean. The north pole itself is not on land, but under great sheets of permanent, frozen sea ice, known as the polar ice cap. This ice extends to and largely covers the surrounding land, permanently, in many areas. In the winter, the temperature easily reaches -50°F , and averages -30°F . Throughout the year, the arctic only averages about 7°F . The summer isn't much warmer, with an average temperature of 29°F , but in July, temperatures soar to nearly 50°F . The thaw allows the land to absorb more heat from the sun, allowing a brief growing period for the grasses, sedges, lichens, mosses, and shrubs. Even with this period of warmer temperatures, the ground does not completely thaw, resulting in permafrost. Because of this, trees do not grow within the arctic circle – they cannot put down roots deep enough to sustain them.

Antarctica has the distinction of being the coldest, windiest, highest, driest, iciest continent on earth. It holds the world record low temperature of -129°F , with an average year-round temperature of -56°F . Normal temperatures in summer are between -5°F and -31°F , and between -40°F and -94°F in winter. 98% of the continent is covered by permanent snow and ice, which is up to 15,668 feet deep – the thickest on the planet. This leaves very little area for plants to grow. There are no trees or shrubs – only mosses, lichens, liverworts, and a very few grasses.

So, what makes Antarctica so cold? Several factors come into play. Because Antarctica is a continent, the interior does not get any warming effect from the water, as the arctic does. The thick ice cover reflects, rather than absorbs, most of the solar energy it receives. During the winter, Antarctica's size nearly doubles as the sea ice freezes, blocking any heat transfer from the warmer, surrounding oceans. More heat is lost due to the extreme dryness of the air. The average humidity is less than 0.03%, causing heat to be radiated back into the atmosphere instead of absorbed by the water vapor in the air. This also gives Antarctica less than 1 inch of annual precipitation, making it the driest desert on earth. With an average elevation of 8200 feet, higher than any other continent, altitude results in colder temperatures. Also, the katabatic winds from the higher elevations in the middle of the continent sweep across the coasts at up to 200 mph, creating wind chills in excess of -150°F !

Staying Alive: Survival Strategies

Because of these harsh conditions, the animals of the polar regions have had to adapt in order to survive. There are a variety of physical features and behaviors that allow them to do so.

Migration Sometimes the best way to survive is to leave! Many of the animals in the arctic enjoy the bounty of the summer, but move on once winter starts to set in. Herds of caribou, up to 100,000 strong, travel about 500 miles to calve and eat the summer grasses. Thousands of migratory birds, such as murrets, snow geese, and albatrosses come to raise their young. One of the most remarkable summer visitors is the Arctic tern, which flies up from its winter home in Antarctica. This amazing bird literally flies halfway around the world each season!

Insulation For those animals that stay through the winter, keeping warm is extremely important. They must retain as much body heat as possible. Fur, feathers, and fat help them to accomplish this.

Fur is one of the most commonly employed insulators in the arctic. Muskoxen have stiff, coarse outer coats with a thick, soft, incredibly warm undercoat known as qivuit. It is eight times warmer than wool. This fur, which is 3 – 4 inches thick, allows even young calves to survive on their own in temperatures of -30°F . Other animals, like Dall sheep and polar bears, have coats

of hollow fur. The air pocket inside each hair helps to trap body heat next to the skin. Polar bear fur is also clear, allowing their black skin to absorb heat from the sun. If their fur was white, it would reflect the heat, greatly reducing the bear's ability to stay warm. The thickest fur in the world belongs to the sea otter, which is found in the kelp forests just outside the arctic circle. Their coat has two layers; long guard hairs on top of an undercoat. A layer of air between them helps to keep heat in. At approximately 1,000,000 hairs per square inch, their fur is so thick that water does not penetrate to their skin. This makes young otters so buoyant that they are unable to dive under the water.

The birds of the polar region have dense feathers to keep them warm. Snowy owls glide on silent wings, and capture prey with feathered feet. Penguins have a waterproof coat of short, densely-packed feathers (about 70 feathers per square inch) Their feathers, unlike most other birds, do not have an outer layer of flight feathers and an under layer of downy feathers. Instead, these two layers are combined. The lower portion of the feather is downy, while the upper portion is stiff, like a flight feather. This top portion, when coated with oil from a gland at the base of the tail, forms a protective shell that locks heat in and water out.

Penguins also have another layer of insulation – blubber. Blubber is a thick layer of subcutaneous fat that helps to keep many polar animals warm. Walruses, seals, and sea lions need this layer of fat to stay warm while swimming in the icy Arctic Ocean. Whales, like the humpback, beluga, orcas, and narwhal (whose spiraled tusk may have given credence to the unicorn myth), have fat layers up to 6 inches thick. Polar bears have about 4 inches of blubber, not only protecting them from the cold, but also adding buoyancy, and acting as a reserve in times when food is scarce.

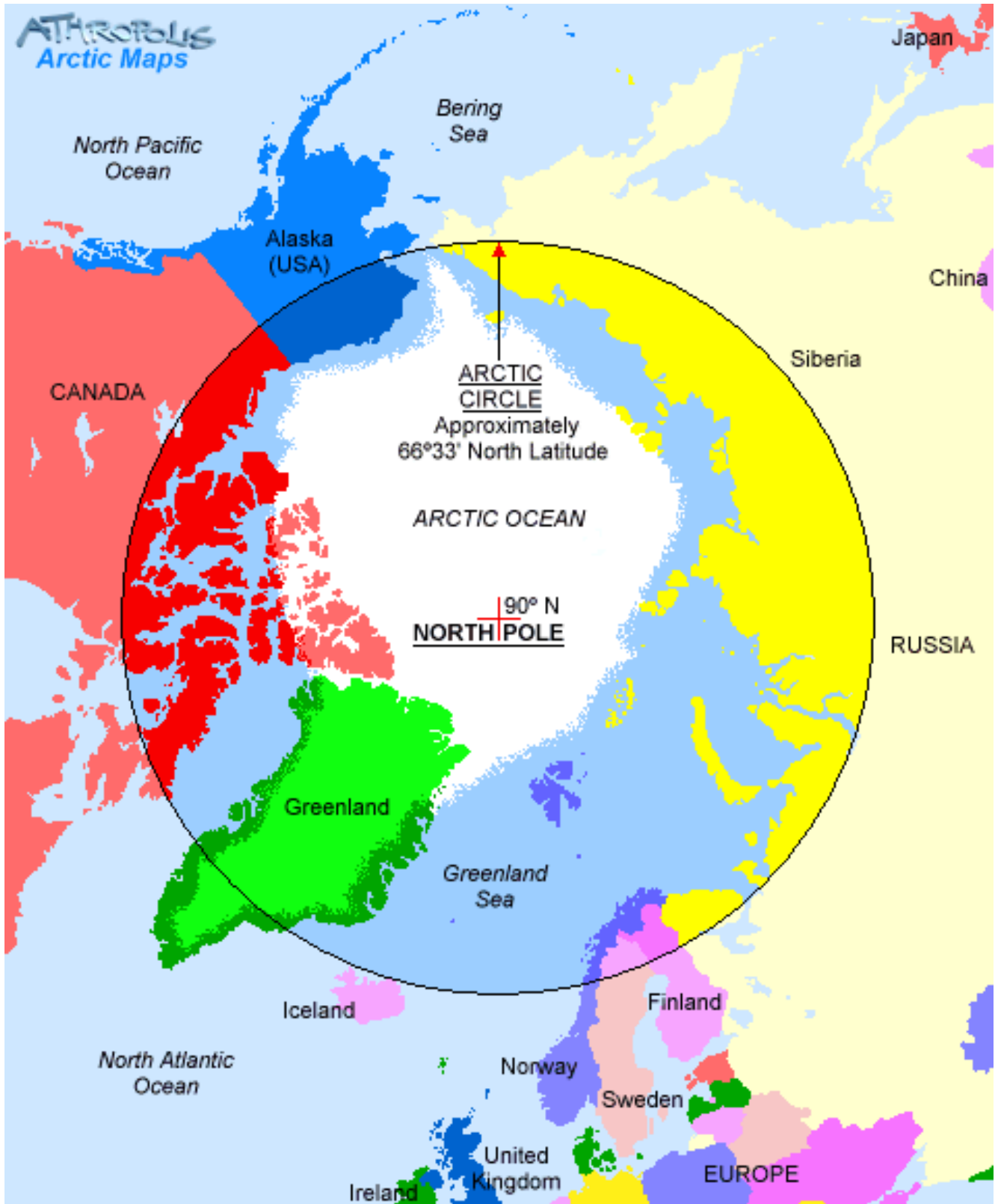
Camouflage Color Change White fur and feathers do much to hide small animals like lemmings, ptarmigans and arctic hare from danger during the arctic winter, but the onset of the summer thaw can leave them exposed. So, these animals trade in their coats of winter white for brown summer suits. This allows them to remain camouflaged as the ground below is uncovered. They are not alone, however. Predators like the arctic fox, ermine (weasel), and even wolves take on new hues as well. When winter once more rears its snowy head, predator and prey alike once more change color with the seasons.

