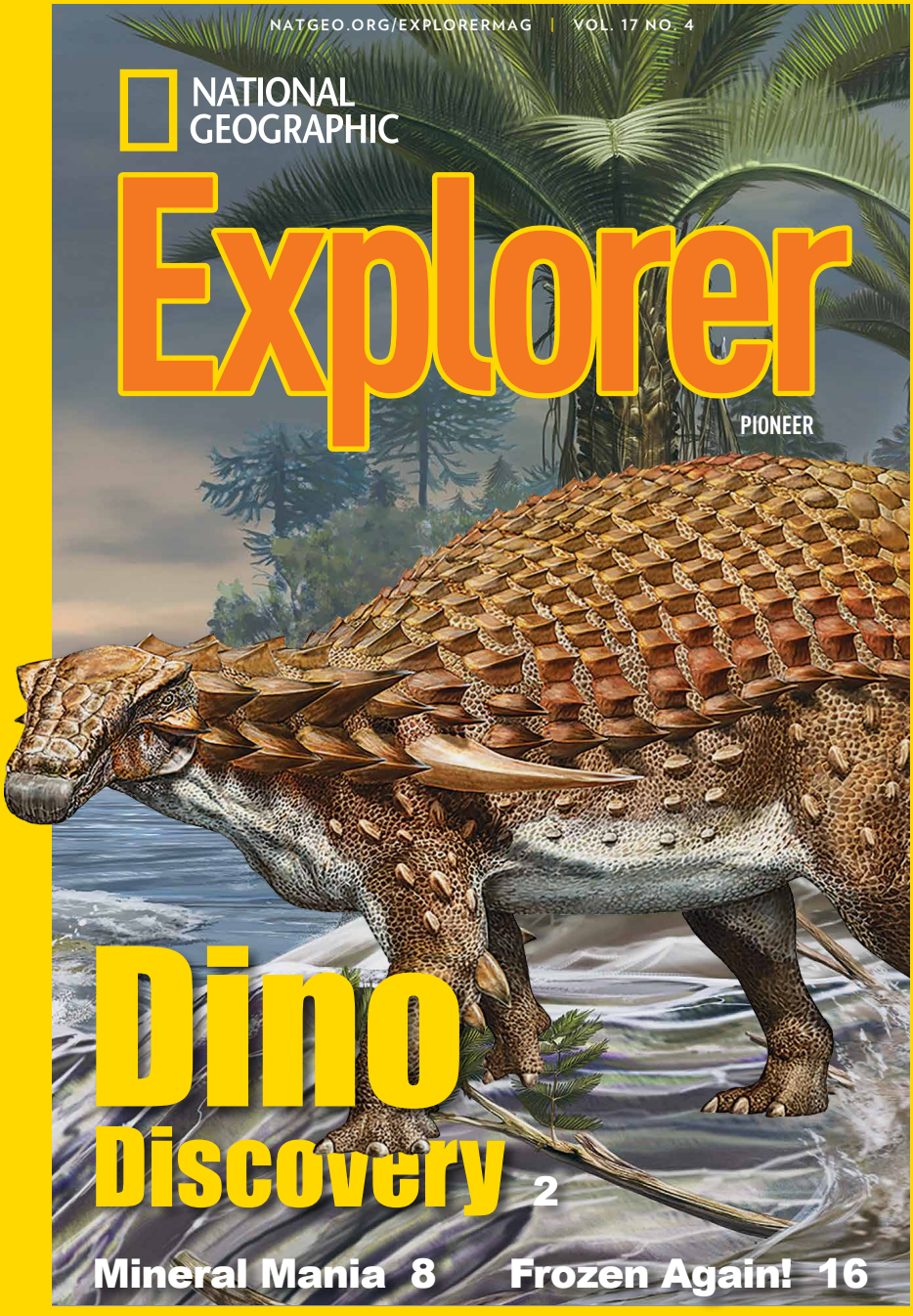
TEACHER'S GUIDE



Pioneer
Vol. 17 No. 4

In This Guide

This guide contains language arts and science or social studies lessons for articles in this issue of Explorer Pioneer.

