

DINOSAURS OF ANTARCTICA



EDUCATOR GUIDE



Dinosaurs of Antarctica Educator Guide

TABLE OF CONTENTS

INTRODUCTION TO GUIDE.....	4
BACKGROUND	5
LESSON 1.1 DISCOVERING ANIMALS	11
LESSON 1.2 EXPLORING WEATHER.....	22
LESSON 1.3 PREPARING FOR ANTARCTICA.....	31
LESSON 1.4 EXCAVATING DINOSAURS	37
LESSON 2.1 EXPLORING DINOSAURS	45
LESSON 2.2 COMPARING CONTINENTS.....	53
LESSON 2.3 CONSTRUCTING ANTARCTICA.....	60
LESSON 4.1 EXPLORING ANTARCTICA	67
LESSON 4.2 MODELING FOSSILS	74
LESSON 4.3 MODELING ROCK LAYERS	79
LESSON 6.1 STUDYING ANTARCTICA’S WEATHER	90
LESSON 6.2 ANALYZING GLOBAL WARMING	98
LESSON 6.3 INVESTIGATING SEA LEVELS.....	108
WRITERS AND CONTRIBUTORS	119



Dinosaurs of Antarctica Educator Guide

INTRODUCTION TO GUIDE

The ***Dinosaurs of Antarctica*** Educator Guide, created by Discovery Place Education Studio in Charlotte, North Carolina, in partnership with Giant Screen Films, is appropriate for students in grades kindergarten through eighth. The guide is most beneficial when used as a companion to the film but also useful as an independent resource. Educators are encouraged to modify the learning activities included in this guide to meet the needs of their students' functional level and to support specific state standards. Activities developed for this guide support the Next Generation Science Standards (NGSS) and national Common Core ELA and math standards. However, educators will find that the ***Dinosaurs of Antarctica*** film and guide align with other content areas such as geography. This guide focuses on the scientific understanding of Antarctica's geological and ecological history while exploring the career understandings of scientists who studied Antarctica. Students will examine the roles of a climatologist, paleontologist, and geologist by completing hands-on activities related to work in the field. This guide consists of sixteen engaging lessons that have been approved by teachers.

Dinosaurs of Antarctica is a story about Antarctica's geological and ecological history, specifically focusing on the Permian and Triassic extinction and Antarctica's climate transition from Icehouse to Greenhouse, creating a connection to present-day climate science. The film highlights the expedition to Shackleton Glacier featuring scientists from the Natural History Museum of Los Angeles and Field Museum, Chicago, along with other academic institutions. During the exploration, scientists uncover Antarctica's past through the discovery of ancient animal and plant fossils. Utilizing computer-generated imagery, ***Dinosaurs of Antarctica*** brings to life the eras of Antarctica's history and utilizes attributes of the giant screen to convey challenging scientific concepts such as plate tectonics, geological time, climate processes, etc. During the film viewers will shadow a team of scientists as they encounter extreme weather conditions to excavate fossils that will deepen our understanding of life on Earth.

Dinosaurs of Antarctica is a production of Giant Screen Films, directed by Dave Clark. The film has a run time of 40 minutes.

BACKGROUND

ANTARCTIC GEOLOGICAL TIMELINE

Geologists have divided Earth's history into a series of time intervals known as a geological time scale. The geological time scale consists of three eras: Cenozoic, Mesozoic, and Paleozoic. Each era splits into periods. Fossils found in Antarctica provide clues to the changing climate and position of the continent during each phase of the geological time scale.

ERA	PERIOD	ABOUT ANTARCTICA	TIMEFRAME
Paleozoic	Permian	The continents were connected as Pangaea. Scientists found fossils of the same species on all continents, including Antarctica.	299-252 million years ago
Mesozoic	Triassic	Antarctica plants and animals experienced climate patterns similar to today, consisting of sunlight in the summer and darkness in the winter.	252-201 million years ago
	Jurassic	Over time, Pangaea split into two supercontinents, Gondwana and Laurasia. Antarctica became part of Gondwana.	201-145 million years ago
	Cretaceous	Antarctica split away from Africa but was still connected to South America and Australia which created a gap filled by the ocean over time.	145-66 million years ago
Cenozoic	Paleogene	Antarctica began transitioning from a greenhouse to an icehouse.	62-23 million years ago

BACKGROUND

ANTARCTIC EXPEDITIONS

Antarctica has been an area of interest for explorers for hundreds of years. Antarctica was the last of the seven continents discovered, and early explorers were interested in learning more about the continent's natural resources. Some early explorers hoped to find new locations to hunt for whales and seals, while others wanted the glory of being the first to visit the continent. Regardless of the reason for expeditions to Antarctica, explorers faced incredible hardships, and many lost their lives in the process. Modern scientists utilize early explorers' findings to conduct further research to understand the history of Earth.

THE EARLY 1900S EXPEDITIONS

to Antarctica focused on competition to reach the South Pole.

1900

1901

British Discovery Expedition: Captain Scott and his team led their first Antarctic expedition with the goal of reaching the South Pole. The scientists turned around due to the extreme weather they encountered.

1907-1909

Ernest Shackleton led an expedition to the South Pole but was forced to turn around after he runs out of supplies.

1910

1910-1912

Norwegian Antarctic Expedition: Roald Amundsen and his team became the first group of people to reach the South Pole.

1910-1913

Terra Nova Expedition: Captain Robert Falcon Scott, along with his team, set out to reach the South Pole again, hoping to be the first people to accomplish the task, but they found out they were a couple of months too late. Scott and his team reached the South Pole but perished during the return trip home.