Cause for Concern

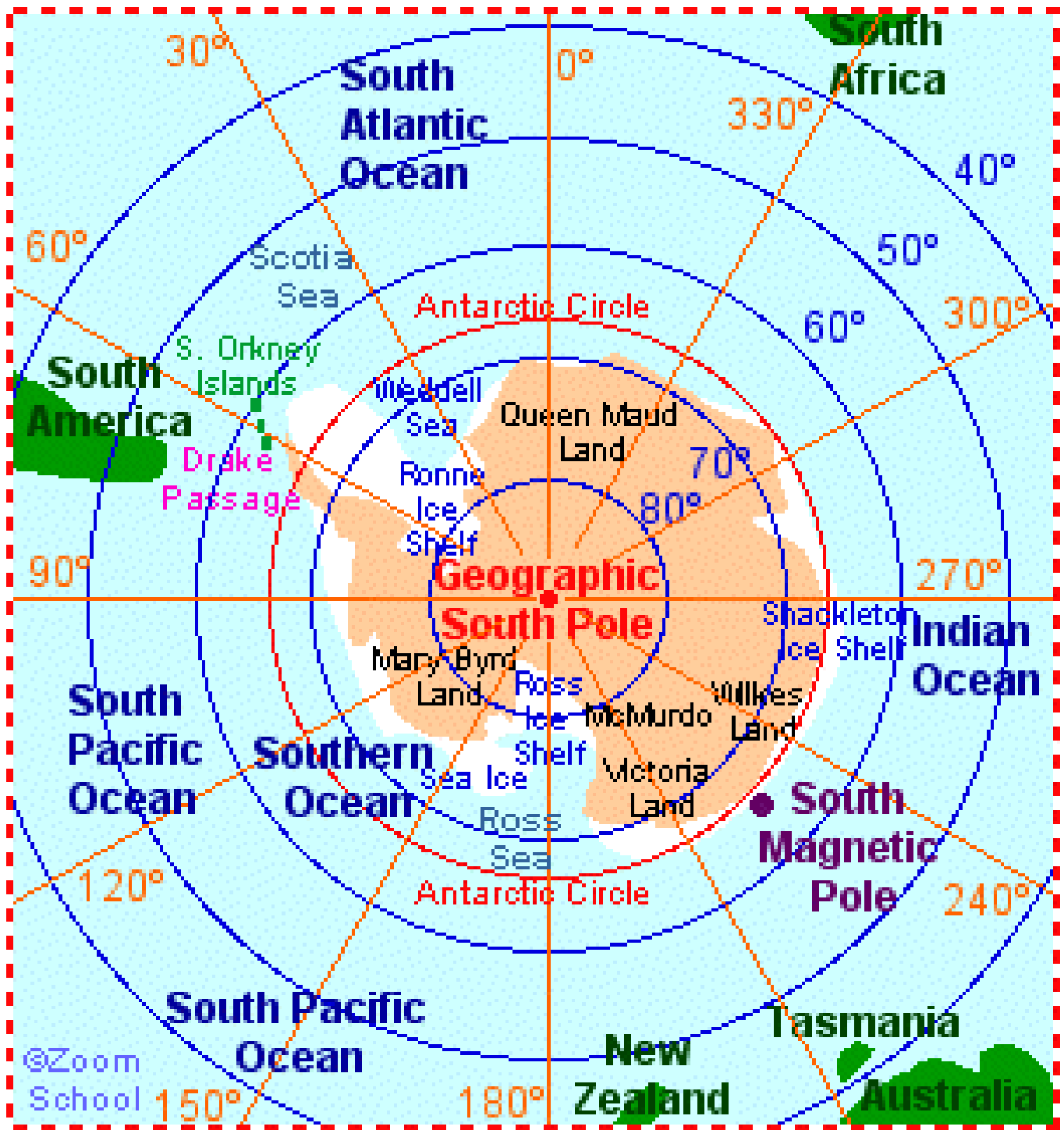
The polar regions of the planet are beautiful, but delicate, ecosystems. Because of the extreme conditions, the survival of the animals and plants are intricately connected to one another and to the land and sea around them. Global climate change is shrinking the polar ice caps and affecting the location, thickness, and duration of the sea ice. This impacts the ability of animals like polar bears to hunt, affects the breeding grounds of penguins, and causes habitat loss for these and many others. Drilling and other human activity affects migration routes, sometimes cutting animals off from inland summer feeding and breeding grounds. Pollution and over fishing impact important food sources.

What Can I Do?

Legislation like the Marine Mammal Protection Act and the Endangered Species Act offer some protection to these animals and their habitat, but your actions at home can make a difference, too. Using fewer petroleum products like gasoline and plastics can reduce the overall need for drilling. Carpooling, using public transportation, and recycling are all ways to lessen your environmental impact. Conserving energy, water, and other natural resources whenever possible is a great way to have a positive effect.



ARCTIC CIRCLE



ANTARCTICA

Suggested Student Reading

Antarctica by Helen Cowcher

Animal Close-Ups: The Seal by Joëlle Soller

Animals in the Wild: Seal by Mary Hoffman

Baby Whales Drink Milk by Barbara Juster Ebbesen

Borealis: A Polar Bear Cub's First Year by Rebecca L. Grambo

A Caribou Journey by Debbie S. Miller

Cold Paws, Warm Heart by Madeleine Floyd

Counting Penguins by Betsey Chesson and Pamela Chanko

Do Whales Ever . . . ? by Nathalie Ward

The Emperor's Egg by Martin Jenkins

A Home on the Tundra by Katie Marsico

Kumak's House: A Tale of The Far North by Michael Bania

Little Mo by Martin Waddell

Little Penguin by Patrick Benson

Little Penguin's Tale by Audrey Wood

Little Polar Bear by Hans de Beer

Mr. Popper's Penguins by Richard and Florence Atwater

Polar Bear by P. Adams

A Polar Bear Journey by Debbie S. Miller

Polar Bear, Polar Bear, What Do You Hear? by Bill Martin Jr. and Eric Carle

Polar Star by Sally Grindley

Sea Elf by Joanne Ryder

See How They Grow: Penguin by Mary Ling

Snowflake the Polar Bear by Judy Ross

The Whale's Song by Dyan Sheldon

Who Lives in the Arctic? by Susan Canizares and Pamela Chanko

Winter Whale by Joanne Ryder

Teacher Resources and Reference

Arctic Explorer: The Story of Matthew Henson by Jeri Ferris

Arctic Wildlife by Monte Hummel

Eyewitness: Whale by Vassili Papastavrou

Looking at Penguins by Dorothy Hinshaw Patent

People of the Ice: How the Inuit Lived by Heather Smith Siska

The World of the Polar Bear by Thor Larsen

Internet Resources

Athropolis – www.athropolis.com – This is an amazing Arctic website! Tons of kid-friendly games, activities, and information on everything from animals to explorers to what the sun is doing.

