

DINOSAURS OF ANTARCTICA



EDUCATOR GUIDE
LESSONS K-1

DINOSAURS of ANTARCTICA

EDUCATOR GUIDE



DISCOVERY PLACE

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Educator Guide written by Candice Wilson-McCain, Ed.S.

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Dinosaurs of Antarctica Educator Guide

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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.



Dinosaurs of Antarctica Educator Guide

BACKGROUND

ABOUT ANTARCTICA

Antarctica is the coldest, windiest, and driest southernmost continent near the South Pole and contains 90% of all of the ice on Earth. Antarctica is a desert because it only receives two inches of rain per year. The small amount of rainfall received each year does not soak into the ground, causing it to accumulate as ice and snow. The Antarctic ice sheet is the largest single piece of ice in the world, covering more than 5 million square miles. Although Antarctica's temperature makes it difficult for many animals to survive, it is still home to some animals such as seals, whales, penguins, fish, and krill. Also, organisms such as algae and moss can survive the icy conditions. No permanent residents are living in Antarctica. However, Antarctica attracts thousands of scientists each year during the summer months to conduct research. Scientists and early explorers have been researching Antarctica since the late 1800's and each century uncovers new findings.

Although 98% of Antarctica is covered in snow and ice making it an icehouse, 200 million years ago, it was a greenhouse with wooded, lush habitat where dinosaurs and other living things thrived. Scientists have discovered fossils and other data that confirm the theory of plate tectonics, the movement of continents over time, and the impact on Antarctica's climate. Fossil records provide paleontologists a global perspective to dinosaur origin, enhancing their understanding of the End-Permian and End-Jurassic extinction events.

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

THE MID 1900'S EXPEDITIONS

to Antarctica focused on research and scientific exploration.

1950

1957-1958

McMurdo Station, the first permanent research station in Antarctica, was built by the U.S. military to support the scientific study of over sixty nations.

1959

The Antarctic Treaty was established to make Antarctica a scientific preserve that banned military activity but supported freedom of research.

1960

THE LATE 1900'S & EARLY 2000'S EXPEDITIONS

to Antarctica focused on understanding Antarctica's past and present environment and excavating fossils.

1990

1990

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

1994

Dr. William Hammer, along with other scientists, began excavating Mount Kirkpatrick and retrieved a skull and thigh bone of a dinosaur described as *Cryolophosaurus ellioti*.

2000

2003

Scientists continued to excavate *Cryolophosaurus* bones but ended the expedition early due to harsh weather.

2010

2011

Dr. Nate Smith and Dr. Pete Makovicky, along with other scientists, retrieved the remaining fossils of the dinosaur, *Cryolophosaurus*, and discovered new dinosaur fossils.

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.*

BACKGROUND

DR. PATRICIA RYBERG

**Paleobotanist, Associate Professor of Biology; Honors Academy Director
Park University**

Although she was on a pre-med career track as an undergraduate student, Dr. Ryberg found her passion for paleobotany on a biology class field trip in Nebraska, where on an excursion to find fossil shark teeth, she also discovered fossil plants. She realized that field research would allow her to travel and spend time outside, discovering plants that are totally unlike anything that exists today. Dr. Ryberg's bachelor's degrees are in biological sciences and history from the University of Nebraska, and she completed her doctoral degree in botany at the University of Kansas.

Dr. Ryberg specializes in studying *Glossopteris*, an extinct plant species from about 260 million years ago. She's especially interested in ecology and the evolution of plant life at high latitudes, and what the ancient past might signal about the future. Her work has taken her on research adventures around the world, from South Africa to Australia to Antarctica.



Dr. Patricia Ryberg

DR. PETER MAKOVICKY

**Paleontologist, Professor, Department of Earth and Environmental Sciences,
University of Minnesota**

Dr. Makovicky is a paleontologist whose research focuses on dinosaur evolutionary history. He received his PhD in Earth and Environmental Sciences from Columbia University, and spent 18 years as a Curator of Paleontology at the Field Museum in Chicago, where he was the lead curator of the Antarctic Dinosaurs exhibition. Prior to that he received his BSc and MSc degrees from Copenhagen University in Denmark, where he grew up.

He has conducted fieldwork on four continents and described more than 15 new dinosaur species from the US, China, Mongolia, Argentina, and Antarctica. Dr. Makovicky uses dinosaurs as model systems to study broader topics in evolutionary biology. His current research focuses on understanding how carnivorous dinosaurs evolved herbivory, and how dinosaur evolution and biogeography were shaped by major geological events. He has also studied biomechanics, scaling, dinosaur trackways, and behavior.



Dr. Peter Makovicky

LESSON 1.1

DISCOVERING ANIMALS

GRADE LEVEL K-1



***DINOSAURS OF ANTARCTICA* EDUCATOR GUIDE**



Dinosaurs of Antarctica Educator Guide

LESSON 1.1 DISCOVERING ANIMALS

GRADE LEVEL K-1
(1) 60 MINUTE LESSON

STANDARDS:

- Use observations to describe patterns of what plants and animals (including humans) need to survive.

FROM THE FILM:

In the film *Dinosaurs of Antarctica*, scientists found the remains of plants and animals that no longer exist today. Paleobotanists like Dr. Patty Ryberg examine fossil remains of dead plants to learn about different periods of time in Earth's history. We are able to use paleobotanists' research findings along with evidence from other scientists - such as paleontologists, who study prehistoric animals - to discover why certain animals and plants become extinct over time.

LESSON OVERVIEW:

All animals need food to live and grow. They obtain their food from plants or other animals. Living things need water, air, and resources such as shelter to survive. They live in places that have the things they need. In this activity, students will explore what animals need to survive by matching animals to their particular needs.

MATERIALS:

- Animal Needs Student Resource Sheets 1.1, 1.1b and 1.1c cards (per group)
- Antarctica Animal Needs Student Resource Sheet 1.1d (per student)
- Technology to show the following videos:
<http://bit.ly/BlueWhaleAmazingAnimals>
<http://bit.ly/AntarcticAnimalKrill>
<http://bit.ly/AntarcticAnimalPenguins>
- Optional: Crayons
- Optional: Chart paper



LESSON 1.1

DISCOVERING ANIMALS

EDUCATOR PREP:

Split the class into groups of four. Print a set of “Animal Needs Student Resource 1.1, 1.1b and 1.1c cards” for each group. Cut each set of cards and place them in an envelope for each group. Print a copy of the “Antarctica Animal Needs Student Resource Sheet 1.1d” for each student.