1915-1917

Endurance Expedition: Ernest Shackleton and his team set out on a journey to reach Antarctica again with the goal of crossing the continent. However, his ship was crushed by ice and destroyed. The team was rescued five months later.

1920

BACKGROUND

ABOUT THE SCIENTISTS IN THE FILM

DR. NATHAN SMITH

**Paleontologist, Associate Curator, Dinosaur Institute
Natural History Museum of Los Angeles County**

Originally from Crystal Lake, Illinois, Nate grew up fascinated with dinosaurs, science, and baseball. He received his B.A. in Biology from Augustana College, a M.S. in Geoscience from the University of Iowa, and a Ph.D. in Evolutionary Biology from the University of Chicago. Nate also served as a Postdoctoral Research Scientist at the Field Museum of Natural History and an Assistant Professor of Biology at Howard University before joining the Natural History Museum of Los Angeles County in 2015.

Nate conducts paleontological research for the museum's Dinosaur Institute, focusing on the evolution and biogeography of Triassic–Jurassic dinosaurs, among other topics. He has made many significant finds in Antarctica and is responsible for naming *Glacialisaurus* (featured in ***Dinosaurs of Antarctica***). Nate's work has taken him to Antarctica, Argentina, China, and the southwestern and western United States, and he appeared in the giant screen film *Dinosaurs Alive*, featuring his collaborative dinosaur dig at Ghost Ranch in New Mexico.

LIBBY IVES

**PhD Student, Geosciences—Physical Sedimentology
University of Wisconsin—Milwaukee**

Libby grew up in Wisconsin and always had a strong love of the outdoors. She spent many summers camping and exploring wilderness areas as a counselor at YMCA camps. She completed a B.S. in Earth Science at Northern Michigan University, and holds an M.S. in Geology from Iowa State University. She has studied geological formations across the world, from volcanoes in Russia to Ice Age deposits in Argentina. Libby is trained as a Wilderness First Responder, a special type of medical certification that's useful for remote field work expeditions.

As a PhD student, Libby is studying the sedimentology and stratigraphy of Late Paleozoic (320 – 250 million year old) Ice Age deposits at sites in Antarctica (Transantarctic Mountains), Tasmania (Wynyard Formation), and Argentina (Tepuel Basin). Her aim is to better understand the type, timing, and extent of glaciation during the Late Paleozoic.



*Dr. Nathan Smith.
Photo courtesy of Akiko Shinya.*



*Libby Ives.
Photo courtesy of Dr. John Isbell.*

LESSON 1.3

PREPARING FOR ANTARCTICA

GRADE LEVEL K-1



DINOSAURS OF ANTARCTICA EDUCATOR GUIDE



Dinosaurs of Antarctica Educator Guide

LESSON 1.3

PREPARING FOR ANTARCTICA

GRADE LEVEL K-1
(1) 45 MINUTE LESSON

STANDARDS:

- CCSS.ELA-LITERACY.SL.K.1.A. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion).

FROM THE FILM:

In the film *Dinosaurs of Antarctica*, students learned that scientists had a limited amount of time to conduct research in the field due to weather conditions. Due to extreme weather conditions, explorers visiting Antarctica had to wear specific clothing to stay warm.

LESSON OVERVIEW:

In this lesson, students will determine the clothing requirements that explorers should consider to ensure a safe trip to Antarctica and create a stick puppet to represent their idea.

MATERIALS:

- Student Resource Sheet 1.3 (for every six students)
- Student Resource Sheet 1.3A (per partner)
- One craft stick (per student)
- Glue (per partner)
- Scissors (per student)
- Crayons



LESSON 1.3 PREPARING FOR ANTARCTICA

EDUCATOR PREP:

Print the “Preparing to Explore Student Resource Sheet 1.3 and 1.3a” and gather the necessary supplies based on your class size. “Preparing to Explore Student Resource Sheet 1.3A” provides six stick figures per sheet. Therefore, each sheet provides enough stick figures for six students. “Preparing to Explore Student Resource Sheet 1.3A” can be utilized by two students.

EDUCATOR GUIDE:

1. In the film *Dinosaurs of Antarctica*, students learned that scientists had a limited amount of time to conduct research in the field. Explain to students that sometimes scientists call the area where they conduct hands-on research “the field” versus when they analyze their findings in the lab. Remind students that in a previous lesson, they learned how the weather can impact their decisions. Ask students if they can recall the reason scientists in Antarctica had a limited amount of time to excavate dinosaurs or conduct research in the field. Students should be able to share that scientists needed certain weather conditions (ex: not too windy or too much snow) to safely fly to the field site. Students should be able to connect that it was necessary for the researchers to plan to work under particular weather conditions to ensure their safety.

2. Explain to students that over the next couple of days, they will explore how scientists retrieve dinosaur fossils. Ask students:

What type of clothing do you think scientists wore when working at the field site in Antarctica?

Example: Scientists wore a lot of clothes to keep them warm such as boots, hats, long sleeve shirts, pants, and gloves.