CIA: World Factbook - <https://www.cia.gov/library/publications/the-world-factbook/geos/ay.html> - Has extensive information about Antarctica (as well as other countries), including maps, geography, resources, and environmental issues.

Antarctic Virtual Tour - <http://astro.uchicago.edu/cara/vtour/pole/> - Take a virtual tour of the Antarctic with photos, text and maps.

Cool Antarctica - <http://www.coolantarctica.com/> - lots of info about animals, climate, exploration, and ecologic issues.

Enchanted Learning: Zoom School - <http://www.enchantedlearning.com/school/Antarctica/> - Great kid-friendly information and activities! Reproducible print-outs for teachers, too!

Enchanted Learning - <http://www.enchantedlearning.com/coloring/arcticanimals.shtml> - coloring pages, shape books and information about arctic animals.

Gander Academy: Antarctica - <http://www.stemnet.nf.ca/CITE/antarctica.htm> - Great resource for teachers! Lots of info and lesson plans.

Arctic Trivia Challenge from Time for Kids - <http://aolsvc.timeforkids.kol.aol.com/TFK/kids/games/white/1,28416,1040327,00.html> – an interactive arctic trivia game

Antarctic Connection - <http://www.antarcticconnection.com/antarctic/info-index.shtml> - great information about Antarctic climate, wildlife, and more!

Vocabulary

adaptation – behavioral or physical feature that improves a plant or animal's chance for survival in its habitat

aurora – sheets or curtains of dancing, colored lights caused by solar particles reacting with gases in the upper atmosphere; also known as the Northern Lights (aurora borealis) or Southern Lights (aurora australis).

blubber – thick, insulating layer of fat under the skin of many polar animals

camouflage - an organism's ability to hide or blend in with its surroundings using color, pattern or shape.

conservation – the wise use of natural resources in order to ensure continued availability to future generations

ecosystem – an ecological community together with its environment, functioning as a unit

glacier – a huge mass of ice formed from compacted snow that flows over a land mass

fast ice – sea ice that is attached to land; also called land-fast ice

habitat - the place an animal lives. It provides the animal with shelter, food, water, and air/space.

ice floe – chunks of floating sea ice that is less than 6 miles across; sea ice chunks larger than this are called **ice fields**

insulator – something that acts to keep heat inside the body, such as fur, feathers, or blubber

katabatic wind - wind that is caused by air flowing down from an elevation; also called a gravity wind

migration – movement of a population of animals from one area to another in order to secure food, shelter, or breeding grounds; most often tied to seasonal climate change

pack ice – large masses of floating sea ice

polar region – areas surrounding the north and south poles, above 66° latitude, that have very cold temperatures, have at least one day where the sun does not set (summer) or rise (winter), and experience auroras

predator - an animal that kills and eats other animals.

prey - an animal that is hunted or killed for food.

sea ice – frozen sea water. Because of the salt content, this happens at 28.8°F.

tree line – altitude or latitude above which trees do not grow

Journey to the Poles

Content Area: Geography, Language Arts, Science

Skills: listening, critical thinking, fine motor

Objectives:

TSW locate the poles on a globe.

TSW describe the climate at the poles.

TSW decide what equipment to take on a polar expedition.

Materials: globe, Who Lives in the Arctic? by Susan Canizares and Palemla Chanko and/or Antarctica by Helen Cowcher, Background Information, Explorer: The Story of Matthew Henson by Jeri Ferris, "Journey to the Poles" Student Page, scissors, glue

Procedures:

Anticipatory Set:

Read one or both of the stories. Where are these set? In the polar regions! Look at the pictures. What do you think the weather is like? Cold! It is much colder at the poles than it is at home. This is because of where the poles are.

Development of Lesson:

1. Use the globe to locate the north and south pole. Explain that the earth tips the poles away from the sun for about half the year, and toward the sun for the other half. This means that for half the year it is dark, and for half the year it is light. This gives the poles the nickname "Lands of the Midnight Sun."
2. It also means that the polar regions only get heat from the sun for a short time each year. A summer day at the north pole only gets to about 50°F (a chilly fall day), and only about -5°F at the south pole – that's below zero!
3. Look at the pictures again. Are there any trees? No. The polar regions are above the tree line – that means that they are too far north for trees to grow. Part of the ground stays frozen year round – called permafrost – that keeps tree roots from going deep. Instead, there are grasses, mosses, lichens, and bushes (in the arctic).
4. Show the last page of Who Lives in the Arctic?. People live in the arctic. Would it be easy to live there? Why or why not? (hard to find food, shelter, stay warm, etc.)
5. People have been interested in finding out what it is like in the polar regions for a long time. Many people have made trips to explore them. Share some of the famous expeditions from the Background Information. You may wish to read an excerpt from Arctic Explorer: The Story of Matthew Henson by Jeri Ferris to older students. The explorers had to take everything they needed with them.
6. Pass out the student pages. Let's imagine that we were going on a trip to the polar regions. What sort of things would we need to take with us? Have the students cut out the things they would take and glue them in their sled.

Summary:

Discuss the things they put in their sleds. Why did they choose those things? Is there anything that they did not need to take? Why not? What else would they take? Why?

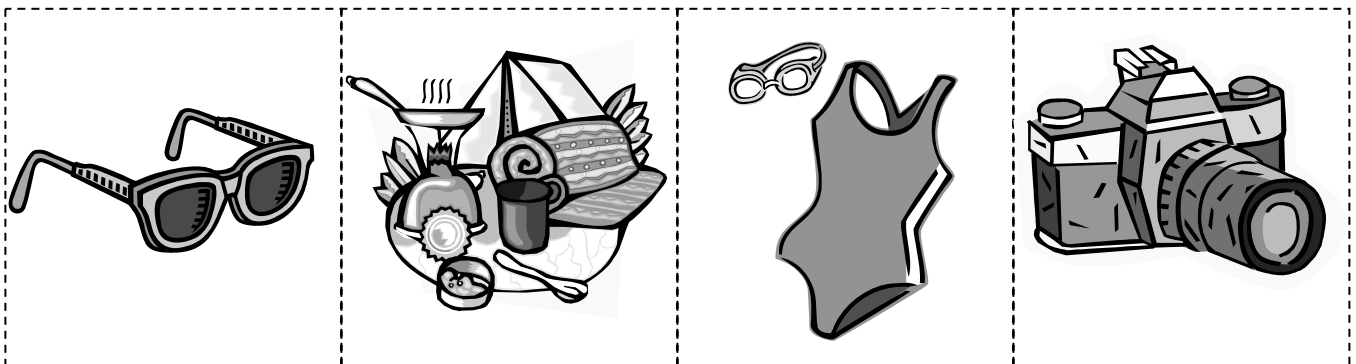
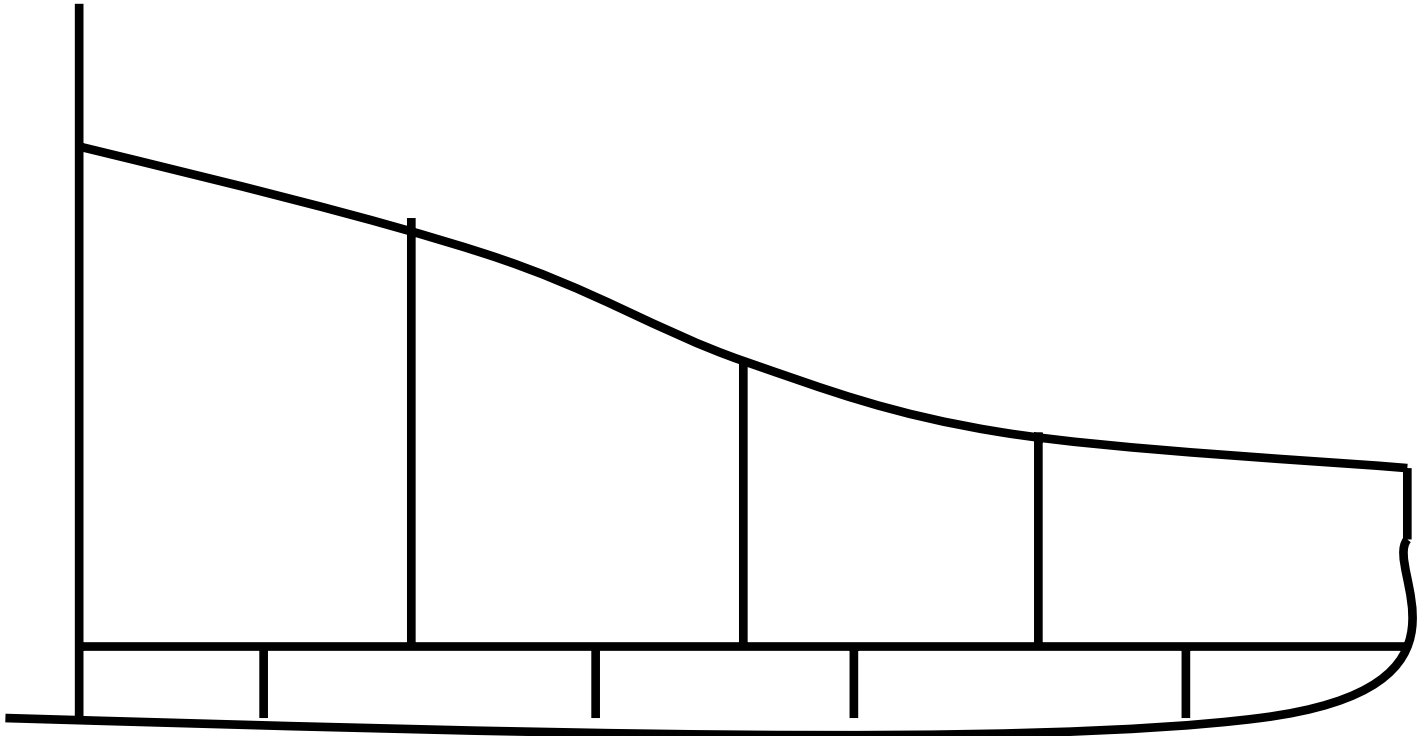
Extensions:

