Ask® Teacher Guide: March 2021



Pole to Pole

Grab your gloves and hat and 'chill out' with teams of scientists who are studying the coldest regions on Earth. This issue of ASK magazine takes readers on a journey to the North and South Poles to discover how important research being done in these locations is helping to unlock some mysteries of the past, as well as gifting us with knowledge to protect our future.

CONVERSATION QUESTION

What is learned by studying the Poles?

TEACHING OBJECTIVES

- Students will learn about the characteristics of the North and South Poles.
- Students will learn why scientists from a variety of disciplines study Antarctica to learn about the world.
- Students will learn how climate change is affecting the polar ice caps and consequently, the whole planet.
- Students will compare and contrast the environments of the North and South Poles.
- Students will obtain information from a nonfiction text.
- Students will examine cause and effect relationships.
- Students will conduct an experiment to determine the magnetic field of a magnet.
- Students will create a journal page chronicling the day in the life of a particular scientist studying in Antarctica.
- Students will use a mathematical process to calculate projected rises in sea level.



In addition to supplemental materials focused on core STEAM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and crosscurricular activities.

SELECTIONS

- Poles Apart
 Expository Nonfiction, ~700L
- Cold Scientists Expository Nonfiction, ~900L
- The Big Melt?

Expository Nonfiction, ~700L

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Poles Apart

pp. 6–8, Expository Nonfiction

Literally at opposite ends of the Earth, the North and South Poles share many similarities, as well as stark differences. This article provides the reader with a clear understanding of the uniqueness of both the Arctic and Antarctica.



RESOURCES

Compare and Contrast

OBJECTIVES

- Students will learn the characteristics of the North and South Poles.
- Students will compare and contrast the environments of the North and South Poles.
- Students will conduct an experiment to determine the magnetic field of a magnet.

KEY VOCABULARY

- ocean current (p. 6) a continuous, directed movement of sea water driven by wind, water, density differences and tides
- ice sheet (p. 6) a broad, thick sheet of ice covering an extensive area for a long period of time
- *axis* (p. 8) an imaginary pin about which a rotating body, such as the earth, turns

ENGAGE

Conversation Question: What is learned by studying the Poles?

Introduce the title of the article, "Poles Apart" and inform students that they will be learning many interesting facts about the two opposing poles of the Earth. Some of the students may already know that in the summer the sun never sets at the poles, and in the winter, it is dark all the time. The article will explain why this occurs. Have students share how their lives would be different if they lived in such a place.

INTRODUCE VOCABULARY

Post and discuss the key terms. Be sure that students understand the definitions before reading the article. As a post-reading activity, have students use the three vocabulary words to summarize the article in paragraph form.

READ & DISCUSS

Reinforce comprehension of the concepts presented in the article by using the following prompts to direct discussion.

- 1. Why would a stick in the ice at the North Pole drift somewhere else within a few months?
- 2. Why do ice sheets around the poles grow in winter and shrink in summer?
- 3. How does the tilt of the Earth affect the amount of daylight at the poles?
- 4. Why is the climate at the poles so cold?
- 5. Explain the difference between the geographical poles and the magnetic poles.

SKILL FOCUS: Compare and Contrast

INSTRUCT: This article presents the reader with an abundance of simply stated information regarding characteristics of the North and South Poles. Tell students that they will need to indicate which pole is being referred to in the given statements on the *Polar Opposites* graphic organizer. They may consult the article to gather accurate information.

ASSESS: The objective of this lesson is to help students to practice the ability to discriminate information. Review completed organizers and challenge students to make a Venn diagram using the differences recorded on the chart, in addition to similarities gathered from reading.

EXTEND

Science Page 8 of the article explains that the magnetic poles are the positive and negative of Earth's magnetic field. Have students conduct the following experiment to measure a magnetic field: Lay a ruler flat on a table and place a magnet alongside the ruler at the 1-inch mark. Then place a paperclip along the same side of the ruler at the 2-inch line. If the paperclip attracts toward the magnet, move the paperclip back a half-inch. Continue to move the paperclip closer to or further from the magnet to find the distance at which the paperclip is no longer attracted. That distance is the length of that magnet's magnetic field.

Polar Opposites

Compare and Contrast Read the statements below and indicate if the fact is referring to the North Pole or the South Pole. Put an **X** in the correct column.

Statement	North Pole (Arctic)	South Pole (Antarctica)
It includes the frozen polar bear sea and a ring of land around it.		
This pole is home to the narwhal.		
It has 90% of the world's ice and 70% of the world's fresh water.		
The first people reached this pole in 1909.		
No people live here and no country owns it.		
The ice around this pole is frozen ocean, not solid land.		
It is a rocky continent with mountains, dry deserts and even an active volcano.		
This pole is very windy, with hurricane-force winds that could last for weeks.		
This pole is water surrounded by land.		
It is the colder pole.		

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Cold Scientists

pp. 22-23, Expository Nonfiction

Hundreds of scientists visit Antarctica every year to study clues that the Earth has buried beneath the ice. Findings great and small, from dinosaur bones to subatomic particles, are leading experts towards a more comprehensive understanding of the Earth's past, present, and future.



RESOURCES

Obtaining Information

OBJECTIVES

- Students will learn why scientists from a variety of disciplines are studying Antarctica.
- Students will obtain information from a nonfiction text.
- Students will create a journal page to chronicle a day in the life of a particular scientist studying in Antarctica.

KEY VOCABULARY

- *ice core* (p. 22) cylinders of ice obtained by drilling into a glacier
- *microbes* (p. 22) very tiny unicellular organisms that are invisible to the naked eye
- meteorite (p. 23) a small natural object that survives its passage through the atmosphere and lands on Earth's surface

ENGAGE

Conversation Question: What is learned by studying the Poles?