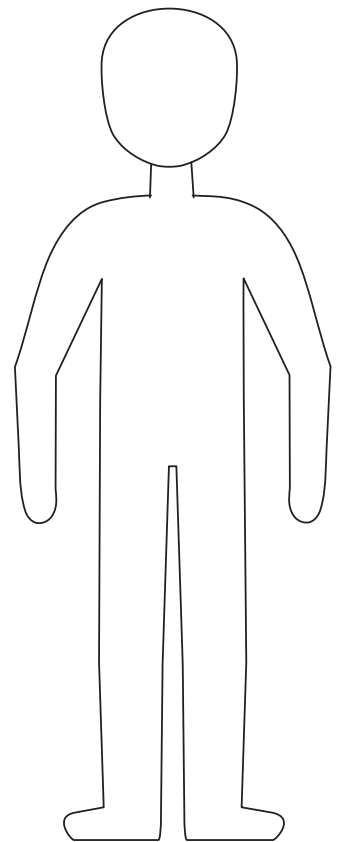
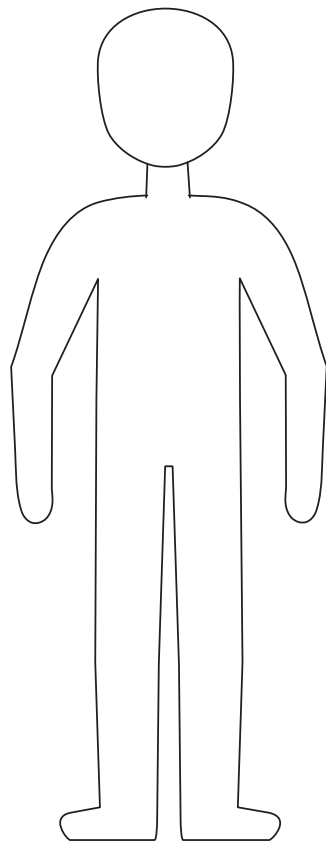
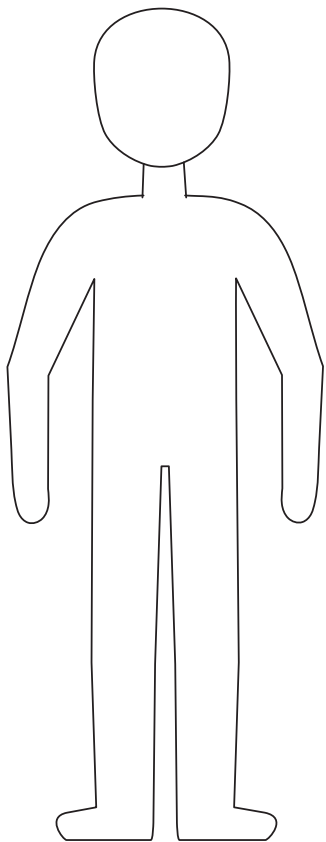
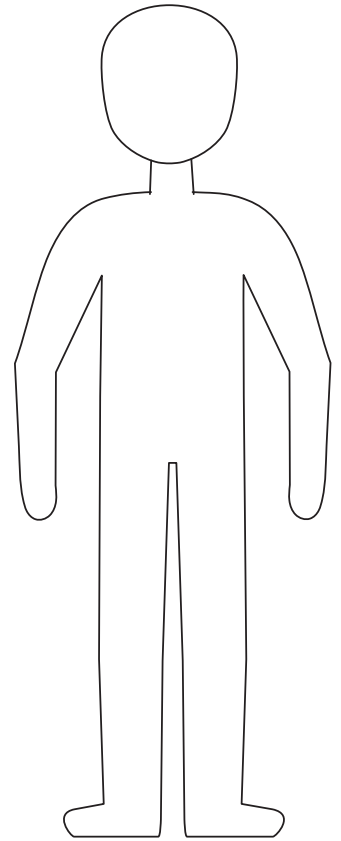
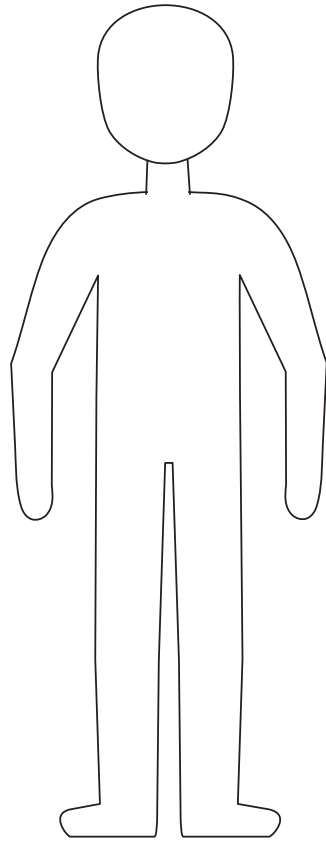
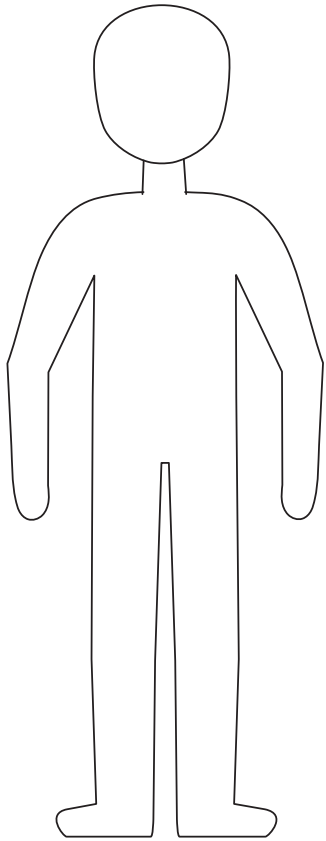
What do you think might happen if someone wore shorts and sandals in Antarctica?