- Write a story about a trip to the polar regions! Share them with the class or publish them and put them in the library to share with other students.
- Find out more about polar phenomena like auroras by completing "Polar Lights."

Name _____

Journey to the Poles

What do you need to go to the polar regions? Cut out what you will take and glue them in the sled.



Journey to the Poles

Answer Key

Sled dog – a great way to get around. Dogsled is the preferred mode of transportation in the remote areas of the polar regions. Gas stations are few and far between in the polar regions, and many areas are inaccessible except by dogsled or air transport.

Sunscreen – it may seem strange, but sunscreen is a good thing to have at the poles, especially if you are there during the summer. You have 24 hour exposure to the sun's rays. Sunscreen will help to protect your skin. Be careful, though. Sunscreen stops being effective if it has been frozen.

Parka and snow boots – you definitely need to bundle up against the cold! Even in the summer, temperatures are still very low, especially in Antarctica!

Sunglasses – like sunscreen, a surprisingly good idea. Native Inuits wear goggles made from caribou antler that have a very narrow slit to let in just enough light to see. These “sunglasses” keep the glare from the snow out of their eyes. Continued exposure to the brightly reflected light can result in a condition known as snowblindness. Snowblindness is like a sunburn to the cornea of the eye which, in severe cases, can result in permanent damage and/or loss of vision.

Camping gear – there is little to no shelter available at the poles, so you must bring it with you. Without appropriate gear, you would freeze.

Bathing suit – sorry, no swimming pools at the poles!

Camera – scientists always want to document their findings! This is one way to make a record of your trip. Early explorers kept journals, too.

How Cold is Cold?

Content Area: Science, Math

Skills: observation, graphing, using instruments and technology

Objectives:

TSW describe the weather in the arctic.

TSW measure and record the temperature outside for at least a week.

TSW describe and record the weather outside for at least a week.

TSW record the weather and temperature in the arctic for at least a week.

TSW create a graph of the weather outside and in the arctic.

TSW compare the weather outside and in the arctic.

Materials: large sheet of graph paper (chart sized), red and blue markers, thermometer, weather symbols (sunny, cloudy, rainy, snowy, windy), outdoor thermometer, computer with internet access*

Procedures:

Before You Start: Copy the weather symbols. Laminate them, if you wish. Make a chart to graph the temperature. The chart will need to range from about 50°F to about -60°F (it may need to go higher, depending on your local weather). For older students, make a fairly precise chart with increments of about 5 or 10 degrees. For younger students, make a simpler chart with larger increments. Be sure to make a special mark at 32°F. Make a column for each day of the week, Monday through Friday. At the top of each column, write "Home" and "Arctic". Have a spot for a weather symbol and daily temperature for each. Use red for home, and blue for arctic.

Anticipatory Set:

Review the climate in the arctic. Do you think it is colder here or in the arctic? How could we find out? (measure the temperature) What do we use to measure the temperature? A thermometer. Show the students the thermometer. Demonstrate how to read it and explain what the numbers mean. (ex. the colder it is, the lower the number is) For the very youngest students, explain that the temperature goes down when it gets colder, and up when it gets warmer. Place the thermometer outside, preferably outside your classroom window or in another easily accessible spot.

Development of Lesson:

1. Show the students the weather chart. We will be keeping track of the weather each day. Explain what the numbers mean. Point out the special mark at 32°F. This is the freezing point. When temperatures fall below it, water freezes. Instead of rain, we get snow.
2. What is the weather like today? Have the students select the weather symbol that best represents the day's weather. Check the thermometer, and write it next to the weather. Use the chart to graph it. Have the students take turns doing these jobs each day.
3. Visit the Athropolis website to check today's weather in the arctic (found under "Maps").
*If you have a computer with internet access in the classroom or school library, do this at the time of the lesson. If not, do this ahead of time. Record the weather symbol and temperature on the chart.
4. Repeat this daily for at least a week.
5. At the end of the week, look at the chart. Connect the temperature recordings on the chart to make a line graph.

Summary:

Discuss what you found. Where was it colder most of the time? How often? By how much?

Extensions:

- Older students can do a more in-depth analysis of the data collected. What was the average temperature for the week at home? In the arctic? What was the greatest temperature difference? The smallest?
- Track Antarctica's weather, too! Up-to-the-minute are available through the Australian Antarctic Data Centre at <http://data.aad.gov.au/aadc/aws/>. *Note: temperatures are given in Celsius.

Weather Symbols



sunny



cloudy



snowy



rainy



windy

Kumak's House

Content Area: Language Arts, Social Studies, Science

Skills: listening, story telling, fine motor

Objectives:

TSW identify the arctic as the setting for the story

TSW compare their lifestyle to Kumak's

TSW name the arctic animals that appeared in the story

TSW create an add-on story about the arctic.

Materials: Kumak's House by Michael Bania, pictures of arctic animals, story strips (1 per student), crayons, glue

Procedures:

Before You Start: Copy the arctic animal pictures. Make story strips: cut 4 1/2" x 24" strips of paper. Mark fold lines every four inches (makes six pages).

Anticipatory Set:

Read Kumak's House. Where does this story take place? The arctic. Review what the students have learned so far about the arctic. Use the pictures in the book to aid your discussion of the story.

Development of Lesson:

1. Kumak and his family are Inuit. They live in the arctic. Some things about the way they live are very different from the way we live. Have the students identify differences and similarities. Differences: use a dogsled, eat salmonberries and blubber, use different tools, prepare animal skins for clothing, wear mukluks, etc. Similarities: family lives together, do chores like laundry, house looks very much like ours do, etc. *Note: many students are surprised that Kumak does not live in an igloo. Before contact with Europeans, the Inuit were nomadic, living off the land. They did not have permanent houses. Igloos were built as winter homes from the surrounding snow and ice. In the summer, families lived in skin tents. Today, igloos are usually built only as temporary shelters when far from home.
2. Have the students identify the animals that are in the story. Not all of these animals would be found within the arctic circle (like porcupines and sea otters), but can still be found on and around the tundra.
3. During the long winters, the Inuit people may be stuck inside for days or even weeks! Stories like the one just read are told to pass the time. Storytelling is considered to be a very valuable talent.
4. Have the students create their own add-on story! Give each student a story strip. Accordion-fold it along the fold lines. You may wish to do this ahead of time for the youngest students.
5. Turn it so the first page opens to the right. Make the cover. Include the title and author's name.
6. Open the cover and lay out the story. Write the story, including a different arctic animal on each page. Use the animal pictures and crayons to illustrate the story. Older students may do this themselves. The youngest students can dictate their stories to the teacher. Sample story:

Susie's House

This is Susie's house.