Explorer Magazine

Explorer classroom magazines are written for each grade, 2-5. Through great storytelling and stunning photographs, the magazines develop literacy skills and teach standards-based content aligned with the Common Core State Standards (CCSS), Next Generation Science Standards (NGSS), or National Council for the Social Studies (NCSS). The activity on the magazine's back cover is tailored to the NG Learning Framework. (see page 2)

Explorer magazines offer engaging reading opportunities for students with different ability levels in the same class. All articles have been measured using the Lexile® Framework for Reading. Articles in Explorer Pioneer will be within the 250-550L range.

For additional resources to extend your students' learning, visit Explorer's website, natgeo.org/explorermag-resources.

Your Subscription Includes:

- Magazines
- Classroom Posters
- Projectable Magazine
- Teacher's Guide
- App (additional subscription required)

National Geographic Learning Framework

INTRODUCTION

BACKGROUND

Since 1888, the National Geographic Society has funded scientists and explorers and shared their findings with the world. To support educators who use our resources, we have created a Learning Framework, which lays out what we believe students should learn from their experiences with the Society.

PURPOSE

The Learning Framework was designed to convey the Society's core beliefs and values. It is built around a set of attitudes, skills, and knowledge that embody the explorer mindset.

To determine the learning outcomes within the Learning Framework, we dug deep into national standards in key subject areas. We also sought advice from subject matter and child development experts, along with the combined expertise of NG instructional designers, researchers, and content developers. To learn more, go to: https://www.nationalgeographic.org/education/learningframework/.

IMPLEMENTATION

Each article in this magazine has a knowledge-based link to the Learning Framework. Students will use the skills and attitudes as they do the activity on the back cover. The activity relates to the article "Frozen... Again!"

MINDSET OF AN EXPLORER

KEY FOCUS AREAS

A — *Attitudes*

National Geographic kids are:

CURIOUS about how the world works, seeking out new and challenging experiences throughout their lives.

RESPONSIBLE, with concern for the welfare of other people, cultural resources, and the natural world. NG kids are respectful, considering multiple perspectives, and honoring others regardless of differences.

EMPOWERED to make a difference. NG kids act on curiosity, respect, and responsibility. They are adventurous and persist in the face of challenges.

S — *Skills*

National Geographic kids can:

OBSERVE and document the world around them and make sense of those observations.

COMMUNICATE experiences and ideas effectively through language and media. They are storytellers!

COLLABORATE with others to achieve goals.

SOLVE PROBLEMS by generating, evaluating, and implementing solutions after identifying alternatives, weighing trade-offs, and making well-reasoned decisions.

K — *Knowledge*

National Geographic kids understand:

THE HUMAN JOURNEY is all about where we have been, where we live now (and why), and where we are going.

OUR CHANGING PLANET encompasses all that coexists on our planet—interconnected through systems that generate and nurture each other.

WILDLIFE AND WILD PLACES inhabit our planet—from the butterflies in our backyards to the lions in Africa.

Turned to Stone

LANGUAGE ARTS LEXILE 480L

Standard Supported

- Know and use various text features and search tools (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently. (CCSS.RI.2.5)

Resources

- Vocabulary Assessment Master (page 7)
- Language Arts Assessment Master (page 8)

Summary

- The article "Turned to Stone" relates the discovery of the best-preserved fossil of a nodosaur ever found and explains how the fossil formed.

BUILD VOCABULARY AND CONCEPTS

- **fossil**
- **herbivore**
- **paleontologist**

Display the vocabulary words on a word wall or on a whiteboard. Inform students that when they read they will encounter words they don't know. Remind them that using context clues such as the sentences before or after an unknown word and visuals such as photographs or illustrations can help them figure out what an unfamiliar word means.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each vocabulary word from the article. Instruct students to scan the article to locate each bold word in the text.