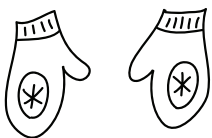
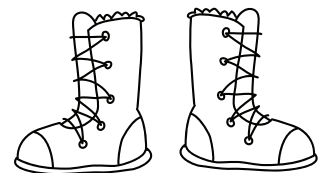
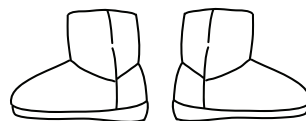
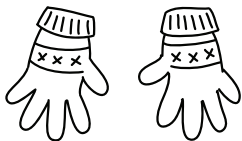
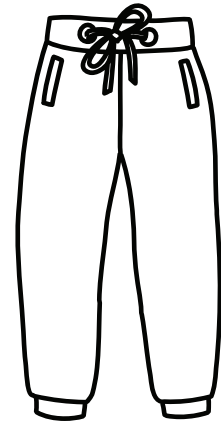
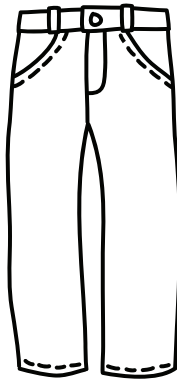
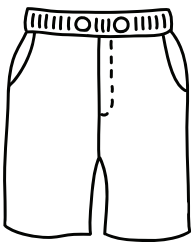
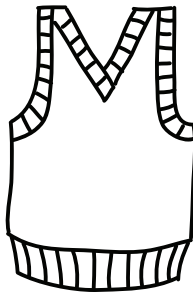
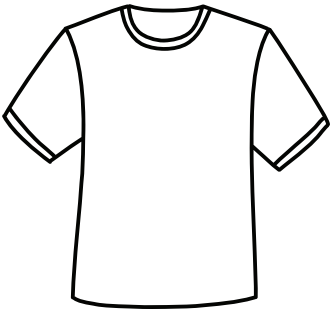
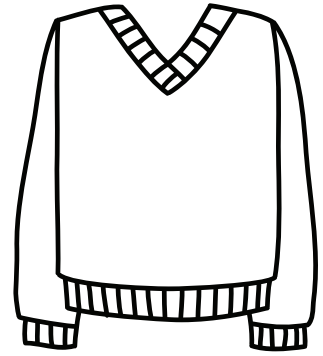
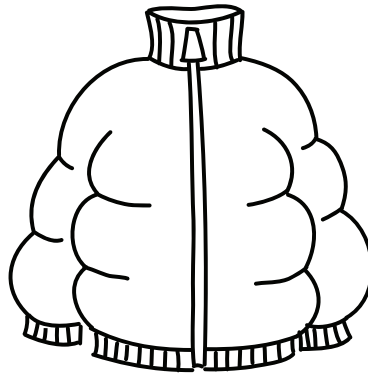
Example: They might become too cold or become really sick.



Scientists on Shackleton Glacier used helicopters to reach remote field sites. Weather often determines their research plans.

Photo courtesy of Dr. John Isbell.





LESSON 2.2

COMPARING CONTINENTS

GRADE LEVEL 2-3



DINOSAURS OF ANTARCTICA EDUCATOR GUIDE



Dinosaurs of Antarctica Educator Guide

LESSON 2.2

COMPARING CONTINENTS

GRADE LEVEL 2-3
(1) 45 MINUTE LESSON

STANDARDS:

- CCSS.ELA-LITERACY.W.3.8. Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

FROM THE FILM:

The film *Dinosaurs of Antarctica* showcases Antarctica's uncommon landscape. Antarctica is the coldest, windiest and driest southernmost continent. Scientists and tourists who visit Antarctica describe a unique experience making the continent an interesting place to visit.

LESSON OVERVIEW:

In this lesson, students will continue to learn about Antarctica's unique landscape and explore North America's scenery to discover similarities and differences between the two continents.

MATERIALS:

- Comparing Antarctica vs. North America Student Resource Sheet 2.2
- Comparing Antarctica vs. North America Venn Diagram Student Resource Sheet 2.2A
- Access to technology to show the following video clips:

Antarctica: Destination World by
National Geographic Kids
<http://bit.ly/DestinationAntarctica>

North America: Destination World by
National Geographic Kids
<http://bit.ly/DestinationNAmerica>



LESSON 2.2

COMPARING CONTINENTS

EDUCATOR PREP:

Based on your class size, print a copy of “Comparing Antarctica vs. North America Student Resource Sheet 2.2” and “Comparing Antarctica vs. North America Venn Diagram Student Resource Sheet 2.2a” for each student. To save paper, print the documents double-sided on one sheet. Test your visual and audio equipment to ensure students are able to view and hear the videos.

EDUCATOR GUIDE:

1. In the film *Dinosaurs of Antarctica*, students learned that Antarctica is the coldest and windiest place on Earth. Students discovered that Antarctica is an ice desert, making it difficult for most plants and animals to survive. Ask students to raise their hands if they remember hearing the word *climate* before.

What does the word climate mean?

Climate refers to the average condition of the weather at a place usually over a period of years as described by temperature, wind velocity, and precipitation.

What are scientists that study weather called?

Meteorologists predict the weather and study how the atmospheric conditions affect the earth and its human inhabitants.

What does the word weather mean?

Weather is what’s happening in the atmosphere over a short period of time with respect to heat or cold, wetness or dryness, and clearness or cloudiness.

What are scientists that study climate called?

Climatologists study climate patterns to provide an understanding of the conditions of a particular area to help residents adapt to their surroundings.

From the film who can recall the landscape of Antarctica millions of years ago?

Antarctica was not covered in ice therefore it was a warmer place with more living creatures such as dinosaurs.

From the film what is Antarctica’s landscape like now?