EDUCATOR GUIDE:

1. In the film *Dinosaurs of Antarctica*, students will learn that dinosaurs and various types of plants once survived in Antarctica. Explain to students that millions of years ago, Antarctica was free of ice, allowing various kinds of plants and animals, including dinosaurs to live. Share with the students that as the climate changed due to natural occurrences, it made it difficult for animals and plants to survive.

2. Introduce the vocabulary word habitat to students. Ask students to raise their hand if they remember hearing the word habitat before.

What does the word habitat mean?

Habitat is the place or environment where a plant or animal naturally or normally lives and grows.

What do you notice about our habitat?

A particular habitat may have water, rain, air, snow, sand, and trees.

Explain to students that our planet has many unique habitats such as oceans, forests, rivers, deserts, lakes, and wetlands. Ensure that students understand that living organisms may have a different habitat depending on their needs.

3. Remind students that living things need particular resources to survive. Ask students:

Who has a pet?

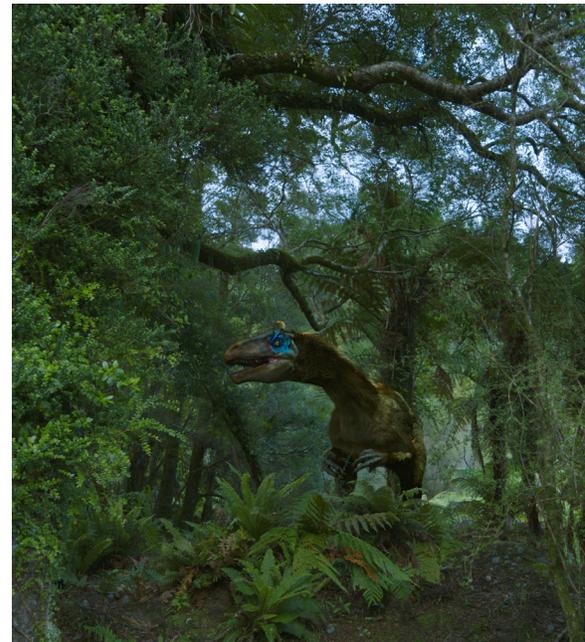
Do you know someone who has a pet?

What kind of pet is it?

What does your pet need to survive?

4. Show students the six animal cards from the “Animal Needs Student Resource 1.1 cards.”

Ask students to name all of the animals to confirm their knowledge about particular animals. Listen to student responses and clarify misunderstandings when necessary.



A male Cryolophosaurus – meaning ‘frozen crested lizard’ stalks through the fern foliage of Gondwana, flashing vivid facial colors and a large head crest.

LESSON 1.1

DISCOVERING ANIMALS

(4. Continued)

Explain to students that each group will receive a card with a picture of an animal that are common pets. Their role is to pretend that their chosen animal is their new pet. They have to purchase items to increase the likelihood of their pet surviving.

5. Give each group of students a set of “Animal Needs Student Resource 1.1, 1.1b and 1.1c cards.” Tell students that as a group their role is to match each pet animal to their needs by stacking the cards into groups. Explain to students that they should have four stacks. Model an example to ensure students understand the expectations. Recall which students shared that they have a pet dog if applicable.

6. Hold up the card with a picture of a dog. Ask students to think about a typical dog’s needs and choose two cards that may meet that requirement. Students should choose the dog food card and the dog house/bed. Direct students to place the three cards in a stack. Tell students to do the same strategy with the other animals. Circulate to provide assistance when needed and to check for understanding. Attempt to guide students to the appropriate choices by asking questions to push their thinking versus immediately sharing that their answers are incorrect.

7. Ask students to brainstorm at least one additional item that the pets may need. Each group will have six blank cards which should be enough for each student to draw one picture. Tell students that they will use the blank cards to draw a picture of at least one additional need for each pet. Ask students to raise their hand when they decide what their group will draw. Circulate to confirm that each student has a picture to draw.

8. Tell students that as a class, they will summarize the findings they explored about various animals using a Venn diagram. Explain to students that Venn diagrams are used to show relationships between a set of objects or ideas.

9. Make a Venn diagram on chart paper or the board for students to view. Write animals above the left circle and plants above the right circle.

*Based on the activity you recently completed,
what do living things need to stay alive?*

Living things such as your pet need water, food, air/oxygen,
appropriate temperature and a habitat to survive.

Based on your knowledge, what do plants need to survive?

Plants need many things to grow such as nutrients,
air, water, light, temperature, space and time.

Be prepared to lead the discussion detailing what plants may need to survive if students have not been introduced to the concept.

Educator Notes:

LESSON 1.1

DISCOVERING ANIMALS

10. As you compare and contrast the needs of plants and animals, record students' thoughts in the Venn diagram. Explain to students that while living things can have different characteristics such as animals versus humans, we all have a few basic needs for survival. We all need water, habitat, and food. Ask students:

Thinking about rabbits that live in the wild, what might they need that's different and similar to a pet rabbit? Why?

Looking at the list of things plants and animals need to survive, do we as humans need any of these items? If so, which ones?

11. Remind students that in the film *Dinosaurs of Antarctica*, dinosaurs once lived in Antarctica but most of them died due to natural occurrences. Scientists believe that a set of natural disasters such as volcanic eruptions or an asteroid colliding with the earth's surface caused a climate shift making it difficult for some animals and plants to obtain food and the necessary conditions for survival in particular parts of the world.

Ask students:

What do you think happened to the dinosaurs?

How might a change in the environment affect their ability to survive?

12. Remind students that in the previous activity, they discovered the living requirements of specific animals (also for common pets).

Ask students:

Which type of animals do you think make good pets?

Which type of animals do you think may not make a good pet? Why?

Do you think a dinosaur would have been a good pet? Why?

13. In the film *Dinosaurs of Antarctica*, students learned that although some animals and plants that once existed in Antarctica may no longer exist, the continent is still home to some animals. Remind students that in the previous activity they explored what animals and plants need to survive. Ask students:



While Antarctica is home to only 6 of the 35 species of seals, the vast majority of all seals on earth live in Antarctica and the Arctic.

LESSON 1.1

DISCOVERING ANIMALS

(13. Continued)

What do living things need to survive?

Most living things need food, water, light, temperatures within particular limits, and air.

What animals currently live in Antarctica?

Some animals that live in Antarctica are whales, seals, krill and many birds such as penguins and petrels.

14. Explain to students that they will use what they know about Antarctic animals to determine their requirements for survival. Provide each student a copy of the “Antarctica Animal Needs Student Resource Sheet 1.1d.”