As a class, find and record text and visual clues in the article related to each vocabulary word. Then divide the class into pairs. Instruct partners to brainstorm ideas about what each word means. Tell them to record their ideas on their worksheets. Invite volunteers to read aloud the definitions from the Wordwise feature on page 7 of their student magazines. Have students record the definitions on their worksheets. In small groups, have students compare the definitions they wrote with the definitions from the text.

READ

Display pages 2-3 of the projectable magazine. **Ask:** *What is this article about?* (a dinosaur fossil) Poll the class to see how many students used the photo to answer the question. Then poll the class to see how many used the deck. Guide students to recognize that photos and the deck are text features that help readers locate key facts quickly.

Point out that this article contains text features that can help them find information quickly. Model how to identify and use text features to learn more about a topic. **Say:** *We've already learned that the object in this photo is a dinosaur fossil. If we had any doubts, the deck made it clear. But why does this dinosaur look so strange? The headline tells us why. The dinosaur has turned to stone. That's what a fossil is.*

Have students review the article to identify diagrams, maps, the glossary, captions, and the 3-D model. Brainstorm a list of questions that could quickly be answered with each type of text feature.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to record one question they can easily answer using each type of text feature. Instruct them to write the answer to each question and identify the text feature they used to get that answer. Provide assistance as students access the website to examine the 3-D model featured on page 6.

Turned to Stone

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about fossils. **Ask:** *What is a fossil?* (part of an ancient plant or animal, or its shape, that has been preserved in rock) *What kind of scientist studies fossils?* (paleontologist) *What kind of fossil is this article about?* (a type of dinosaur called a nodosaur) Invite students to share what else they learned about fossils.

• **Strengthen Understanding** Inform students that combining what you already know with what you learn can help readers understand new words. **Say:** *Once you understand what a word means, it's easier to use it correctly in a sentence.* Invite students to make statements using each of the vocabulary words. Monitor their responses to ensure accuracy. Encourage students to use their **Vocabulary Assessment Masters** as a resource. Remind them to be original. They shouldn't restate sentences from the article. They should create new sentences of their own.

• **Using Text Features** After reading the article, divide the class into small groups. Instruct students share and compare the questions and answers they recorded on their **Language Arts Assessment Masters**. If there are any discrepancies, instruct students to refer back to the cited sources. Rejoin as a class. Discuss how using various text elements helped them quickly answer questions they had about the article .

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *What is a fossil? How did people know this dinosaur was a fossil?*
- *What have paleontologists learned so far from studying the nodosaur?*
- *What surprised you about what you read?*

Turned to Stone

SCIENCE

Standard Supported

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (NGSS.2-ESS1-1)

Resources

- Content Assessment Master (page 9)
- Comprehension Check (page 10)

Science Background

When paleontologists want to learn about the past, they study fossils. Fossils are the remains, or traces of remains, of ancient organisms that have been preserved in rock.

There are many different types of fossils. Bones, shells, feathers, and leaves can become fossils. So can footprints and animal poo. Sometimes, an entire organism is preserved because the animal got stuck in amber or was frozen in ice. Most often, just the bones and teeth are preserved.

That's why the fossil of a dinosaur that was discovered in western Canada in 2011 is so amazing. The fossil is the preserved remains of a nodosaur, a dinosaur that lived 110 million years ago. It is so well preserved that it looks like a rocky statue of the dinosaur. Each sandy brown scale on its back is outlined with a gray circle. Fossilized remnants of skin cover the bumpy armor plates on its skull.

According to paleontologists, this extreme level of fossilization was possible for one reason. When the dinosaur died, it was quickly buried under the sea. Minerals replaced its soft tissues before they could rot away. And unlike many fossils, this dinosaur's body wasn't squashed flat as layers of sediment built up over time. Instead it retained its life-like form, resulting in the best preserved fossil of a dinosaur that has ever been discovered.