Antarctica is considered an icy desert and home to a few animals that mostly live near or in the water.



Antarctica is an ice desert making it difficult for most plants and animals to survive.

LESSON 2.2

COMPARING CONTINENTS

2. Tell students that today they will compare two continents: North America and Antarctica. Explain to students that they will explore the similarities and differences between the continents by learning more about both places through video. Provide each student with a copy of “Comparing Antarctica vs. North America Student Resource Sheet 2.2.” During this assignment, students will watch a short video about Antarctica and a short video about North America. Students will fill in the blank spaces on the chart as they watch the videos.

3. Optional: To ensure students are able to complete their chart, it may be necessary to allow students to watch the video once without pausing. Replay the video for students and pause at key points to allow students to complete the chart.

During the video, “Antarctica: Destination World,” pause at the following markers to allow students to fill in their chart.

30 seconds [land size & physical features of Antarctica]

65 seconds [average temperature of Antarctica]

2:10 minutes [animals of Antarctica]

During the video, “North America: Destination World,” pause at the following markers to allow students to fill in their chart.

28 seconds [land size of North America]

60 seconds [physical features of North America]

2:18 minutes [population of North America]

3:08 minutes [popular attractions of North America]

Educator Notes:

Comparing Antarctica vs. North America

View the videos *Antarctica: Destination World* and *North America: Destination World* and fill in the blank spaces by recording facts about the two continents.

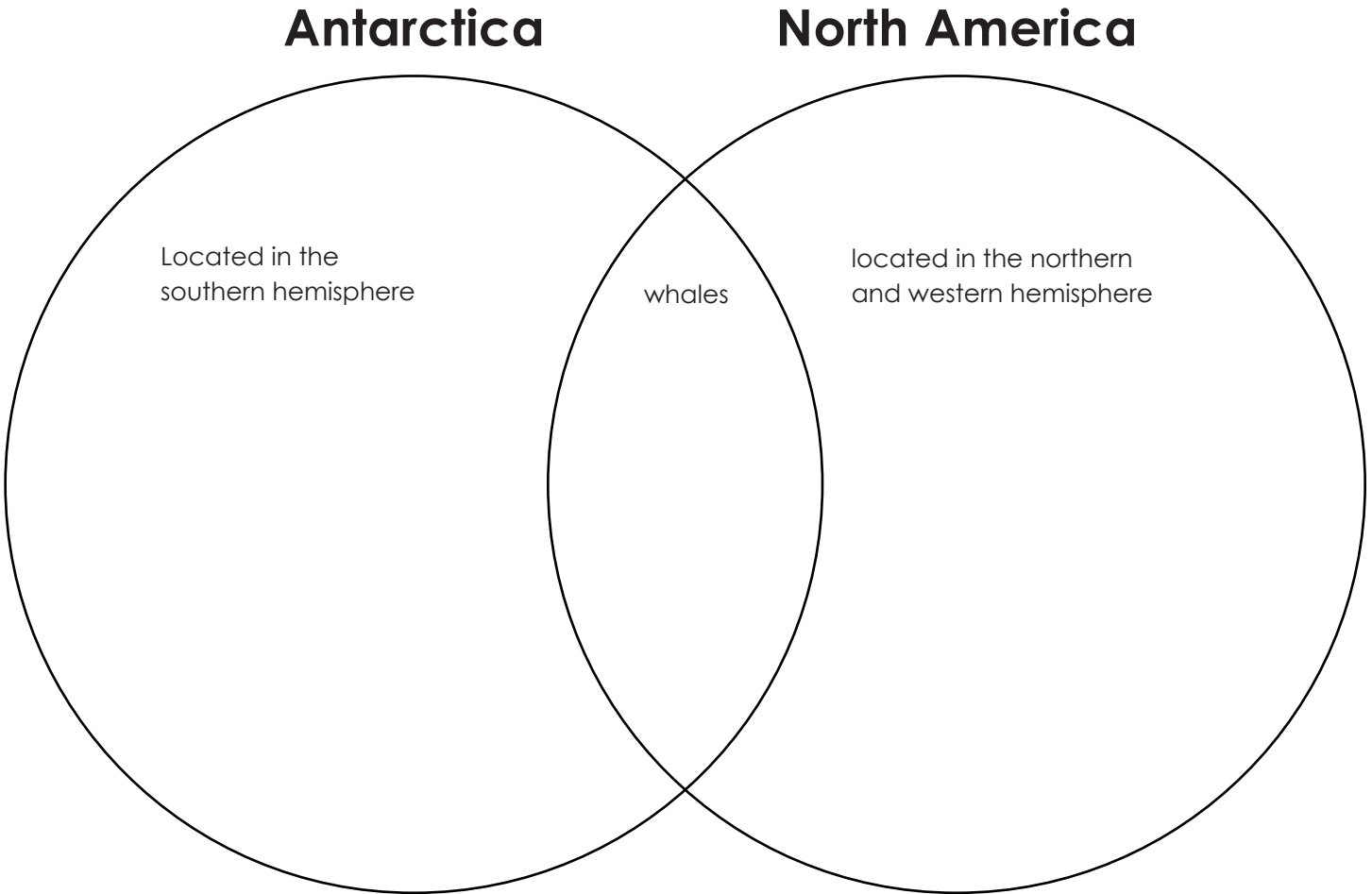
	Antarctica	North America
Location	Southern most continent near the South Pole	Northern & Western hemisphere
Land Size	_____ largest continent 5.5 million square miles	_____ largest continent 9.5 million square miles
Physical features		
Temperature		varies by location
Population	No permanent residents but _____	
Common animals		
Popular attraction		

1. What did you learn about Antarctica that surprised you?

2. After completing this activity, what do you wonder about Antarctica?

Comparing Antarctica vs. North America Venn Diagram

Using the “Comparing Antarctica vs. North America” table, summarize your findings by creating a Venn diagram.



