



Putting Antarctica on the Map

Middle School Grades

Lesson Summary

Students will start with a “pop quiz” about Antarctica and fill in a map of locations and features. Then the students will compare and contrast the arctic with the Antarctic and their home state.

Prior Knowledge & Skills

- Map skills
- Knowledge of the Polar Regions

AAAS Science Benchmarks

The Mathematical World (with expand/adapt/connect #2)

Reasoning

NSES Science Standards

History and Nature of Science

Science as a Human Endeavor

NCGE Geography Standards

The World in Spatial Terms

Standard 1

Places and Regions

Standard 4

Standard 5

Physical Systems

Standard 8

Teaching Time: ~ 1.5 hours

Materials

- Paper to cover a 4 x 4 ft. bulletin board
- Overhead projector
- Transparency of the Antarctic continent made from Blackline Master #2 (supplied)
- Markers, crayons, pens
- Atlases, encyclopedias, CD-ROMs, access to on-line research sources
- Individual outline maps of Antarctica for students made from Blackline Master #2

Advanced Planning

Preparation Time: ~10 minutes

1. Review the instructions
2. Gather the necessary supplies.

Recommended Reading: (attached)

- Teacher Background

NASA Quest: An Educational Website

http://quest.arc.nasa.gov/antarctica2/main/t_guide/activity_A1.html



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A.1 Putting Antarctica On the Map

Teacher Background

Although Antarctica is certainly "of this world," it's so distant and alien that some students may perceive it as "out of this world!" There are many misconceptions and much misinformation about this remote, frozen continent. The main purpose of this Opening Activity is to begin a process of discovery and exploration to enable your students to sort out Antarctic fact from fiction. Who lives here? Are there indigenous peoples? Are there cities? Where are the research stations? Who "owns" Antarctica? Who or what sets the rules for this vast continent of more than 5.4 million square miles, but fewer than 3,000 seasonal residents? Are there mountains? Volcanoes? Deserts? Rivers? Valleys? If so, where are they? What mammals, birds, and fish are considered "native" to Antarctica? And... are there any polar bears? (Just checking!)

Today, we know geography is more than making maps and memorizing the names of the states and their capitals. Geography seeks to identify, analyze, and explain how regions change over space and time, how physical processes influence ecosystems and how human processes contribute to changes in those ecosystems. (See [Blackline Master #1](#), The Five Themes of Geography.)

Objective

Students will assess what they already know about Antarctica, and begin to identify, research and position new Antarctic features on a map of the continent.

Materials

- paper to cover a 4 x 4 ft. bulletin board
- overhead projector
- transparency of the Antarctic continent made from [Blackline Master #2](#) (supplied)
- markers, crayons, pens
- atlases, encyclopedias, CD-ROMs, access to on-line research sources
- individual outline maps of Antarctica for students made from [Blackline](#)

Master #2

Engage

Ask students to brainstorm about Antarctica. Here's a ten item "pop quiz" to test their knowledge of this vast (as large as North America and Mexico combined) and mysterious (visited to date by fewer humans than would fill a sports stadium!) continent. Have them write a true or false answer to each statement as you read it aloud:

1. Antarctica is the largest continent. (F)
2. There are cities in Antarctica. (T: McMurdo in summer swells to over 1,500 people)
3. You will find polar bears in Antarctica. (F)
4. Antarctica doubles in size and shrinks each year. True or False, and Why? (T: The ice sheet grows and melts from winter to summer.)
5. Antarctica is a continent covered by ice and snow, just like the Arctic. (T: for Antarctica. F: for the Arctic, which is ice over water, and is not a continent)
6. Daylight lasts for six months at the South Pole. (T)
7. There are rivers and volcanoes in Antarctica. (T)
8. There is water under nearly all the ice. (F)
9. Penguins live only in Antarctica. (F: Penguins live elsewhere south of the equator, including coasts of South America, Southern Africa, and islands north of Antarctica.)
10. Antarctica is a territory of the United States. (F)

Check the test and ask students if their scores are "keepers" or if they would prefer a re-test at a later date. Ask students to file the quiz in their Antarctic Logbooks for later reference. Re-administer the pop quiz at the end of Live From Antarctica 2 and let students compare their results.

Note: the NSF booklet Facts About the USAP and the CTW/NSF Antarctica brochure co-packaged with this Guide contain geographic information which can be used with this Activity. NSF's Facts... is also on-line at the LFA 2 site. [Blackline Master #3](#) is a simplified map with a limited number of place names. The LFA 2 Kit also includes an oversize USGS map packed with data.

Explore

Discuss whether it's frustrating to miss answers to straightforward questions. Explain that participating in Live From Antarctica 2 can keep this from happening a second time. Encourage them in the coming weeks to see how many geographical features-physical, political, human, animal, economic, cultural and others-they can locate to boost their "A.K.Q." ("Antarctic Knowledge Quotient").

Procedure

1. Make a map transparency of Antarctica from [Blackline Master #2](#). Project it onto a 4' x 4' piece of paper and trace the outline of the continent. Place it where it can

be permanently displayed during the Live From Antarctica 2 unit. (Perhaps in a school corridor, where others can enjoy the ongoing discovery process?)