ENGAGE

Tap Prior Knowledge

Instruct students to close their eyes and imagine that they lived during the time of the dinosaurs. Invite volunteers to describe what they see. What does the land look like? What is the climate like? What kinds of plants and trees are growing? What kinds of dinosaurs do they see? Encourage students to give detailed descriptions of their visions.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Invite volunteers to describe what they see. **Ask:** *If you found this lump of rock in the ground, would you think it could be the remains of a dinosaur? Why or why not?* Encourage students to share their opinions. Tell students that as they read the article they will learn more about this dinosaur, where it lived, and how it became a fossil.

Set a Purpose and Read

Have students read the article in order to learn about the nodosaur and how it became a fossil.

Turned to Stone

SCIENCE

EXPLAIN

Identifying the Nodosaur

Instruct students to examine the photo on pages 2-3 of their student magazines. Then display pages 4-5 of the projectable magazine. **Say:** *The photo and illustration show a nodosaur, a type of dinosaur that lived 110 million years ago.* Point out that the area outlined in white represents the recovered remains shown in the photo. **Ask:** *Why was only the front half of the dinosaur fossil recovered?* (Miners dug through half of the fossil before they saw it.) Give each student a copy of the **Content Assessment Master**. Instruct students to draw a picture of a nodosaur. Then divide the class into small groups. Instruct groups to scan the article and record details that tell what the nodosaur was like. Then have each student write one more thing they think scientists can learn from studying this fossil.

Understanding Fossils

Display the Wordwise feature on page 7 of the projectable magazine. Highlight the word *fossil*. As a class, review what a fossil is. **Say:** *Usually only parts of big animals like dinosaurs become fossils. Many dinosaur fossils are bones.* **Ask:** *How is this dinosaur fossil different?* (It looks like the dinosaur did when it was alive.) Display pages 6-7 of the projectable magazine. Review the diagram as a class. Guide students to understand that the nodosaur's body was so well preserved because of what happened when it died.

ELABORATE

Find Out More

Point out to students that there are many different types of fossils. Many dinosaur fossils are bones. The nodosaur fossil is unique because it was preserved in lifelike form. As a class, conduct research to identify other types of fossils. Challenge students to find pictures of many different types of fossils. Invite students to share what they learned with the class.

Extend Your Thinking About Fossils

Remind students that a fossil is part of an ancient plant or animal, or its shape, that has been preserved in rock. So the nodosaur fossil featured in the article is really a big chunk of rock. Point out that this would make it easy to study the outside of the fossil. Challenge students to explain why it could be difficult to study what lies beneath the dinosaur's fossilized skin.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What is a herbivore?* (an animal that eats plants)
- *How was this dinosaur fossil discovered?* A miner struck the fossil when he was digging at a mine.)
- *Why did the miner think he had found something important?* (His machine hit something hard. He saw rows of brown disks that were ringed in gray stone.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

Name _____ Date _____

VOCABULARY ASSESSMENT: Turned to Stone

Record information from the article about each vocabulary word.

Word			
Text Clues			
Visual Clues			
What I Think the Word Means			
Definition			

Name _____ Date _____

LANGUAGE ARTS ASSESSMENT: Turned to Stone

Record a question you can quickly ask and answer using each type of text feature in the article.

Text Feature	Question	Answer
diagram		
map		
glossary		
caption		
3-D model		

Name _____ Date _____

CONTENT ASSESSMENT: Turned to Stone

Draw a picture of a nodosaur

Answer each question.

1. What have scientists learned about the nodosaur so far?

_____

_____

_____

_____

_____

2. What else do you think they can learn from studying this fossil?

_____

_____

_____

_____

_____

Name _____ Date _____

COMPREHENSION CHECK: Turned to Stone

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. When did nodosaurs live?