What do Antarctica and North America have in common?

How are Antarctica and North America different?

LESSON 4.1 EXPLORING ANTARCTICA

GRADE LEVEL 4-5



DINOSAURS OF ANTARCTICA EDUCATOR GUIDE



Dinosaurs of Antarctica Educator Guide

LESSON 4.1 EXPLORING ANTARCTICA

GRADE LEVEL 4-5
(1) 45 MINUTE LESSON

STANDARDS:

- CCSS.ELA-LITERACY.RI.4.7. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
- CCSS.ELA-LITERACY.SL.5.2. Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

FROM THE FILM:

In the film *Dinosaurs of Antarctica*, you will learn that Antarctica has been an area of interest for explorers dating back to the 1800's. The film provides several timelines, a representation of important events in the order in which they occurred, to help viewers understand more about Antarctica's past. We are able to use early explorers' successes and challenges to advance current research efforts.

LESSON OVERVIEW:

In this lesson, students will use an internet resource to review a timeline of Antarctica's explorations to summarize important events that occurred in the continent's history.

MATERIALS:

- Exploring Antarctica Timeline Student Resource Sheet 4.1
- Exploring Antarctica Timeline Student Resource Sheet 4.1a
- Technology to access the following resources:
 - Website* <http://bit.ly/CoolAntarctica>
 - Video: Dr. Nate Smith Talks about Dinosaur Expeditions to Antarctica by the Natural History Museum of Los Angeles County [2:28 minutes] <http://bit.ly/DrNateJourney>*
- Cover of the *Dinosaurs of Antarctica* Education Guide



LESSON 4.1

EXPLORING ANTARCTICA

EDUCATOR PREP:

Assign partners. Print a copy of “Exploring Antarctica Timeline Student Resource Sheet 4.1” and cut out the event cards. Be sure that you have enough event cards to provide each partner with one card. Print a copy of “Exploring Antarctica Timeline Student Resource Sheet 4.1a” for each student.

EDUCATOR GUIDE:

1. In the film *Dinosaurs of Antarctica*, students will learn that Antarctica has been an area of interest for explorers dating back to the 1800’s. Explain to students that early explorers were interested in learning about the continents’ landscape and resources. Findings from several expeditions led to more research topics that future scientists will begin to investigate. Ask students:

Based on the title, Dinosaurs of Antarctica, and the picture, what do you think scientists in the film were researching in Antarctica?

2. Introduce the vocabulary word *expedition* to students. Ask students to raise their hands if they remember hearing the word *expedition* before.

What does the word expedition mean?

An expedition is a journey or voyage taken by a group of people with a particular purpose such as an exploration or scientific research.

Explain to students that participating in expeditions allows people to experience new discoveries first hand versus just reading about it in a book or online. Ask students if they have ever read about a place and then actually had the opportunity to visit. Ask students to share how the experience of reading about a place is different from visiting the location. If students are unable to come up with an example, share about a local attraction. For example, some students may have seen advertisements for a local carnival that may have sparked their interest.

Therefore, reading or hearing about the carnival may have made them curious about the rides, food, people, games, etc. Help students make the connection that explorations are often influenced by people’s desire to solve a problem, to discover something new or to satisfy general curiosity.



The Endurance was one of the two ships used for the Imperial Trans-Antarctic expedition to Antarctica from 1914-1917.

LESSON 4.1

EXPLORING ANTARCTICA

3. Share with students that they will have an opportunity to view the film *Dinosaurs of Antarctica* and that by now they may have guessed that scientists were interested in learning about dinosaurs. It's okay if students are unable to figure out why scientists were researching dinosaurs. The aim is to prepare them for the general idea of the movie. Explain to students that they will complete a timeline activity to learn more about expeditions that occurred in Antarctica.
4. Provide students with a copy of "Exploring Antarctica Timeline Student Resource Sheet 4.1." Explain to students that they will collaborate with a partner to research an event in history using an online resource. Tell students that they will have seven minutes to read about various expeditions that occurred in Antarctica. Allow seven minutes for students to read the timeline on the website. <http://bit.ly/coolantarctica>
5. After the allotted time expires, give each set of partners one event card. Explain to students that their task is to determine when their specific event occurred in history (ex: date). They can refer back to the website for support. Allow three minutes for students to determine their event date. Circulate to provide support if needed.
6. After students determine their event date, direct students to organize themselves as a human timeline starting from the earliest date to the most recent date. After students form a human timeline, they are to quickly explain what happened that year in their own words. Turn the task into a fun challenge by telling students the goal is to get through the entire timeline in two minutes and set a timer.
7. Provide students with a copy of "Exploring Antarctica Timeline Student Sheet 4.1a." Ask students:

How is this timeline different from the one you just reviewed?

This timeline has additional exploration dates from the 1990's to 2000's whereas the other timeline stopped in the mid-1900's. Also, the timeline mentions the finding of dinosaur fossils.

Review the additional events with students. Explain to students that in the film *Dinosaurs of Antarctica*, they will learn more about the findings of dinosaur fossils and how the discovery has led to additional research about climate science.

Educator Notes:

Exploring Antarctica Timeline Cards



1901

Captain Scott and his team led their first Antarctic expedition to the South Pole. The scientists turned around due to the extreme weather they encountered.