2. On lined chart paper next to the map, list the places and features found on the reverse of [Blackline Master #2](#).

3. Have students form teams of 2-3. Distribute copies of [Student Worksheet #A.1](#) "North Pole, South Pole, My State" to each team to set up a kind of "Antarctic Geography Scavenger Hunt", and (at your discretion) [Blackline Master #4](#), "Contrasting Poles," which is a summary of key differences between the Arctic and Antarctic. Have students use all available research tools to "fill in the blanks", and share their findings with the class, transferring the places, features and creatures from the list onto the outline of the continent. Add new places, features and creatures that can be found in the videos or on-line.

Expand/Adapt/Connect #1

In the picture book, *Where's Waldo?*, readers try to locate Waldo as he wanders among crowds in various places around the world. LFA 2's video producer in the Antarctic is Deane Rink: you can find his informative Field Journals on-line. This is his fifth visit to Antarctica to make TV documentaries. He's visited just about every research station operated by the USAP and many bases of other nations. He'll be posting special "Where's Deane Been?" Challenge Questions on-line during the course of the project, with clues as to what locations he's referencing. After completing the map exercise outlined in this Activity, and throughout LFA 2, use Deane's postings to review students' new knowledge of Antarctica's geography by tracking Deane's travels around the frozen continent.

Deane has visited and worked in: McMurdo Station, the McMurdo Dry Valleys, Amundsen-Scott South Pole Station, what was the Soviet Union's Vostok Base, Palmer Station, Rothera, and King George's Island, as well as field sites in the Allan Hills (searching for meteorites) and Central West Antarctica. Have students work up "clues" for this game of "20 Geo-Questions." (no on-line access necessary).

Procedure

1. Divide the class into two teams. Team "A" agrees upon a sequence of 5 locations on the Antarctic continent that Deane has visited, writes them down, and gives a folded copy of the itinerary to the teacher.
2. Team "B" has 20 chances to track Deane by asking careful questions that will pinpoint his present location and future direction (e.g. north, northeast, etc.). (Assume for the sake of this Activity, that he's got a "Magic Helo" with no fuel limits, which can take him anywhere, in any sequence, in any direction, rather than the real path he had to follow.)

Some examples of questions:

Is Deane visiting an American research station on a peninsula?

Is Deane eating Thanksgiving dinner near Lake Hoare? (read his Field Journals in [LFA 1](#))

Is Deane visiting the most populated settlement on the continent?

Expand/Adapt/Connect #2

Once students have enough new knowledge to feel confident, they can give the pop quiz to parents or younger students and then play Where's Deane Been? as a mentoring/learning experience.



Have students search for Antarctic maps on the Internet. (Check the LFA 2 Home Page as a place to start.) Have teams research and report to the whole class on the use of space-age technology (satellites, etc.) to create maps of Antarctica, the seasonal sea-ice surrounding it, the ozone hole, even the life-forms which live in the oceans. How does this technology work to create maps that track climate? Wildlife populations?



Using maps of Antarctica, have students work in teams to take measurements:

- Palmer Station to McMurdo Station
- Punta Arenas, Chile to Palmer Station
- Palmer Station to Los Angeles

Have some go on-line and read Deane's Field Journals to see his actual travel path to the Antarctic in 1996-97 (LA, Auckland [NZ], Christchurch, McMurdo, South Pole, McMurdo, Christchurch, LA, Miami, Santiago [Chile], "P.A.", Palmer!)

Using the map's scale, convert measurements to miles and/or kilometers. Record distances on the class chart and compare. How do you account for the variations? (Maps with smaller scales lead to bigger errors.) What's the range of error?



Most scientific research uses the metric system, e.g. NSF's Facts... packaged with this Guide. Review metric measurement for temperature (Celsius rather than Fahrenheit) and distance (kilometers rather than miles). Have students practice using appropriate conversion formulas (see Glossary for C/F formulas) and post a temperature chart illustrating Celsius/ Fahrenheit temperatures.



Last Update: 1/18/97

Comments on the LFA Web site:

[Webspinner.](#)

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SPACE



AEROSPACE



ASTROBIOLOGY



WOMEN OF NASA

.....
DONALD JAMES IS THE RESPONSIBLE NASA OFFICIAL FOR NASA QUEST.
MARK LEON IS THE RESPONSIBLE NASA OFFICIAL FOR THE LEARNING TECHNOLOGIES PROJECT.

Five Themes of Geography

Blackline Master #1

1. **Location**

(Absolute and Relative): Location answers the basic question: "Where?" Absolute and relative location are two ways of describing the positions of the Earth's physical and cultural features.

2. **Place**

(Physical and Human Characteristics): All places on Earth have special features that distinguish them from other places. Geographers usually describe places by their physical and human characteristics.

3. **Human-Environment Interactions**

(Relationships within Places): People interact with their environments and change them in different ways.