15. Tell students that the learning task is to match the Antarctic animal to their habitat, food source, environmental needs, etc. Explain to students that they may not know a lot about some animals such as the Antarctic krill so they will watch a short video. Play the two-minute video “Animals of the Ice: Antarctic Krill” by Ocean Today for the class. <http://bit.ly/AntarcticAnimalKrill>

After showing the video, “Animals of the Ice: Antarctic Krill,” ask students:

What do you think would happen if all of the Antarctic krill disappeared?

Many animals such as whales, ice fish, seals, and penguins would have limited amounts of food because they depend on krill as a food source.

What does the Antarctic krill eat?

Krill eat small plants under the surface of the sea ice.

Using the “Antarctica Animal Needs Student Resource Sheet 1.1d,” instruct students to draw a line to match the Antarctic Krill with their particular needs for survival.

16. Share with students that they will watch another video about penguins. Play the two-minute video “Animals of the Ice: Emperor Penguins” for the class. <http://bit.ly/AntarcticAnimalPenguins>

After showing the video, “Animals of the Ice: Emperor Penguins,” ask students:

How does the size of the emperor penguin keep them warm?

Their bodies can maintain more heat and they have a lot more feathers than any other bird.

Educator Notes:

LESSON 1.1

DISCOVERING ANIMALS

(16. Continued)

How do penguins travel in Antarctica?

Penguins slide around on their bellies. They also know how to climb ice cliffs using their claws and beaks.

17. The video does not mention penguins' food sources. Share with students that penguins eat seafood (ex: krill and fish) and they drink salt water. Ask students:

What do you think will happen if all of the fish in Antarctica disappeared?

Other animals such as penguins, whales, and seals will have a limited food source.

Using the "Antarctica Animal Needs Student Resource Sheet 1.1d" instruct students to draw a line to match the Emperor Penguin with their particular needs for survival.

18. Share with students that they will watch another video about blue whales. Play the one-minute video "Blue Whale Amazing Animals" by National Geographic Kids for the class.

<http://bit.ly/BlueWhaleAmazingAnimals>

19. After showing the video, "Blue Whale Amazing Animals," ask students:

How large is the blue whale?

The blue whale is the largest mammal living today and can grow up to 98 feet long and weigh up to 180 tons (larger than a truck).

Where can you find a blue whale?

Blue whales can be found in every ocean.

Using the "Antarctica Animal Needs Student Resource Sheet 1.1d" instruct students to draw a line to match the blue whale with their particular needs for survival. Tell students to complete the rest of the worksheet. Review the correct responses for each animal to ensure student mastery of the content.

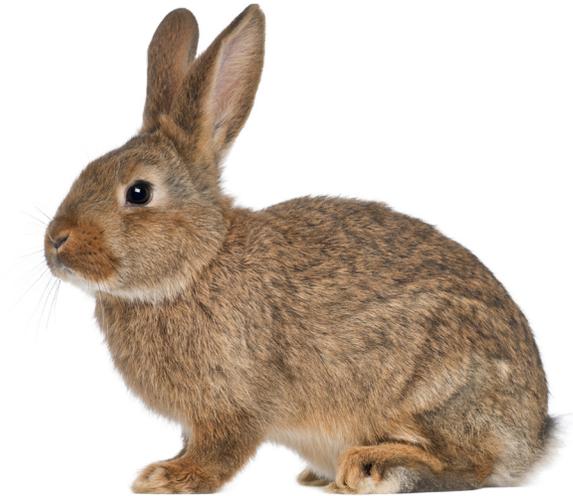
20. Conclude the lesson by restating that all living things have particular requirements to survive. Explain to students that in the film *Dinosaurs of Antarctica*, they will learn more about the ancient and current animals of Antarctica and how the continents' environment impact their survival.



An Emperor Penguin with chick at the Emperor Penguin Colony at Snow Hill, Weddell Sea, Antarctica. October 2018.



Bird



Rabbit



Dog



Cat





Match the animal on the left to their particular food and habitat needs on the right. Choices on the right side may be used more than once.

whale



ocean & land



penguin



ocean



krill



krill



fish



phytoplankton (algae)



LESSON 1.2

EXPLORING WEATHER

GRADE LEVEL K-1



***DINOSAURS OF ANTARCTICA* EDUCATOR GUIDE**



Dinosaurs of Antarctica Educator Guide

LESSON 1.2

EXPLORING WEATHER

GRADE LEVEL K-1
(1) 30 MINUTE LESSON
(4) 20 MINUTE LESSONS

STANDARDS:

- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
- CCSS.ELA-LITERACY.W.K.8/1.8. With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

FROM THE FILM:

In the film *Dinosaurs of Antarctica*, explorers faced harsh weather conditions while conducting research. Many earlier explorers were unable to complete their Antarctic journeys due to the extreme cold. Scientists now are able to track Antarctica's weather patterns and normally take expeditions during the summer months to take advantage of warmer seasonal weather, making it easier to survive.

LESSON OVERVIEW:

In this lesson, students will identify characteristics of weather by observing, tracking, describing and predicting their local weather for six consecutive days.

MATERIALS:

- Exploring The Weather Booklet Pages
- Stapler
- Crayons or coloring pencils
- Technology to show the following video:

Be a weather watcher by SciShow Kids
<http://bit.ly/WatchWeather>



LESSON 1.2 EXPLORING WEATHER

EDUCATOR PREP:

DAY 1

Print one copy of the “Exploring The Weather Book Pages” for each student. To assemble the booklets, print the booklet pages front and back in the page order provided (ex: the cover page is the last page). Be sure that you print the pages as a booklet/tablet format to ensure the layout is correct. After printing a set of pages for each student, create booklets by folding the document in half. Based on your class size, it may be necessary to request parent or volunteer support in creating the booklets to avoid losing instructional time. Gather the necessary materials based on your class size. Create a visual display of a monthly calendar (ex: whiteboard, chart paper, bulletin board, etc.)

DAY 2

Pass out student materials (ex: flipbooks and crayons). Research the current daily temperature.

EDUCATOR GUIDE:

DAY 1

1. In the film *Dinosaurs of Antarctica*, students learned about the harsh weather conditions many early explorers faced during their journey to the South Pole. The film also mentioned how although scientists today are more prepared for Antarctica’s weather, they still find it challenging. Remind students that the weather is the way the atmosphere is behaving. Ask students:

Who can remember from the film why some early explorers didn’t reach their goal of visiting the South Pole?