1907-1909

Ernest Shackleton led an expedition to the South Pole but was forced to turn around after he ran out of supplies.

1912

Captain Robert Falcon Scott, along with his team, set out to reach the South Pole again, hoping to be the first people to accomplish the task, but they found out they were a couple of months too late. Scott and his team reached the South Pole but perished during the return trip home.

1911

Roald Amundsen and his team became the first group of people credited to reach the South Pole.

1915-1917

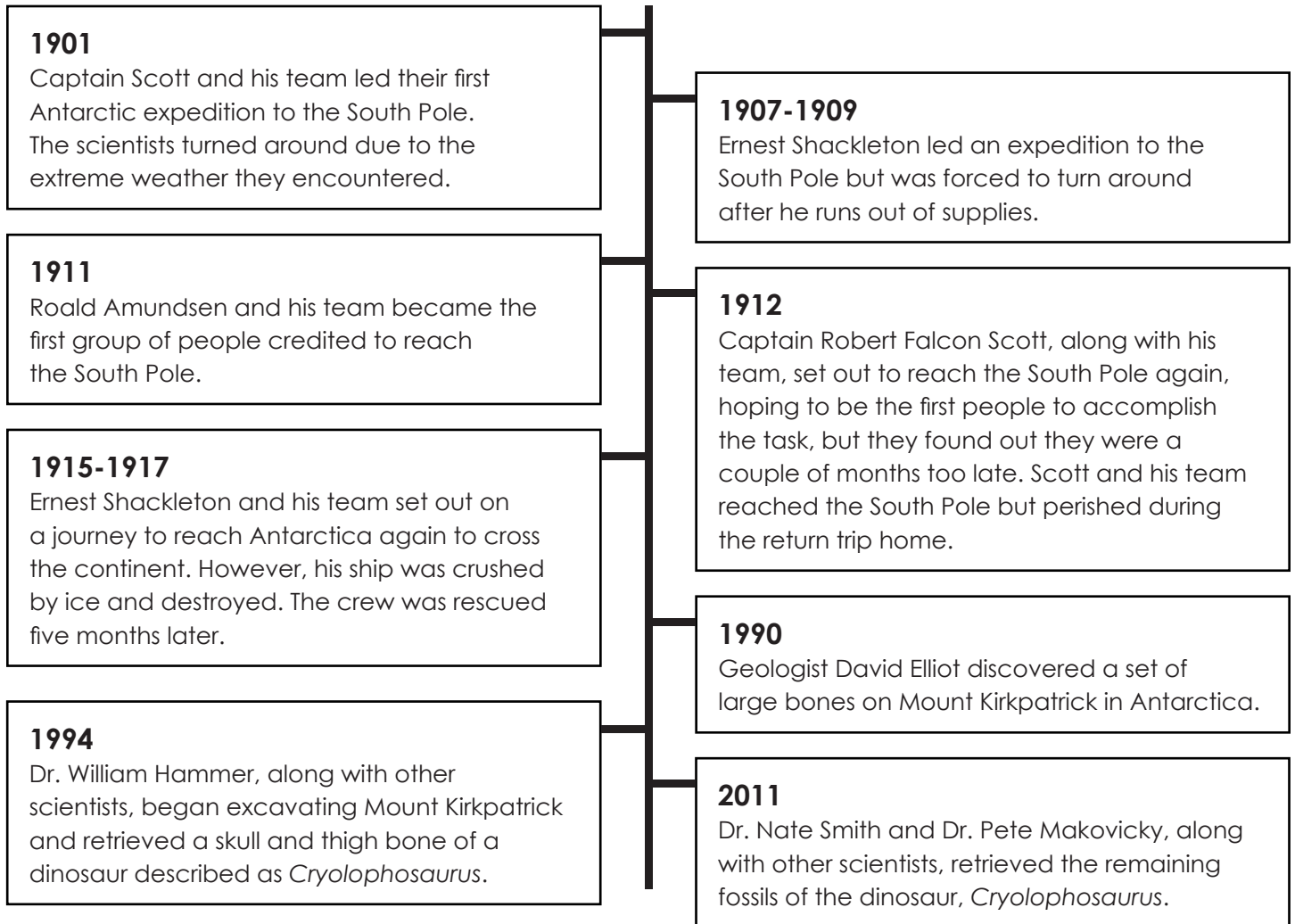
Ernest Shackleton and his team set out on a journey to reach Antarctica again to cross the continent. However, his ship was crushed by ice and destroyed. The crew was rescued five months later.

1990

Geologist, David Elliot discovered a set of large bones on Mount Kirkpatrick in Antarctica.

Exploring Antarctica Timeline

Review the timeline of Antarctica's explorations and answer the questions below.



Why did so many early explorers have a difficult time reaching the South Pole?

Why do you think early researchers desired to explore Antarctica?

Why do you think researchers continue to explore Antarctica?

LESSON 6.2

ANALYZING GLOBAL WARMING

GRADE LEVEL 6-8



DINOSAURS OF ANTARCTICA EDUCATOR GUIDE



Dinosaurs of Antarctica Educator Guide

LESSON 6.2

ANALYZING GLOBAL WARMING

GRADE LEVEL 6-8
(1) 50 MINUTE LESSON
(1) 10 MINUTE CLEAN UP

STANDARDS:

- MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
- SP2: Develop and use a model to describe phenomena.