Review the meaning of the suffix; -ologist (refers to people who study a particular science or subject). Give students 3 minutes to list as many 'ologists' as they can. Introduce the title of the article, "Cold Scientists" and tell the class that they will be reading about five 'ologists' that are conducting research in Antarctica. How many of them did the class list?

INTRODUCE VOCABULARY

Post the key terms and discuss the definitions. Then display the following questions and have students supply the correct answers:

- What word refers to tiny life forms that can't be seen? (microbes)
 What other things can't be seen with the naked eye?
- What word refers to long samples of ice? (ice core)
 What can be discovered by studying these samples?
- What word refers to rock that comes from outer space? (meteorite) Why is Antarctica an optimal place to look for black space rocks?

READ & DISCUSS

Read the article aloud with the class. Have students reread the article in small groups to answer the questions below. Discuss responses.

- 1. How do certain fish in the North and South poles keep from freezing solid?
- 2. Explain how scientists learn what the air was like long ago and how Earth's climate has changed.
- 3. What is causing a particular Antarctic glacier to turn rusty red?
- 4. Why is Antarctica an ideal place for studying space?
- 5. What conclusion have scientists reached about the temperature of the planet since dinosaur fossils have been found in Antarctica?

SKILL FOCUS: Obtaining Information

INSTRUCT: Guide students to obtain information from the text and subheadings in the article. Remind them that the article was written to present the reader with information about a variety of scientists that are studying Antarctica. Distribute the *Polar Science* worksheet and instruct students to refer to the article to correctly match the scientist on the left with their field of study on the right.

ASSESS: Review the worksheet and have students share their answer to the final question.

EXTEND

Language Arts Have students select one of the scientists to write about. Instruct them to use information from the article and their imagination to create a journal page, "A Day in the Life of a ______." Students should state the goal of the mission and include details about the work. Descriptive entries about the climate and conditions should be included. Simple sketches will enhance their journal page, as will comments about their physical and mental state in such an environment.

Polar Science

Obtain Information Refer to the article to obtain the information needed to match the scientist with their field of study. Answer the question in the **Think Tank** using details to support your thinking.

1	Astronomers	A. They are studying microbes trapped under the ice that have evolved to live without oxygen.
2	Climatologists	B. They are studying fish that produce a natural antifreeze in the south polar oceans.
3	Geologists	C. They are using The South Pole Telescope to look at distant galaxies for clues to dark energy.
4	Microbiologists	D. They are searching for sub-atomic particles to help them locate black holes and supernovas.
5	Paleontologists	E. They use drills to collect ice cores to learn how the Earth's climate has changed.
6	Physicists	F. They are searching for meteorites that are more easily seen in the white snow of Antarctica.
7	Zoologists	G. These fossil hunters have discovered that at least eight species of dinosaurs have roamed Antarctica.

Think Tank: Do you think money is better spent studying the Earth or funding a space a program? Explain.

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The Big Melt?

pp. 26-28, Expository Nonfiction

BOOM! A large cliff of ice splashes into the Southern Ocean and consequences are experienced across the planet. This article explores the impact of global warming on plant, animal, and human life.



RESOURCES

Cause and Effect

OBJECTIVES

- Students will learn how climate change is affecting the polar ice caps and consequently, the whole planet.
- Students will examine cause and effect relationships.
- Students will use a mathematical process to calculate projected rises in sea level.

KEY VOCABULARY

- fossil fuel (p. 27) a fuel formed in the earth from plant or animal remains
- weather pattern (p. 27) consistent, repetitive weather extending for a period of time

ENGAGE

Conversation Question: What is learned by studying the Poles?

Present the title of the article, "The Big Melt?" Students will likely identify this phrase with our current climate crisis. Inform the class that the final paragraph of the article reveals simple ways that humans can help to stop the ice at the poles from melting. Have students work with a partner to discuss efforts and list strategies. After reading the article, compare student lists to the information provided in the last paragraph.

INTRODUCE VOCABULARY

Post the key words and discuss the meanings of the terms. Based on the definitions, have students use critical thinking skills to decide which word does NOT belong. (Answers: electricity, moon phases)

Types of fossil fuel: oil/electricity/coal/natural gas

Affects weather patterns: temperature/wind/moon phases/rain

READ & DISCUSS

Pose the following questions to the students to prompt meaningful discussion following the reading of the article.

- 1. How are new icebergs formed?
- 2. What human activities are causing the Earth to heat up at an advanced rate?
- 3. What has happened to the Arctic over the past 42 years?
- 4. When the ice from the poles melts, where does it go? Why is this problematic?
- 5. Why will warmer poles change weather patterns across the entire planet?

SKILL FOCUS: Cause and Effect

INSTRUCT: Lead the students in a discussion that guides them to recognize the many cause-and-effect relationships (a relationship in which one event makes another event happen) that are presented in this article. Introduce the graphic organizer, *Slip, Slide and Away,* and advise students that they will be recording such relationships. Allow students to share ideas and to assist each other in locating suitable passages in the text.

ASSESS: Review *Slip, Slide and Away* worksheet. If there is not a legitimate cause-and-effect relationship between events recorded, direct students to revisit the text and adjust answers.

EXTEND

Mathematics Current research estimates that sea level is rising at a rate of 3.6 millimeters (0.14 inches) per year. Using that measure, have students calculate how much sea level is expected to rise by the year 2050. Have students use the R-D-W process (Read-Draw-Write) process to show their work. They should express their answer in both millimeters and inches. (Answer: 104 millimeters/4.06 inches) Challenge students to convert answers into centimeters and a fraction of a foot.

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Slip, Slide and Away

Cause and Effect Review the article and highlight the devastating effects of global warming. Explain the effects and their outcomes in the boxes below.