4. **Movement**

(Mobility of People, Goods, and Ideas): People everywhere interact. They travel from place to place, they communicate and they depend upon other people in distant places for products, ideas, and information.

5. **Regions**

(How They Form and Change): Regions are areas on the surface of the Earth that are defined by certain unifying characteristics. These characteristics may be physical. Or they may be human.

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National Geographic Society, *Teaching Geography: A Model for Action*, 1988
http://www.nationalgeographic.com/ngs/geo_ed/geoed30.html

Antarctica

Blackline Master #2



Locate as many of these *creatures* and *geographic features* on your Antarctic map as you can. Watch out - some of the creatures *do not belong* in the Antarctic!

Geographic Features

Amundsen-Scott South Pole Station
 Antarctic Circle
 Antarctic Convergence
 Antarctic Ocean
 Antarctic Peninsula
 Anvers Island
 Balleny Island
 Beardmore Glacier
 Bouvet Island
 East Antarctic Ice Sheet
 Ellsworth Mountains
 Geographic South Poles
 Geomagnetic South Pole
 Gerlache Strait
 Heard Island
 Indian Ocean

Creatures

Adelie penguins
 algal mats
 Antarctic hairgrass
 Beluga whales
 blue whales
 dinosaur fossils
 elephant seals
 Emperor penguins
 endolithic organisms
 finback whales
 Great Auks
 indigenous peoples, such as Eskimos
 international research stations
 kraken
 leopard seals
 lichens

King George Island	Macaroni penguins
Magnetic South Pole	ostriches
Marie Byrd Land	pearlwort
McMurdo Dry Valleys	polar bears
McMurdo Station	sei whales
Mount Erebus	skuas
Palmer Station	USAP field teams
Ronne-Filchner Ice Shelf	USAP research stations
Ross Ice Shelf	walruses
Ross Island	Weddell seals
Rothera	
Scott Base	
Sentinel Range	
South Atlantic Island	
South Georgia Island	
South Orkney Island	
South Pacific Ocean	
South Sandwich Island	
South Shetland Islands	
Transantarctic Mountains	
Vostok	
Victoria Land	
Weddell Sea	
Vinson Massif	

Antarctica

Blackline Master #3



Activity A.1

Student Worksheet #A.1

North Pole, South Pole, My State

Name:

Date:

Make a chart comparing these opposites:

	Arctic	Antarctic	My State
land forms			
area			
highest point			
lowest point			
sea mammals			
land mammals			
sea birds			
indigenous peoples			
population			
major cities			

The Contrasting Poles

Blackline Master #4

The Arctic North

The Antarctic South

Ocean basin enclosed by continents.	Continent surrounded by ocean world.
Winds, ocean currents restricted to an internal basin.	Winds, ocean currents circumpolar, uninterrupted by land masses.
Icebergs, derived from glaciers, seasonal measured in cu. meters.	Icebergs derived from glaciers and shelf ice; persistent and may measure in excess of 100 cu. m.
Sea ice multiyear, circulates in polar gyre, annual thickness to 1.5m.	Sea ice annual, outward growth doubles continental extent, annual thickness to 2.5m.
Land ice in limited areas; largest Greenland ice sheet.	97.6% of land covered in almost unbroken South Polar ice cap.
Elevation at North Pole 1m of sea ice; bedrock 4300m below sea level.	Elevation at South Pole 2912m above sea level; bedrock 34m above sea level.
North Pole mean annual temperature -18 degrees C; no research station.	South Pole mean annual temperature -50 degrees C; permanent 30 person, meteorological and geophysical research station.
Beaches and shallow extensive continental shelf.	Beaches rare; narrow deep continental shelf backed by vertical ice cliffs.
Frozen ground extensive, over 500m.	Frozen ground limited to ice free areas.
Tundra well developed, extensive, marked by a tree, shrubline.	No tundra, no tree line. Subantarctic zone marked by antarctic convergence.
90 species of flowering plants at 82 degrees N lat., 450 species at 66 degrees -70 degrees N lat.	Crustaceous lichens at 82 degrees S lat., 2 species of flowering plants at 66 degrees -70 degrees S lat., vegetation primarily lichens and mosses.
Arachnids, crustaceans, insects, and myriapods numerous and common.	Free living arthropods include insects (2), mites (150), Collembolla (6), scarce.
Musk ox, reindeer, caribou, fox, hare, wolf, lemming, bears, etc.	No terrestrial animals.
Whales and porpoises (18), seals (7), amphibious mammals (1).	Whales and porpoises (14), seals (4).
Bird species 107 (75 degrees -80 degrees N lat.).	Bird species 19 (70 degrees -80 degrees S lat.).
Primitive man with long rich cultural record; ethnic groups circumarctic.	No record of primitive man; no native groups.

Human population 60 degrees N, in excess of 2 million, modern settlements, widespread exploitation and technological development.	Population 60 degrees S sparse, scattered at scientific stations. No exploitation of terrestrial resources.
Crossing of Arctic Circle prehistoric.	Crossing of Antarctic Circle by James Cook, January 17, 1772.