FROM THE FILM:

In the film *Dinosaurs of Antarctica*, students learned that scientists discovered more clues that proved the climate of the continent changed over millions of years. Despite its harsh weather, some animals, such as penguins, have been able to adapt to Antarctica's environment. Changes in temperature can influence the environment and thus make it difficult for some living things to survive. Scientists are using clues from Antarctica's past to predict how climate change can impact the future.

LESSON OVERVIEW:

In this lesson, students will explore global warming by modeling the greenhouse effect.

MATERIALS:

- Clean sand
- 4 clear, plastic cups (10 oz)
- 2 cups of water
- 2 empty soda bottles (1 liter)
- Scissors
- Tray of ice cubes
- Plastic wrap
- Rubber band
- Ruler
- Clip-on spotlight or light source with at least 100-watt bulb
- Analyzing Global Warming Lab Student Resource Sheet 6.2
- Analyzing Global Warming Student Resource Sheet 6.2a (each student)



LESSON 6.2

ANALYZING GLOBAL WARMING

EDUCATOR PREP:

Assign each student a lab partner. Based on your group size, gather enough materials to accommodate each set of partners. Print a copy of the “Analyzing Global Warming Lab Student Resource Sheet 6.2” for each set of partners. Print a copy of “Analyzing Global Warming Student Resource Sheet 6.2a” for each student. This lesson can also be taught as a whole class demonstration.

EDUCATOR GUIDE:

1. In the film *Dinosaurs of Antarctica*, scientists discovered more clues that proved the climate shifted over the years transitioning the continent into an icehouse. While Antarctica’s weather is bleak, it is still home to seals, whales, penguins and other animals that have the ability to adapt to the conditions. Changes in temperature can influence the environment and thus make it difficult for some living things to survive.

2. To activate prior knowledge, facilitate a discussion using the following question prompts:

What happened when you got into a car that had been left in the sun on a hot day with the windows rolled down?

Example response: When you leave the car windows rolled up, the car becomes very hot causing someone to immediately roll down the window to cool it off. Sometimes the seat belt buckle is so hot it almost burns your hand. However, when you leave the windows down, the car feel cooler.

Ask students:

Why do you think the temperature in a car with the windows rolled up is higher than the temperature in a car with the windows rolled down?

Example response: The air in the car is trapped inside and is unable to circulate.



Crabeater seals resting on icebergs in Antarctica.

LESSON 6.2

ANALYZING GLOBAL WARMING

3. Share with students that the experience they described getting into a car placed in the sun with the windows rolled up is how the greenhouse effect works. Ask students:

Have you ever heard of the greenhouse effect?

The greenhouse effect is a process that occurs when gases such as carbon dioxide in Earth's atmosphere trap the Sun's heat.

Have you ever seen a greenhouse?

What is the purpose of a greenhouse?

A greenhouse is a building with glass walls and a glass roof often used to grow plants. A greenhouse stays warm inside because sunlight shines into the greenhouse and warms the plants and air inside because the glass walls of the greenhouse trap the Sun's heat.

Have you ever heard of greenhouse gases? What is it?

Gases in the atmosphere trap heat just like the glass roof of a greenhouse. These gases are called greenhouse gases and they allow sunlight to pass through the atmosphere, but they also prevent the heat that the sunlight brings from leaving the atmosphere making the Earth warmer.

Can you explain global warming?

Global warming is the long-term warming of the Earth's overall temperature.

4. Tell students that today they will explore global warming by modeling the greenhouse effect. Provide each group with a set of lab materials, the "Analyzing Global Warming Lab Student Resource Sheet 6.2" and "Analyzing Global Warming Student Resource Sheet 6.2a" Review lab safety rules if necessary. Circulate to provide assistance when needed but encourage students to utilize their partners for support.

Educator Notes:

Analyzing Global Warming

I. Lab notes: Use the table to record your observations.

Label	Starting height of water level	Height of water after 6 minutes	Height of water after 12 minutes	Height of water after 18 minutes	Height of water after ice melts
Greenhouse Effect					
Control					

Why do scientists use models to understand phenomena?

Was there a difference in the warming rate of the greenhouse bottle and the control bottle? If so, described what you noticed.

What might be the effect of placing the bottles different distances from the light source?

How did the change in Antarctica's climate impact the environment?

II. Video reflection: As you view the "Cause and effects of climate change" video, fill in the blanks.

Human activities such as _____ and _____ are contributing to the increase in the Earth's temperature. The _____ occurs when gases in the atmosphere allow the sunlight in and prevent some of the heat from _____ like glass walls of a greenhouse. Human activities such as _____ have increased the amount of carbon dioxide in the atmosphere causing the planet to warm at a faster rate. Climate change has consequences for our _____, _____, _____, and _____. Water from melting glaciers causes _____. Climate change can cause _____ impacting our _____ and _____. In areas with high amounts of smog, health problems can occur such as _____, _____, and _____. Humans can reduce the rate of climate change by replacing _____ with _____ energy sources that don't produce greenhouse gases.



Dinosaurs of Antarctica Educator Guide

WRITERS AND CONTRIBUTORS:

LESSON PLAN DEVELOPER:

Candice Wilson-McCain, *Ed.S in Curriculum & Instruction*
Discovery Place, Inc.

EDUCATION EVALUATOR:

Karen Elinich, *Ed.D in Educational Technology*

PROJECT MANAGEMENT:

Joanie Philipp
Discovery Place, Inc.

Heather Norton
Discovery Place, Inc.

Deborah Raksany
Giant Screen Films, Inc.

GRAPHIC DESIGN:

Althea Holenko
Discovery Place, Inc.

Andrew Crews
Discovery Place, Inc.

DINOSAURS
of ANTARCTICA