Ⓐ hundreds of years ago

Ⓑ millions of years ago

Ⓒ billions of years ago

2. What did nodosaurs eat?

Ⓐ plants

Ⓑ animals

Ⓒ plants and animals

3. Where was this nodosaur buried?

Ⓐ in the ocean

Ⓑ in a mine

Ⓒ on a mountain

4. Which part of the nodosaur was covered with thick scales?

Ⓐ its head

Ⓑ its feet

Ⓒ its back

5. Tell how this nodosaur became a fossil.

_____

_____

_____

_____

Mineral Mania

LANGUAGE ARTS LEXILE 520L

Standard Supported

- Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (CCSS. RI.2.1)

Resources

- Vocabulary Assessment Master (page 15)
- Language Arts Assessment Master (page 16)

Summary

- The article "Mineral Mania" examines minerals, the building blocks of rocks, and explains how we rely heavily on them in our daily lives.

BUILD VOCABULARY AND CONCEPTS

- **gem**
- **mineral**
- **mixture**
- **property**

As a class, discuss the difference between familiarity and knowledge. Guide students to recognize that the more familiar you are with something, the more knowledge you have. Challenge students to explain how this concept applies to words when they read.

Display the vocabulary words on a word wall or on the whiteboard. Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write each word on their papers. Review the categories under the header "Familiarity with the Word." Tell students to make a checkmark to indicate how well they know each word.

Divide the class into pairs. Instruct partners to brainstorm ideas and write what they think each word means on their worksheets. Then display the Wordwise feature on page 15 of the projectable magazine. Have students record those definitions and compare them with the definitions they wrote.

READ

Inform students that the purpose of this article is to learn what minerals are, how they're sorted, and how people use them every day.

Tell students that the best way to learn more about minerals is to ask themselves questions as they read the article. **Say:** *Good readers always do this. It helps them learn more about the topic. And asking questions isn't as hard as you might think. Many questions begin with the same six question words:* Who? What? Where? When? Why? *and* How?

Display pages 8-9 of the projectable magazine. Model how to ask and answer questions. **Say:** *When I look at this page, the first thing I notice is the photo. What are these pretty, shiny things? Where did they come from? How do they relate to minerals?* Encourage students to introduce new questions of their own.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to write at least one question related to the article that begins with each question word. Challenge them to find answers to their questions in the text. Instruct students to record the answers on their worksheets.

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about minerals. **Ask:** *What is a mineral?* (a natural, solid material that is not of plant or animal origin) *How do people study minerals?* (They observe their properties.) *What is a gem?* (a crystal of a mineral that has been cut and polished) Invite students to share other facts they learned about minerals.

• **Strengthen Understanding** Inform students that it is essential for readers to understand the technical meaning of words when they're reading science-related topics. If they don't it will be very difficult to understand the text. **Say:** *Once you do understand what technical words mean, you follow along with the text. You can also use the words correctly in sentences of your own.* Challenge students to make accurate statements using each of the vocabulary words. Encourage them to use their **Vocabulary Assessment Masters** as resources.

• **Ask and Answer Questions** Remind students that asking and answering questions is a strategy that can help them understand what they are reading. **Say:** *Even the best readers come across words or ideas they don't understand. Asking questions is the first step toward figuring those things out. If you ask questions, you know which answers to search for as you read the text.* Have students share and compare their **Language Arts Assessment Masters** in small groups. Do they have the same questions? Did they find the same answers? If not, encourage them to identify where in the text they found the answer and make any necessary corrections.

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *Why does your body need minerals? How does you body get the minerals it needs?*
- *What are three ways people use minerals?*
- *What surprised you about what you read?*

Mineral Mania

SCIENCE

Standard Supported

- Different kinds of matter exist and many of them can be either solid or liquid, depending on the temperature. Matter can be described and classified by its observable properties. (NGSS.2-PS1-1)

Resources

- Content Assessment Master (page 17)
- Comprehension Check (page 18)

Science Background

What do a diamond and the graphite in pencil lead have in common? Both of these substances are minerals. Minerals are naturally occurring, inorganic solids. They are made of chemical elements and their atoms are arranged in a distinct pattern.