In came a ptarmigan.
 Next came a seal.
 Then came a polar bear.
 Along came a caribou.
 Susie's house was full!

7. Fold up the story strip into a book. Read it, revealing one page at a time until the entire story strip is revealed.

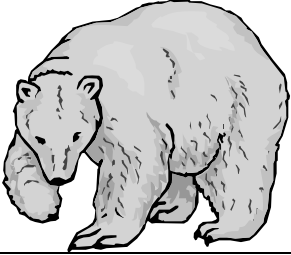
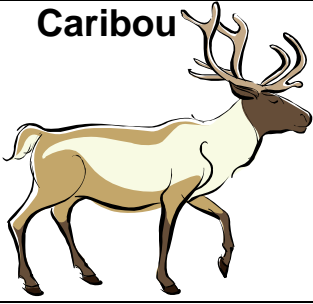

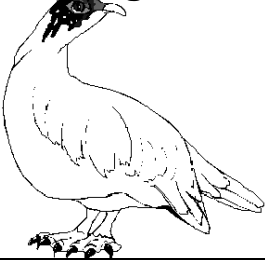



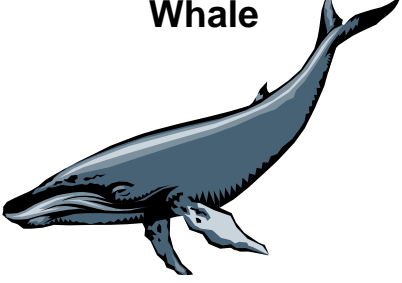




Summary:

Share the stories with the class. You may wish to share them with another class or

Extensions:

- Learn more about how Inuits passed the time during the long winters by playing some traditional Inuit games!
- Try an Inuit treat! Make Aana Lulu's doughnuts from Recipes.

Arctic Animal Pictures

<p>Polar bear</p> 	<p>Caribou</p> 	<p>Sea Otter</p> 
<p>Ptarmigan</p> 	<p>Wolf</p> 	<p>Snowy Owl</p> 
<p>Sea Lion</p> 	<p>Whale</p> 	<p>Arctic Hare</p> 
<p>Walrus</p> 	<p>Arctic Fox</p> 	<p>Lemming</p> 

Fur, Feathers, and Fat

Content Area: Science

Skills: comparing, sensory, verbal

Objectives:

TSW identify fur, feathers, and blubber as ways polar animals stay warm.

TSW define *insulator* as something that keeps heat inside the body.

TSW conduct an experiment to compare having fur, feathers and blubber to bare skin.

TSW compare the way fur, feathers, and blubber work as insulators.

Materials: zip-lock type sandwich- and gallon-sized baggies (**NOT** the easy-zip type), craft feathers, poly-fill, shortening, stapler, duct tape, plastic tubs, ice cubes or snow, water

Procedures:

Before You Start:

Make insulator gloves:

1. Take the sandwich sized bag and add about 1 c. of shortening. **DO NOT** get shortening on the outside of the bag. Note: if you are going to have this set up in your room for several days as a discovery station, use a heavy freezer bag or it may break open and you will have a big mess!
2. Take another zip-lock bag and carefully turn it inside out. Be careful not to tear the sides as you do this. Put it inside the first bag, aligning the male and female sides of the zip-locks. **DO NOT** get shortening on the inside of the bag.
3. Zip the bags together. Reinforce the top with staples, if necessary, **ABOVE THE ZIP-LOCK ONLY**, smooth side of the staple facing out. Cover the top edge with duct tape, cuff the top, and reinforce again with duct tape.
4. Distribute the shortening inside the bag, making sure that the bottom and sides are covered.
5. Repeat for feathers and fur (poly-fill), using the gallon-sized bags.

Fill your tub with snow or ice water.

Anticipatory Set:

Review the climate in the polar regions. How do animals stay warm? Some, like musk oxen, have warm fur. Some, like snowy owls, have feathers. Some, like whales, have a thick layer of fat called *blubber*. Some, like penguins and polar bears, use a combination of fur or feathers and blubber. These work as *insulators* – they help keep the heat inside their bodies.

Development of Lesson:

1. Look at your hand. Do you have fur, feathers or blubber? Predict: what will happen if you put one hand in snow by itself and one hand in the blubber glove in snow? Try it!
2. Repeat for the fur and feather gloves.
3. Predict: what happens if you put blubber and fur together? Try it! Put the blubber glove inside the fur glove, then into the ice water or snow. Is it warmer than just one of the gloves by itself?
4. Repeat for blubber and feathers.

Summary:

Discuss what they found. Which was warmer, your hand or the gloves? Which one glove do you think made the best insulator? What about when you put them together? What glove or pair of gloves made the best insulators of them all?

Extensions:

- Look at your winter clothes. How are they different from your summer clothes? What do they use as an insulator?

Camouflage Hide and Seek

Content Area: Science, Active/Creative Play

Skills: observation, color identification, gross motor

Objectives:

- TSW define camouflage
- TSW define predator and prey
- TSW play a game to demonstrate the effect of camouflage.
- TSW explain the effect of light levels on camouflage

Materials: How to Hide a Polar Bear by Ruth Heller, pictures of arctic fox, arctic hare, lemmings and wolf, ptarmigan shapes (at least one per student), tape

Procedures:

Before You Start: Gather pictures of arctic hare, arctic fox, arctic wolf, ptarmigan, lemmings, etc., in winter and in summer. The Athropolis website and National Geographic Kids <http://animals.nationalgeographic.com/> are great sources for these and other animal pictures. Cut ptarmigan shapes out of colored paper. Do your best to use colors that match those found in the classroom. Place the ptarmigans around the classroom, using tape to attach to vertical surfaces.

Anticipatory Set:

Read How to Hide a Polar Bear. What did the animals in the story do? Some of the animals in the arctic use their color to help them hide. We call this *camouflage*.

Development of Lesson:

1. Review the climate of the arctic. Is the weather the same in the summer as in the winter? What happens here? The same things happen in the arctic – it gets warmer and some of the snow melts.
2. When it does, some of the arctic animals trade their white winter coats for brown ones. Show pictures of some arctic animals that do this (fox, hare, lemming, ptarmigan, wolf).
3. Tell the students that they are going to be predators – arctic foxes (or snowy owls). They will be hunting for ptarmigans – their prey. Show students a ptarmigan cut out. The ptarmigans are hidden around the room.
4. Have the students find the ptarmigans. You may wish to give older students a time limit of 1-2 minutes.
5. Search until all ptarmigans are found or until time runs out.
6. During the winter, the north pole is tipped away from the sun. This makes it dark all day long. Play the game again, this time with the lights lowered to simulate the light levels during the arctic winter.