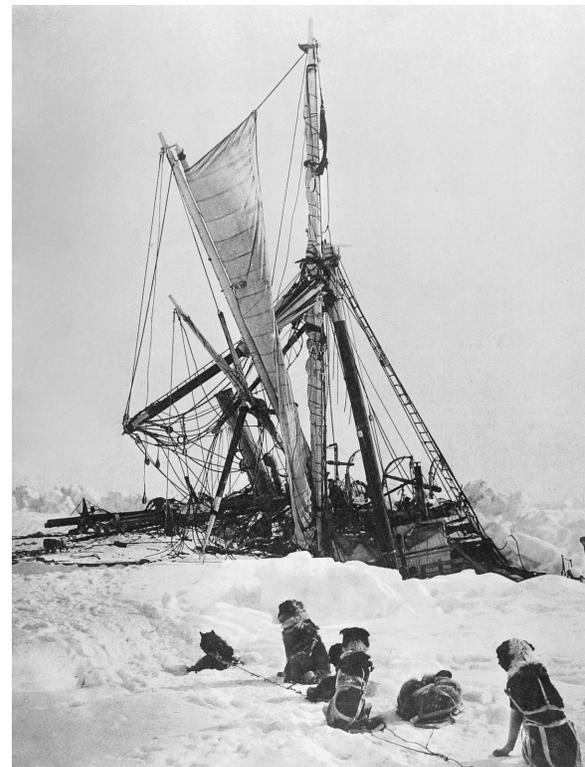
The weather was too harsh (bad) and it was too cold for them to continue.

Who can remember from the film, the type of clothing scientists on the expedition wore in Antarctica?

Scientists wore waterproof and windproof outerwear (ex: pants, jackets, and boots), hat, gloves, sunglasses, and thermal underclothing to keep warm.

Why should we care about the weather?

Weather tells us how we should prepare for the day (ex: how we dress, what to bring with us, whether we should attend an outdoor event, how animals might behave, etc.)



The Endurance sank to the bottom of the Weddell Sea during Sir Ernest Shackleton’s expedition to Antarctica in 1914.

LESSON 1.2

EXPLORING WEATHER

2. Tell students that when scientists describe weather conditions, they are sharing what’s happening in the atmosphere over a short period of time like today, this week or even this month. Tell students weather forecasters or meteorologists understand, observe, forecast and then share the earth’s atmospheric behavior and how the atmosphere affects the earth and life on the planet. Tell students that a climatologist studies how the atmosphere behaves over a long period of time, such as years.

3. In the film *Dinosaurs of Antarctica*, students learned that scientists were studying how the climate changed over time (moving from warm temperatures to extremely cold temperatures) in Antarctica and how it affected plant and animal life. Remind students that in the previous lesson, they discovered that plants and animals have certain requirements to survive and that the appropriate temperature level was one necessity.

4. Share with students that they will watch a short video about the different types of weather and how to keep track of the weather by making observations. Show students the video, “Be A Weather Watcher” by SciShow Kids. <http://bit.ly/WatchWeather>

After watching the video, lead a class discussion using the following question prompts:

What is a weather journal?

A weather journal is a document where people can record weather trends.

What is a thermometer?

A thermometer is an instrument for measuring temperature.

What type of weather might we experience in the summer?

In the summer, it might be warm and sunny.

5. Explain to students that over the next week, they will track the local weather and determine how it affects their daily life. Ask students if their parents/guardians/teachers ever had to change plans due to the weather. Students should be able to share an example such as not being able to go outside during recess because it rained or it was too cold.

6. Tell students that they will act as weather forecasters for the week. Explain to students that they will create a booklet to monitor the weather. Share with students that their booklet will have six pages and show them an example of a book. Tell students that each day, they will track the following: temperature, how it looks outside (ex: sunny or cloudy), how to dress for the weather and make a prediction about the weather for the following day. Point out that each page represents a day.

Educator Notes:

LESSON 1.2 EXPLORING WEATHER

7. Provide each student with a booklet. Tell students that they will begin tracking the weather today. Guide students through the process of completing day 1. Share the current temperature with students and share how you found this information (ex: news channel, phone app, car thermometer, etc.). Permit students to quickly share their booklet with a partner. Show students the large classroom calendar and explain that the weather for the previous two weeks has been updated. Tell students that they will update the calendar days as a class for the next week.

8. To conclude the lesson, explain to students that it's possible to retrieve weather conditions from last year, ten years ago, twenty years ago and beyond. Tell students that today's temperature will be recorded as part of history so perhaps thirty to fifty years from now scientists can track climate shifts.

DAY 2- DAY 5

1. Guide students through the process of completing their daily booklet page. Share the current temperature with students. Permit students to quickly share their booklet with a partner. Show students the large classroom calendar and update it with the daily weather forecast. To check for understanding, choose a couple of questions below.

Did you notice a difference in the weather during the morning, afternoon and evening?

Why do you think the weather is cooler at night?

Did you notice a difference in the weather today compared to yesterday?

What do you think the temperature will be like tomorrow?

How did the weather affect your plans or decision making this week?

How does the season affect the weather?

What kinds of problems might we face if we had a lot of rain in a short period of time?

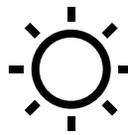
2. To conclude the series of lessons, allow students to take their weather booklet home. Encourage them to track the weather on Saturday with their parents/guardians.



Thermometer in snow marks temperatures below zero.

MONDAY

1. Today is _____ date _____.
2. The temperature today is _____.
3. It looks like this outside. Circle one.



sunny



cloudy

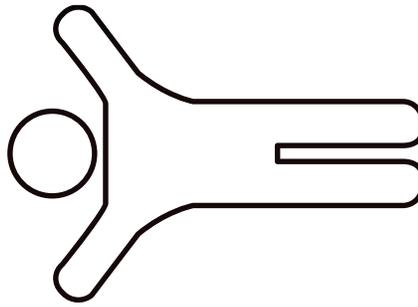


rainy

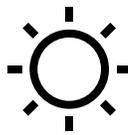


snowy

4. Children should dress like this today.
Draw a picture.



5. Tomorrow, I think it will look like this.
Circle one.



sunny



cloudy



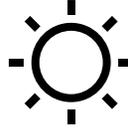
rainy



snowy

TUESDAY

1. Today is _____ date _____.
2. The temperature today is _____.
3. It looks like this outside. Circle one.



sunny



cloudy

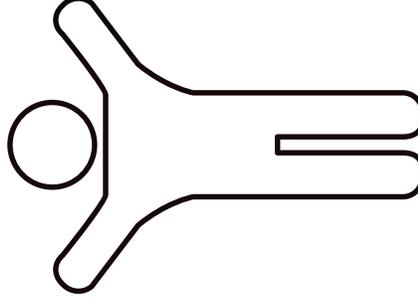


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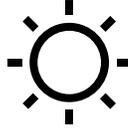