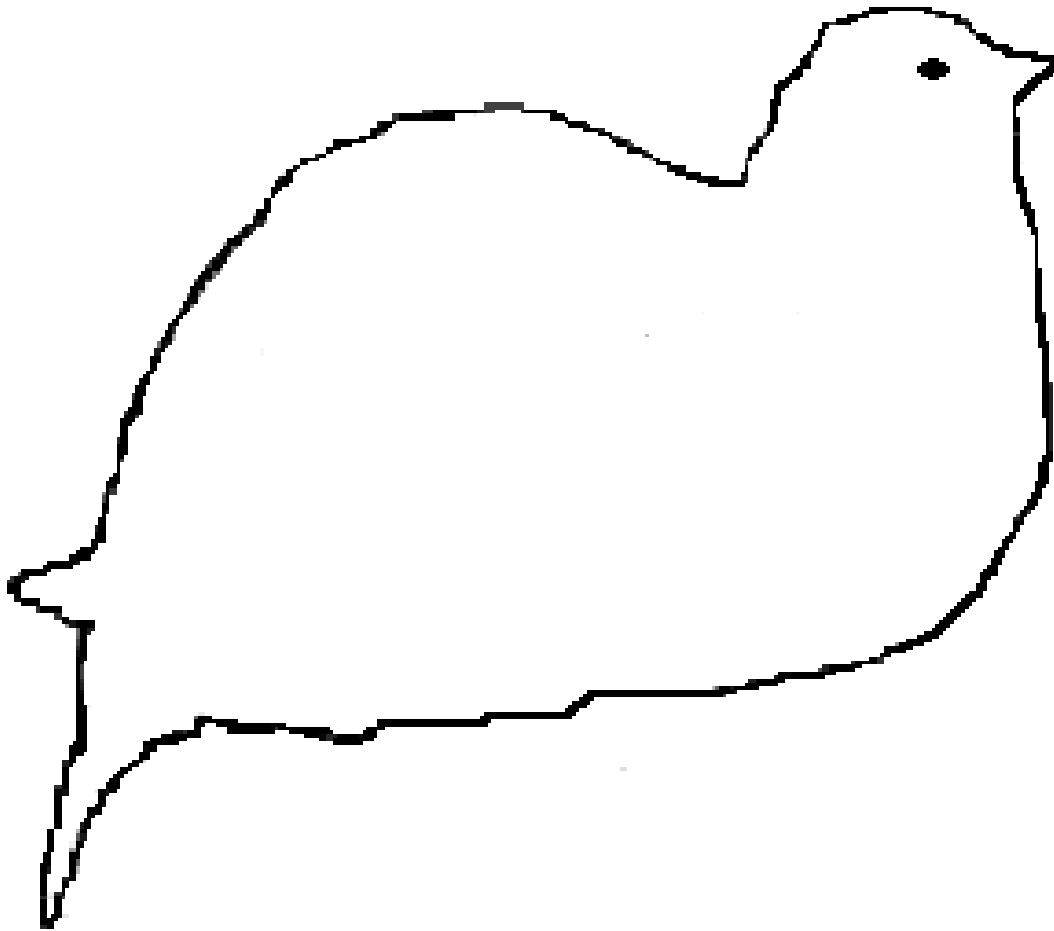
Summary:

Locate any ptarmigans. Which ptarmigans were easiest to find? Which were hardest? Why do you think that was? How did their color help them? What difference did the lowered light levels make? How do you think the light affects the animals in the arctic?

Extensions:

- Find out how much sunlight there is today in the arctic at the Athropolis website. You can find local sunrise/sunset times at <http://www.timeanddate.com/worldclock/sunrise.html>.
- Learn more about predators and prey by playing “My Den!” from Games.

Ptarmigan outline



Deep Breathing

Content Area: Science, Math

Skills: observing, following directions, comparing, using stopwatch

Objectives:

TSW time their ability to hold their breath.

TSW compare their time to a sea lion.

Materials: stopwatch (one per cooperative group), paper and pencil or chalkboard

Procedures:

Anticipatory Set:

Ask the students if they have ever gone swimming. Did you ever dive underwater? Can we breathe underwater? No. What did you have to do? Hold your breath. Sea lions dive underwater to get their food. Sometimes they stay under for up to 8 minutes!

Development of Lesson:

1. How long can you hold your breath? Let's find out! Divide students into cooperative groups of 2 or 3.
2. Give each group a stopwatch. For the youngest students, the teacher may run the stopwatch.
3. Have the students take a deep breath and hold it for as long as they can. When they do, start the stopwatch. When they breathe, stop the watch.
4. Record the time.
5. Repeat for each member of the group. You may wish to give each student a second try to better their time.

Summary:

How did you do? Did anyone come close to a sea lion's score?

Extensions:

- More Math Mania! Have older students find their average time, and the average for the class. Graph your results! Find out how many student's scores it takes to equal that of a sea lion. Find times for other marine mammals and birds and compare your scores to them.
- Move like sea lions and seals! Have a Seal Race from Games.

Penguin Parents

Content Area: Active/Creative Play, Science, Language Arts

Skills: gross motor, cooperation, eye-hand coordination, following directions, listening

Objectives:

TSW identify penguins as birds.

TSW explain the importance of keeping the egg warm.

TSW demonstrate the roles of penguin parents by acting it out.

Materials: The Emperor's Egg by Martin Jenkins, picture of a penguin, two-handed mittens or adult-sized mittens (1 per student), 6" footballs (1 per pair)

Procedures:

Before You Start: Two-handed mittens are not commercially available (as far as I know), but they are great for this activity. If you would like to make one, knitting instructions may be found at <http://www.gallentine.org/Knitting/loversmitten.html>. To make it kid-sized, use #8 needles, and only work about 4 inches after the increase row.

Anticipatory Set:

Show the penguin picture. Ask the students to identify it. What kind of animals are they? (Birds) What do birds lay? (Eggs) Read The Emperor's Egg.

Development of Lesson:

1. Where do penguins live? (Antarctica). What is the weather like? (Very cold).
2. How do the parents keep the egg warm? (They hold it on their feet) After mom lays the egg, she passes the egg to dad. He tucks it under his belly feathers with his beak. Dad keeps the egg warm while it is hatching. Is it important to keep the egg warm? Why? (If the egg gets cold, it will not hatch)
3. Let's try it! Put the students in penguin parent pairs. If you have a limited number of eggs (footballs), divide the class into squads. Line them up a few feet from each other. Give each pair (or squad) an egg and mittens. If they are using regular mittens, they should put both hands in one mitten. They may need assistance to do this.
4. Place the egg on top of one student's feet, tucked between the ankles. Have them carry the egg on their feet to the other parent. If they drop it, they may use their mittened hands as a beak to tuck it back onto their feet. Then they carefully transfer the egg to the other parent and return to their spot.
5. The other penguin parent now takes the egg back over to their partner (or the next penguin in line on the other side), and transfers the egg back.
6. Repeat this so that everyone has several chances to try this.

Summary:

What was it like to be a penguin parent? Was it harder than you thought? What was the hardest thing? What was the easiest? Did you get better after you had a chance to try it a few times? So do penguin parents!

Extensions:

- Run the egg carry as a relay race!
- Watch a video clip from March of the Penguins to see how real penguin parents take care of their eggs. *Note: this excellent documentary shows some eggs and chicks that do not survive. It may be disturbing to some students.

Penguin Jump

Content Area: Science, Math, Language Arts

Skills: measuring, gross motor, listening

Objectives:

TSW measure their long jump.

TSW measure their vertical jump.

TSW compare their jump to that of a penguin.

Materials: Little Penguin by Patrick Benson, masking tape, measuring tape, marker

Procedures:

Anticipatory Set:

Read Little Penguin. Discuss Pip's adventure. How did Pip get onto William's back? She jumped. Penguins are amazing jumpers! They can jump six feet up out of the water onto the ice. How far can you jump? Let's find out!

Development of Lesson:

1. Use the masking tape to mark a starting line on the floor. Measure out six feet and put a tape line. Write "Pip Penguin" on the tape.
2. Have each student stand with their toes behind the starting line. Have them jump straight out as far as they can. Mark each student's jump with tape and their name.
3. Measure the distance each student jumped and write it on the tape. Older students may do this themselves. The youngest students can simply compare their line to the penguin line.
4. Now see how high they can jump. Measure up six feet from the ground and put a tape line. Write "Pip Penguin" on the tape.
5. Have the students stand next to the wall and try to jump high enough to reach the tape line. You may wish to mark and measure jumps for older students.

Summary:

How did you do? Was anyone able to jump as far as a penguin? As high? Point out that the tape is how high the penguin's **feet** go – not their reach.

Extensions:

- Have older students find the average jump for the class and compare it to the penguin's jump. Graph the results.
- Compare more of yourself to penguins by making a Personal Penguin from Crafts!

Polar Lights

Content Area: Art, Science

Skills: fine motor, following directions

Objectives:

TSW define aurora.

TSW create their own aurora picture.

Materials: black construction paper (1 per student), colored chalk, salt water, paintbrushes

Procedures:

Before You Start: Gather pictures of the auroras. You can find great pictures of both the aurora borealis and aurora australis at Wikipedia [http://en.wikipedia.org/wiki/Aurora_\(astronomy\)](http://en.wikipedia.org/wiki/Aurora_(astronomy)) .

Make the salt water: combine 2 c salt in a 2-liter bottle of water. Shake until completely dissolved.

Anticipatory Set:

Ask the students if they have ever watched fireworks. What do they like about them? In the polar regions, there beautiful lights in the sky. They are the auroras, sometimes known as the Northern Lights (aurora borealis) or Southern Lights (aurora australis).

Development of Lesson:

1. Show pictures of the auroras. These lights are not made by fireworks. They are light caused by a reaction in the atmosphere high above the earth. Use the background information to give a more detailed explanation to older students.
2. Let's make an aurora picture! Give each student a piece of black construction paper. Use the chalk to create swirls of color.
3. Brush salt water carefully over the chalk. Allow this to dry. When it does, the salt crystals will make it sparkle!

Summary:

Display the pictures in the classroom.

Extensions:

- Find out more about the earth's magnetic field. Use a compass to find magnetic north. What happens if another magnet comes close to the compass?
- Experiment more with magnets! Bring in a variety of magnets. What do they stick to? What won't stick? Make a magnet by rubbing a paperclip along the magnet's side and use it to pick up other paperclips. Explore polarity by bringing the ends of bar magnets together. Turn them around. Do they still come together?

Songs

Content Area: Music, Science, Language Arts

Music is a great way to sharpen grammatical skills and, at the same time, present new material or check for understanding in a new and exciting way. Kids really connect with it, so it also makes a great memory tool. Not only that, it's FUN!

Peter Penguin

(chant)

Peter, Peter Penguin
Marching by (march in place)
Toes turned out, (point to toes, then point out)
And his head held high. (lift chin up with finger)
With a long black coat (make coat tails with your hands)
And a clean white vest, (put thumbs to chest and sway)
Peter, Peter Penguin, (march in place)
You're the best! (point to a friend, then pump your arm in the air)

I'm a Little Penguin

(sung to "I'm a Little Teapot")

I'm a little penguin, black and white.
Stout and fluffy, what a sight!
I can't fly, but I love to swim.
So I'll waddle to the water
And dive right in!

Walk on all fours,
On rocky seashores,
Barking loudly.
Can you tell me what I am?
(RESPONSE: Sea lion!)

On the ice floe,
I will bellow.
Long white tusks
Can you tell me what I am?
(RESPONSE: Walrus!)

The Polar Regions

(sung to "Here We Go 'Round the Mulberry Bush")

The polar regions are very cold
Very cold, very cold
The polar regions are very cold
All year long.

Furry feet,
Big sharp teeth,
Lots of blubber
Can you tell me what I am?
(RESPONSE: Polar Bear!)

The poles are dark for half the year
. . . And then they're light.

You'll just find bushes, grass and moss
. . . There are no trees

Pointed beak,
Feathered feet
Hunting lemmings
Can you tell me who I am?
(RESPONSE: Snowy Owl!)

The animals have fur, feathers and blubber
. . . To keep them warm.

I've Got Whiskers

(sung to "I Got Rhythm")

I've got whiskers,
Short front flippers,
Have no ear flaps,
Can you tell me what I am?
(RESPONSE: Seal!)

Strong legs, long ears
Help ease my fears
Changing colors
Can you tell me who I am?
(RESPONSE: Arctic Hare!)

Make up your own verses!

Recipes

Content Area: Math, Science

Cooking with children is a great way to introduce many basic math concepts such as comparing volume, weight and quantity. As you make these recipes with your children, have them count the ingredients, weigh them, measure them, and compare the amounts of different ingredients. You can even graph them! Basic science concepts in physics (states of matter: room temperature = liquid, frozen/chilled = solid, boiling = gas) and chemistry (dissolving = solutions, combining/mixing = compounds) may also be demonstrated. All that, plus a yummy treat to eat!

Polar Bear Cupcakes

- Cupcakes (1 per student)
- White icing
- Chocolate chips
- Junior Mint candies
- Shredded coconut
- White gumdrops (1 per student), cut in half

Directions:

1. If the cupcakes have paper cups around them, take them off.
2. Ice the cupcake all over with frosting. To make it a little less messy, do the bottom first. Use a fork to hold the cupcake while you do the top.
3. Roll the cupcake in shredded coconut. Put it on a plate on its side (bottom facing you).
4. Press a junior mint candy in the center of the side facing you. This is the bear's nose.
5. Press two chocolate chips into the icing just above the nose. These are the bear's eyes.
6. Put the gumdrop halves on top to make ears.

Caribou Crunchies

- 2 c chocolate chips
- 1 (15 ounce) box Crispix or Rice Chex
- 1 c peanut butter
- ½ c butter or margarine
- 3 c powdered sugar

Directions:

1. Heat chocolate chips, peanut butter and margarine on HIGH in a glass bowl in microwave until melted — mix well.
2. Combine cereal and chocolate mix. Stir until completely coated.
3. Place powdered sugar in a bag, add cereal mix, and shake to coat.
4. Spread on wax paper. Let stand until set.

Penguin Pops

- Fruit juice
- Candy fish
- Clean, small craft sticks (**NOT** colored)

Directions:

1. Lightly coat an ice cube tray with cooking spray.
2. Place a candy fish in each cube.
3. Fill tray with juice.
4. Cover the tray with plastic wrap.
5. Gently poke craft sticks through the wrap into each cube.
6. Freeze overnight or until solid.
7. Remove plastic wrap and unmold.

Aana Lulu's Doughnuts

Aana Lulu's doughnuts are deep fried rings of bannock dough. It is said that Inuit children prefer these "doughnuts" to sweet cookies. These can be baked, pan fried, or deep fried.

- 1c whole wheat flour
- ½ c all-purpose flour
- ½ c old fashioned oatmeal (**NOT** instant)
- 2 T sugar
- 2 T butter, melted
- 2 t baking powder (optional, if not baking)
- ½ t salt
- 1/3 c raisins, blueberries, cranberries or dried apricots
- ¾ c water, approximately
- oil for frying (optional)

Directions:

1. Combine the flours, oatmeal, baking powder and salt.
2. Add the butter, fruit, and water. Mix well. Add more water, if necessary, to make a sticky dough.
3. To bake: With floured hands, pat into a greased pie pan. Bake at 400° for 20 – 25 min. until browned and a toothpick comes out clean.
4. To pan fry: Heat ½" oil in a cast iron skillet. With floured hands, divide into 10 – 12 balls. Pat flat, and fry until golden. Drain on paper towels.
5. To deep fry: Heat oil to 375°. With floured hands, divide into 10 – 12 balls. Shape into rings, and deep fry until golden. Drain on paper towels.
6. Variations: This recipe is VERY forgiving, and can be varied in many, many ways. Cornmeal may be substituted for some of the flour in addition to, or in place of the oatmeal. Oil or fats of almost any kind may be used in place of the butter (the Inuits would most likely have used seal oil or melted blubber, both in the dough and to fry). Berries or dried fruit of almost any kind may be used, alone or in combination.



Games

Content Area: Active/Creative Play, Science

Games are a fun and active way to improve your students' gross motor skills while reinforcing scientific concepts such as predator/prey, habitat components, locomotion, and natural history.

Polar Bear and Seal

Polar bears will wait outside seal breathing holes for hours, then strike with amazing speed and strength to catch their prey. Seals dive under the ice to try to escape.