snowy

4. Children should dress like this today.
Draw a picture.



5. Tomorrow, I think it will look like this.
Circle one.



sunny



cloudy



rainy



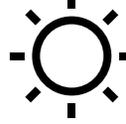
snowy

WEDNESDAY

1. Today is _____ date _____.

2. The temperature today is _____.

3. It looks like this outside. Circle one.



sunny



cloudy



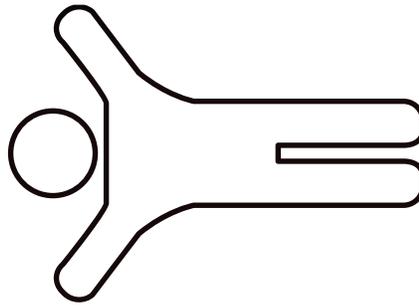
rainy



snowy

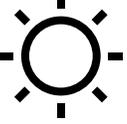
4. Children should dress like this today.

Draw a picture.



5. Tomorrow, I think it will look like this.

Circle one.



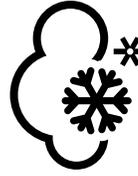
sunny



cloudy



rainy



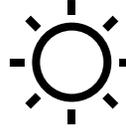
snowy

THURSDAY

1. Today is _____ date _____.

2. The temperature today is _____.

3. It looks like this outside. Circle one.



sunny



cloudy



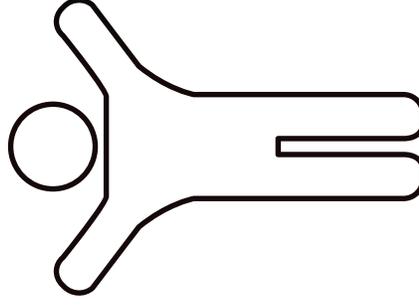
rainy



snowy

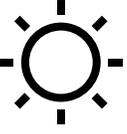
4. Children should dress like this today.

Draw a picture.



5. Tomorrow, I think it will look like this.

Circle one.



sunny



cloudy



rainy



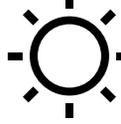
snowy

FRIDAY

1. Today is _____ date _____.

2. The temperature today is _____.

3. It looks like this outside. Circle one.



sunny



cloudy



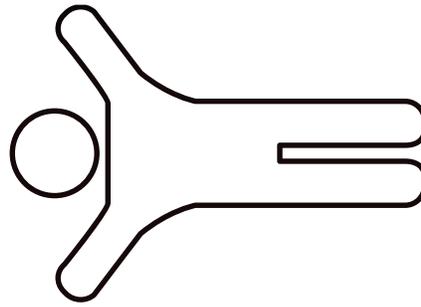
rainy



snowy

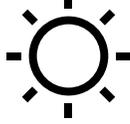
4. Children should dress like this today.

Draw a picture.



5. Tomorrow, I think it will look like this.

Circle one.



sunny



cloudy



rainy



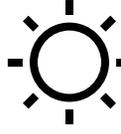
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SATURDAY

1. Today is _____ date _____.

2. The temperature today is _____.

3. It looks like this outside. Circle one.



sunny



cloudy



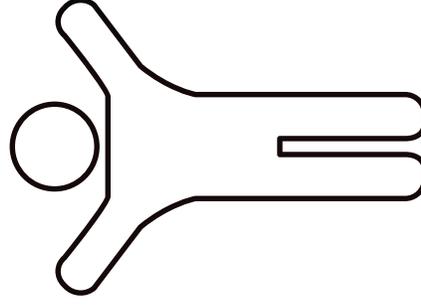
rainy



snowy

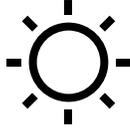
4. Children should dress like this today.

Draw a picture.



5. Tomorrow, I think it will look like this.

Circle one.



sunny



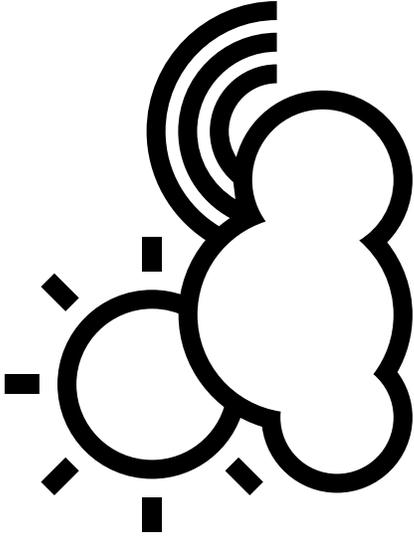
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rainy

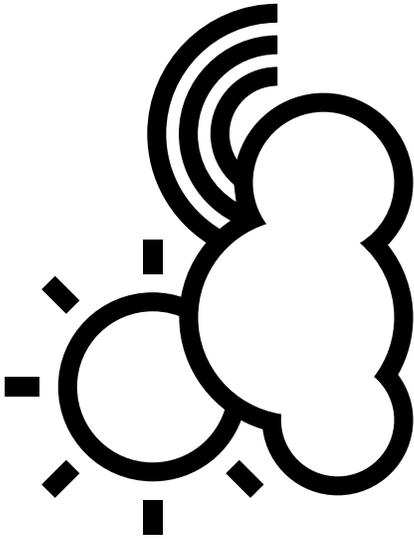


snowy



**EXPLORING
THE WEATHER**

A BOOK BY



**EXPLORING
THE WEATHER**

A BOOK BY

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 1.3

PREPARING FOR ANTARCTICA

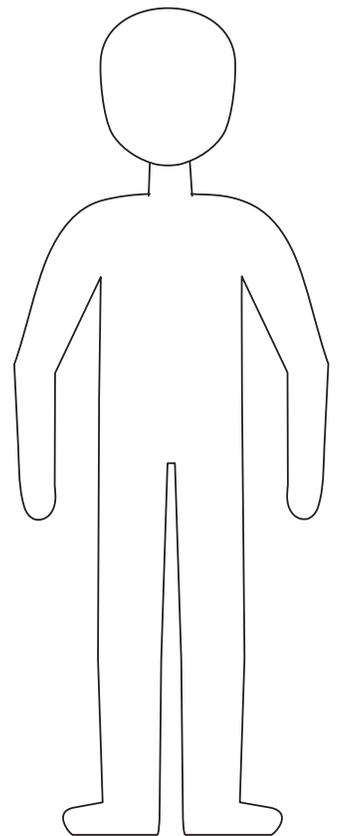
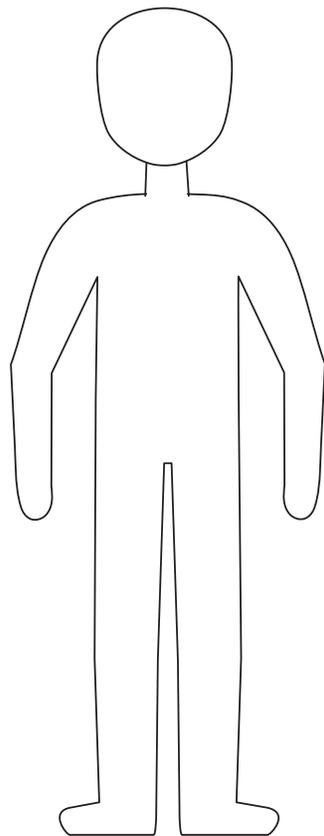
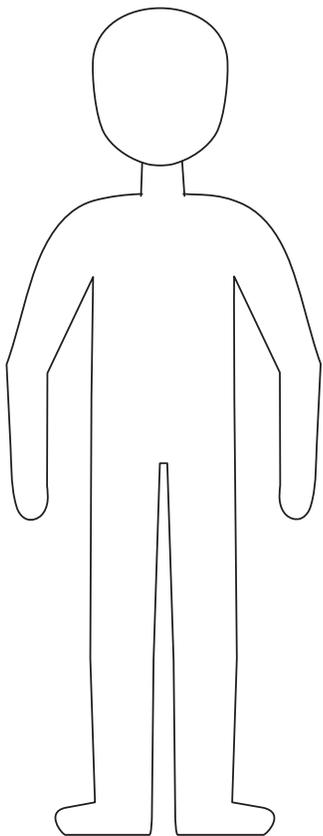
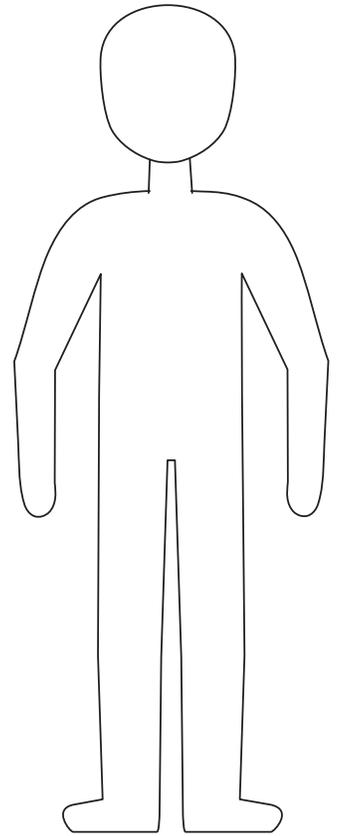
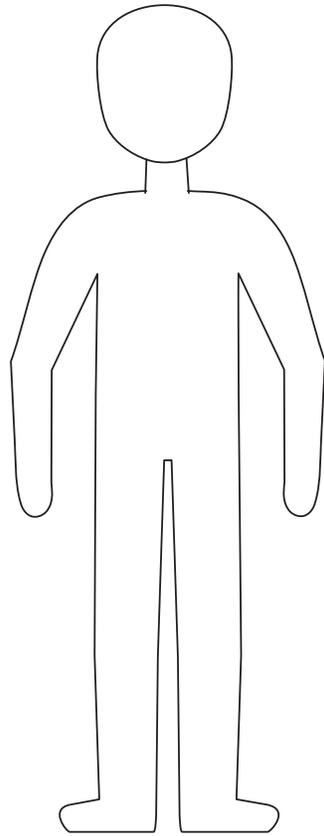
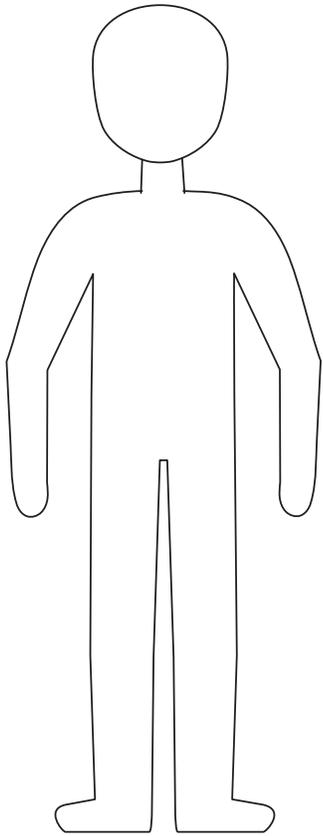
3. Share with students that they will pretend to dress an explorer or scientist in Antarctica and they need to choose appropriate clothing based on what they know about the continents' climate. Provide students with materials and supplies (ex: crayons, scissors, craft sticks, and glue) to complete the assignment. Guide students to complete the following steps:

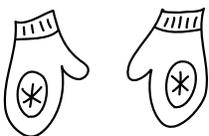
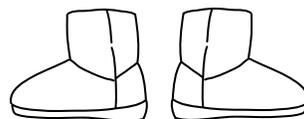
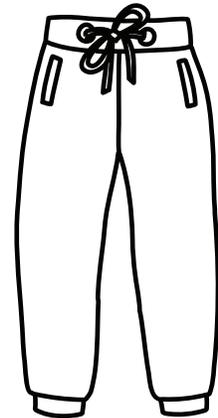
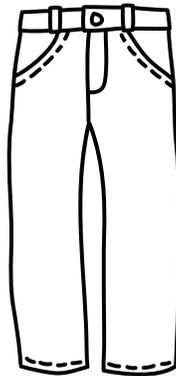
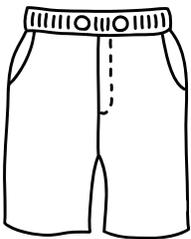
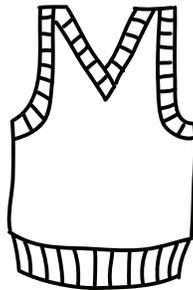
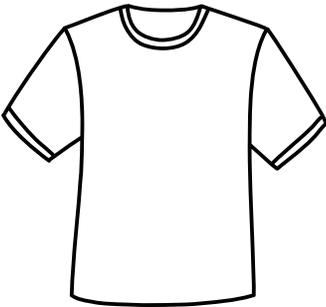
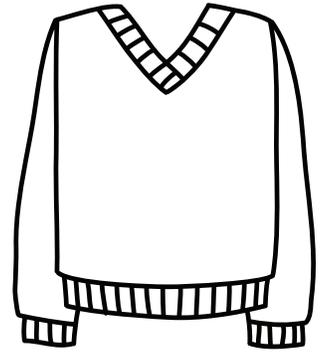
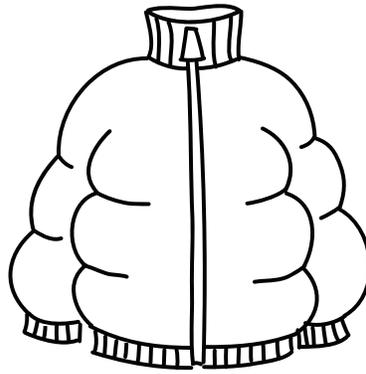
- Choose paper clothing for their explorer puppet
- Color the paper clothing for their explorer puppet
- Cut out the paper puppet
- Cut out the chosen paper clothing for their explorer puppet
- Glue the paper clothing to the paper puppet
- Glue the dressed paper puppet to a craft stick
- Circulate to provide individual assistance when necessary