Materials: none

Directions:

1. Select one camper to be the seal and one to be the polar bear. The rest form a circle around the seal and join hands. The polar bear stays outside the circle.
2. The seal starts the game by ducking out of the circle and running around the players. The polar bear must try to tag the seal, staying outside the circle. The seal may run in and out of the circle. The circle players may lift their arms over the seal's head to help them, and likewise block the polar bear.
3. When the polar bear finally tags the seal, the seal becomes the new polar bear. The polar bear joins the circle, and another player becomes the new seal. You may wish to select both a new seal and a new polar bear, and have the old ones rejoin the circle.

Arctic Fox! (Assassin)

Camouflage not only hides prey, but predators, too. It can be hard to spot them, even when you're on the lookout!

Materials: none

Directions:

1. Sit in a circle.
2. Secretly select an arctic fox: have everyone bend over and hide their eyes. Gently tap one player on the back. They will be the arctic fox. Everyone else is a lemming.
3. The arctic fox makes eye contact with a lemming and winks at them. When they have been winked at, the lemming says, "Arctic fox!" and drops out of the game. They have been eaten.
4. The other lemmings try to guess the identity of the arctic fox before they are winked at and eaten.
5. If someone catches the arctic fox in the act of winking, they win. If the arctic fox eats all the lemmings but the last one (who will soon figure out who the arctic fox is by process of elimination), the arctic fox wins.

The Nose Knows

Polar bears have an amazing sense of smell. They can smell prey miles away, and can smell seals and other prey in their dens about 3 feet under the ice and snow

Materials: Smell vials (see directions)

Directions:

1. Sit in a circle. Pass a film canister with a cotton ball and a scented liquid in it (ex. vanilla, vinegar, perfume, soap, banana extract, etc.).
2. Sniff the canister. Try to identify whether the liquid is edible.
3. After everyone has had an opportunity to smell the vial and given their opinion, identify the liquid.
4. Repeat with 2 or 3 more scents. Be sure to include some edible and some inedible liquids.
5. Did you identify what could be eaten? Did any fool you? Which were hard to tell?

During the long winters, the Inuit people had to remain inside for long periods of time, so they needed to find ways to pass the time. Games were played by both young and old alike. The following are some traditional Inuit games. The Inuit name for the game is included.

Laughing Contest – *illagasuanig*

With an even number of players, each faces a partner. The object is to laugh and laugh and laugh. The pair that laughs the hardest and the longest wins.

Not-laughing Contest – *illatailirniq*

Pairs of players face their partners. No one is permitted to smile. The first to smile or laugh loses and the last to smile wins.

Making Hideous Faces – *nassilaq*

See who can contort his/her face to make the most hideous and grotesque face. Being able to do this masterfully is considered a talent.

Wolfman – *amarujaq*

This is a variation of tag. One player is the wolfman and the other players are caribou. The wolfman tries to tag a caribou. When he does, the caribou becomes the new wolfman. Play continues until everyone is exhausted.

Crack the Whip – *ussutaq*

Players form a line and hold hands. The first person leads the line in a way that causes the line to wind and snake around. As the line whips around the corners, the players are not to let go of each other's hands. The person who lets go loses. (The penalty, in some regions, was that the loser got his bellybutton touched.)

Seal Racing – *natiuguatuq*

Players get on the ground, stomach down, and straighten their arms, palms on the floor. On a signal, the race starts. Players use their hands and arms to move forward, letting their bodies drag behind them.

Ball Games

Inuit balls could have been anything from a smooth stone to a bone to a ball made from seal or caribou skin and stuffed with sand or moss. These games can be played with any balls available.

Tossed Ball – *pattaq igitaq*

Take a lightweight ball (like a beach ball or even a balloon) and toss it up in the middle of the group of players. Everyone must try to keep the ball in motion without letting it stop or touch the ground.

Toss the Ball – *arsamit igitiqataniq*

Players kneel in a circle. The person directly across from them is their partner. Partners toss a small ball back and forth to each other. Interceptions are permitted, but everyone must remain kneeling. The pair that tosses the ball between them the most times wins.

Open-Hand Ball Pass – *agganigit isivingainaluni tunisiqatautiniq aataaijami*

Players sit in a circle and a ball is passed from player to player on the palms or open hand only. The ball is passed faster and faster. The object is to see how long the ball can be passed without dropping it.

Crafts

Content Area: Art, Science, Math

Crafts are a fun way to improve your students' fine motor skills, matching, and counting. They also give you the opportunity to review the different forms and functions of each part of the animal. Each of these crafts uses a pattern for at least one portion of the craft. They can be found following the instructions.

Penguin Pin

Materials:

- wooden spoon craft sticks (3 per student)
- tiny google eyes (2 per student), paint brushes
- black and white tempera paint
- glue
- orange construction paper triangles (1 per student)
- pin backs (one per student)

Directions:

1. Paint 2 spoons black and 1 spoon white. Let them dry.
2. Glue the black spoons in a V. Glue the white spoon behind them so that it shows in the open space.
3. Glue on the orange construction paper triangle. This is the penguin's beak.
4. Glue on 2 small google eyes.
5. Glue the pin on the back.

Personal Penguins

Materials:

- Black and white construction paper, cut into half sheets
- Yellow construction paper diamonds
- 1" x 3" orange construction paper strips
- Large google eyes
- Yellow craft feathers (optional)
- Craft sticks
- Tape
- Glue
- Scissors
- Pencil or crayons for tracing

Directions:

1. Trace your foot on the white construction paper and cut it out. This is the penguin's body.
2. Fold the black paper in half, short and fat like a book. Trace your hand, fingers and thumb together, and cut out. These are the penguin's flippers. Glue them on either side of the body.
3. Fold the orange strip in half. Trace your 3 fingertips so they are touching, and cut out. These are the penguin's feet. Glue them at the bottom of the body
4. Fold the yellow diamonds in half. This is the penguin's beak. Glue on the head.
5. Glue on google eyes. Add yellow feathers to the head, if you want to make a crested penguin (like a rockhopper or macaroni).
6. Tape a craft stick to the back and use your penguin as a puppet.

Caribou Hat

Materials:

- Brown construction paper, cut into 4" x 24" strips
- Card stock
- Brown construction paper, cut into 1" x 3" strips
- Brown construction paper ears
- Scissors
- Brown or black 1" pompoms
- Stapler
- Glue

Directions:

1. Measure the long strip around the student's head to make a headband. Staple to hold in place.
2. Fold the cardstock in half. Trace student's hands on cardstock. Cut out to make antlers.
3. Glue the short strip in the center of the headband. Glue a pompom at the end. This is the nose.
4. Glue or staple the antlers to the top of the headband. Glue the ears to the top of the headband on either side of the antlers.

Paper Plate Walrus

Materials:

- 10" paper plates (1 per student)
- 6" paper plates (1 per student)
- 6" paper plates, cut in half (3 pieces per student)
- Wide craft sticks (2 per student)
- Brown and white tempera paint
- 2" pieces of yarn
- Markers
- Glue
- Stapler

Directions:

1. Glue or staple the 6" plate to the 10" plate to make the head and body.
2. Glue or staple two half plates at the bottom to make flippers.
3. Fold the outside corners of the remaining half plate back to make a trapezoid shape. Glue this to the head to make the muzzle.
4. Paint the walrus brown. Paint the craft sticks white. These are the tusks. Let dry.
5. Glue the tusks to the underside of the muzzle. Glue yarn to the muzzle to make whiskers.
6. Add details such as eyes and nose with markers.

Polar Bear Prints

Materials:

- Blue construction paper
- White tempera paint
- White crayons or chalk
- Black markers
- 2" white construction paper ovals
- Artificial snow
- Glue

Directions:

1. Cover the student's palm with paint. Make a handprint on the construction paper, holding the thumb close to the hand. Turn the paper over. This is the polar bear's body. The fingers make the legs, and the thumb is the tail.
2. Glue on the ovals to make a head. Dip fingertip in the paint to make ears.
3. Draw a face with the black marker.
4. Use white crayons and glue on artificial snow to make a frosty background. *Note: if artificial snow is not available, use white paper punches.