4. Split students into groups of four and allow ten minutes for them to create a play with their stick puppets. Provide students with the following prompt: Pretend you and your group mates are explorers in Antarctica and someone finds a dinosaur fossil. Using your puppet, create a scene or story detailing what happened. Circulate to hear the stories students create.

5. Conclude the lesson by permitting students to share their stick puppets with other groups and encourage them to explain their choice of clothing. Connect the lesson to the film ***Dinosaurs of Antarctica*** by asking students: How might scientists determine which type of clothing to bring to Antarctica?

Educator Notes:





LESSON 1.4

EXCAVATING DINOSAURS

GRADE LEVEL K-1



DINOSAURS OF ANTARCTICA EDUCATOR GUIDE



Dinosaurs of Antarctica Educator Guide

LESSON 1.4 EXCAVATING DINOSAURS

GRADE LEVEL K-1
(1) 20 MINUTE PREP
(1) 45 MINUTE LESSON

STANDARDS:

- CCSS.ELA-LITERACY.SL.K.3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood.
- CCSS.MATH.CONTENT.1.MD.C.4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

FROM THE FILM:

The film *Dinosaurs of Antarctica* discusses how it can take decades and multiple expeditions to excavate dinosaur fossils. The *Cryolophosaurus* fossil was first discovered in 1990 and wasn't fully retrieved until years later in Antarctica. Paleontologists such as Dr. Nate Smith and Dr. Pete Makovicky study ancient life such as prehistoric mammals, fish, and even dinosaurs. Using fossil evidence, paleontologists can understand how organisms and our planet change over time.

LESSON OVERVIEW:

In this lesson, students will explore how excavating dinosaur fossils from rock in Antarctica is a lengthy process by retrieving “dinosaur fossils” from hard material using a variety of tools.

MATERIALS:

- One balloon (per partner)
- One mini toy dinosaur (per partner)
- One rectangle bin to melt iced dinosaurs (per partner)
- One turkey baster or small squeeze bottles (per partner)
- One handheld scrubber (per partner)
- Optional: kid-size plastic gloves (per student)
- Warm water
- Technology to show the following video:

Dig In To Paleontology by SciShow Kids
<http://bit.ly/Huntfordinos>



LESSON 1.4

EXCAVATING DINOSAURS

EDUCATOR PREP:

Split your class into partners. Gather enough materials to accommodate the class size. For example, if there are twenty students in the class, you will need materials for each set of partners (ex: ten). To prepare the lab, place a miniature dinosaur inside each balloon. Fill the balloon with water, tie the top and place it in the freezer overnight. Based on your class size, it may be necessary to request parent or volunteer support in preparing the balloons.

EDUCATOR GUIDE:

1. Reintroduce the vocabulary word *excavate* to students. Ask students to raise their hands if they remember hearing the word excavate in the movie.

What does the word excavate mean?

Excavate means to make a hole or channel by digging to remove pieces of Earth that are covering old objects buried in the ground to discover things about the past.

Can you remember a time when you had to dig into something to find an object?

[Acknowledge students responses]

Example: Some children like to bury items in the sand or dig for items in the sand such as rocks or shells.

2. Remind students that there are many people such as scientists who may excavate or dig for old objects and remains. In the movie, we learned about the role of a paleontologist and how it took a long time to dig up dinosaur remains in Antarctica.

Who is a paleontologist?

They are scientists who study ancient life such as prehistoric mammals, fish, and dinosaurs. Paleontologists use fossil evidence to determine how organisms and our planet changed over time.

Let's talk about the word fossil. Fossils are the remains or traces of remains of aged animals and plants. In the movie, some scientists were looking for dinosaur fossils.

From the movie, who remembers how long it took to dig up the largest meat-eating dinosaurs?

It took about twenty years to retrieve the entire remains of the *Cryolophosaurus*. So they started digging for this dinosaur before you were born.



Example of a plant fossil.

LESSON 1.4

EXCAVATING DINOSAURS

(2. Continued)

Do you think it's easier to dig in sand or rock? Why does it take so long to dig up the dinosaur remains in Antarctica?

Since it's so cold in Antarctica, the rock doesn't have the opportunity to thaw so it remains extremely hard. Unlike when you have probably dug in the dirt, the ground was softer so depending on how deep the object was located, it impacted the length of time it took to retrieve.

3. Over the next couple of days, we will attempt to explore how scientists excavate dinosaur fossils.

Why might some people think scientists dug into Antarctica's ice instead of rock to find dinosaur remains?

Since most people know that Antarctica landscape is covered in sheets of ice, they often assume scientists are digging in ice to find remains. Actually, they are drilling into frozen rock. While we will use frozen ice in our hands-on experiment, remember that the frozen ice is modeling the toughness of frozen rock.

4. Tell students that they are going to prepare for a fun experiment. Place students in their respective pairs or groups to prep for the experiment. It's suggested that students at least work in pairs to complete the activity. Be sure that each student understands their role and expectations for partner work before moving forward.

5. Show students a balloon, a cup of water and a toy dinosaur. Tell students that you placed the toy dinosaur inside the balloon and filled it with water. Afterward, you placed the balloon in the freezer overnight. Ask students:

What do you think happened to the water inside the balloons?

The water inside the balloons froze.

What do you think happened to the toy dinosaur inside the balloon?

The toy dinosaur should appear frozen inside the balloon.

Tell students that in a few minutes we will determine if our predictions were correct.

Educator Notes:

LESSON 1.4

EXCAVATING DINOSAURS

6. Explain to students that they will watch a video to learn more about how paleontologists find and remove dinosaur fossils. Show students the video, “Dig In To Paleontology” by SciShow Kids [4 minutes]. After students view the video, facilitate a discussion using the following question prompts:

How do paleontologists remove fossils from rocks and sand?
Scientists use tools such as shovels, big diggers and picks.

Where do paleontologists take the fossils they find?
Scientists take the fossils back to the lab to analyze their findings.

What is one way paleontologists share their findings?
Scientists’ work can be found in museums.

Why is the role of a paleontologist important?
They study how life on planet Earth changed over time.

7. Remind students that in the movie *Dinosaurs of Antarctica*, scientists found a large dinosaur called *Cryolophosaurus* from the frozen rock of the Transantarctic Mountains. Ask students:

What did we say will happen to the water and toy dinosaur inside the balloon after being placed in the freezer overnight?
We predicted that the water inside the balloon would freeze and that the toy dinosaur may look like it’s frozen.

8. Remove the balloons from the freezer. Give each set of partners a rectangle bin with 2 cups of warm water, a frozen balloon, handheld scrubber, gloves (optional) and a turkey baster or squeeze bottle.

9. Cut a circular section of the balloon near the tie point. Tell students to peel or remove the balloon, exposing the ice. Ask students to share their observations. Students should be able to share how their predictions were true or untrue.

10. Tell students the goal is to use the tools provided to excavate the dinosaur out of the “frozen rock” without removing it from the rectangle bin. Explain to students that you will set a timer so they can determine how long it took to retrieve the dinosaur. Use an anchor chart to record the amount of time it took for each group to “find” their dinosaur using a bar graph. Allow the groups to color in their time on the bar graph when they finish. Be sure to explain how to read and understand a bar graph if students are unfamiliar with the concept.



*Nate Smith uses a saw to excavate a fossil on Shackleton Glacier.
Photo courtesy of Akiko Shinya.*

LESSON 1.4

EXCAVATING DINOSAURS

11. After every group retrieves their dinosaur, debrief the experience with the following question prompts:

What did you think about the activity?

Looking at the bar graph, which group took the shortest amount of time to find the dinosaur?

Which group took the longest amount of time to find the dinosaur?

Ask each group to share their method and have students discuss why one method might have worked quicker than the other method.

12. Conclude the lesson by connecting the activity to what they learned in the film about paleontologists' role in excavating buried remains. Be sure to emphasize that it can take years for scientists to recover dinosaur fossils.

Educator Notes:

Animals of Antarctica Puzzle

Use the pictures and the word bank to solve the puzzle.

If correct, the word will fit in the puzzle.

Word Bank:

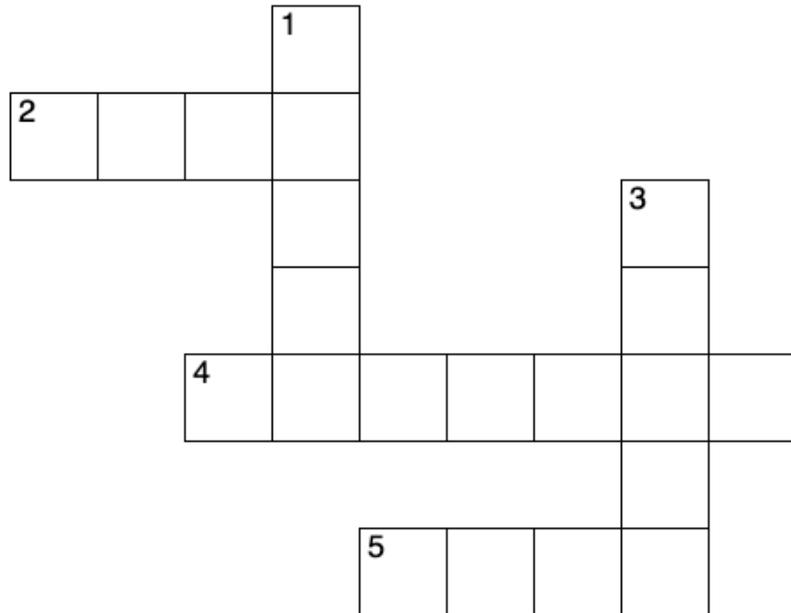
whale

penguin

seal

krill

fish



Across

2.



4.



5.



Down

1.



3.



Animals of Antarctica Puzzle

Use the pictures and the word bank to solve the puzzle.

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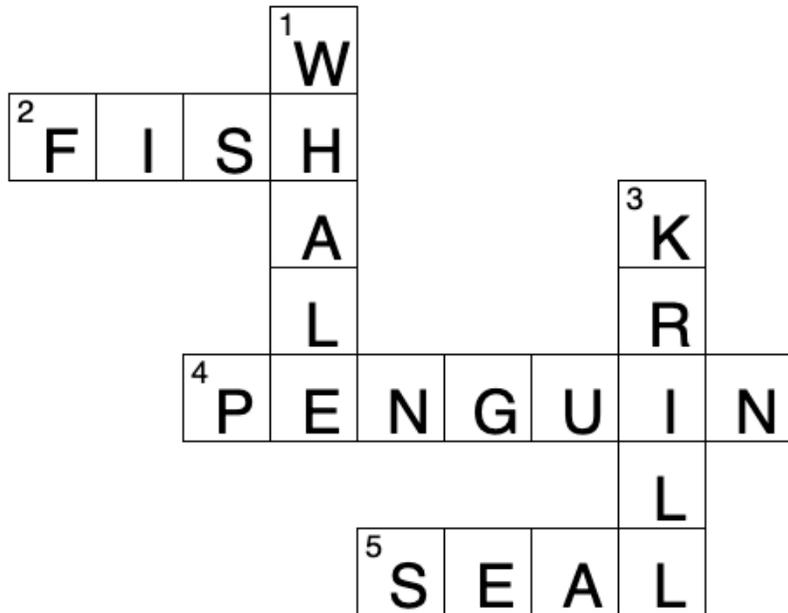
whale

penguin

seal

krill

fish



Across

2.



4.



5.



Down

1.



3.





Dinosaurs of Antarctica Educator Guide

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DISCOVERY PLACE



DINOSAURS
OF ANTARCTICA