There are about 4,000 different minerals on Earth. And each mineral has a specific set of physical properties. Some of these properties include color, hardness, luster (shininess), magnetism, and solubility, or the ability to dissolve in another substance.

While some properties can be observed, others must be tested. The Mohs Hardness Scale, for example, is used to test hardness. This test contains 10 known minerals, which have been classified based on their hardness. If one of these minerals produces a scratch when scraped against an unknown mineral, it is harder than that substance. If not, it is softer.

People use minerals in a variety of ways. Some minerals are in the foods we eat. They help our bodies grow. Other minerals are used to create a multitude of products that we use each day. For example, talc can be ground into a food powder. Gypsum is used to make drywall. Precious minerals like diamonds, rubies, and emeralds are cut and polished into jewelry. A mineral's properties determine what it is like and how it can be used in a product.

ENGAGE

Tap Prior Knowledge

Display three similar objects, such as a baseball, a football, and a basketball. Encourage students to describe each one. Challenge them to identify one way each ball is like one of the others. Then have them point out key differences. Guide the class to understand that they are describing properties of the three balls.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Have students examine the headline, deck, and images. **Say:** *Each of the items you see in this photo is a mineral. According to the deck, minerals can be fancy, familiar, shiny or dull.* **Ask:** *What other words could you use to describe the minerals you see here?* Invite students to share their ideas. If necessary, suggest words such as *hard*, *soft*, *slick*, *bumpy*, etc. Tell students they will learn more about minerals and how people use them as they read the article.

Set a Purpose and Read

Have students read the article in order to understand what minerals are, identify properties of minerals and recognize how those properties allow people to use minerals in a variety of different ways.

EXPLAIN

Understanding What a Mineral Is

Display the Wordwise feature on page 15 of the projectable magazine. Invite a volunteer to read aloud the definition of *mineral*. (a natural, solid material that is not of plant or animal origin) Based on this definition, challenge students to explain why objects such as plastic (not natural), cotton (comes from a plant) or milk (not a solid) cannot be classified as minerals. Invite students to share other facts they know about minerals.

EXPLAIN

(continued)

Identify Properties of Minerals
Display pages 8-9 of the projectable magazine. Zoom in on the purple minerals at the bottom of the photo. Instruct students to review the article's images in their student magazines. **Ask:** *Based on what you see, is this mineral most likely to be aragonite, apatite, or amethyst?* (amethyst) *Why?* (It's shiny, purple, and smooth, just like amethyst. Aragonite and apatite look different.) Inform students that what they just did was to identify a mineral based on its properties. **Say:** *A property is what you can observe about something with your senses. Color and hardness are properties of minerals. So is how shiny a mineral appears when you look at it.* As a class, brainstorm a list of other properties that could be used to describe minerals. Encourage students to review the article for examples. (Possible responses: magnetic, glow in the dark, sending out electrical pulses)

Recognizing How People Use Minerals
Display page 12 of the projectable magazine. **Say:** *This diagram shows five different minerals. Each mineral is harder than the one above it. Hardness is an important property of minerals. How hard a mineral is determines how people use it.* Review the diagram as a class. Challenge students to explain how other properties of minerals could determine how people use them. Then give each student a copy of the **Content Assessment Master**. Instruct students to draw a picture of something that is made out of a mineral mentioned in the article. Challenge them to identify a property of that mineral and explain why that property makes this mineral a good choice to use in that product.

ELABORATE

Find Out More
Remind students that gems are minerals that have been cut and polished by craftspeople. Gems are precious, valuable stones. And some, like the Delhi Purple Sapphire, are famous. Divide the class into small groups. Instruct groups to conduct research to learn about other famous gems. Encourage them to select one, find a photo, and write a brief narrative explaining why the gem is so famous. Invite groups to share their discoveries with the class.

Extend Your Thinking About Minerals
Poll the class to see how many students were surprised by the number of products they use that come from minerals. Remind students that minerals are natural resources. People don't make them. **Ask:** *What would happen if people used the entire supply of a mineral?* Invite students to share their ideas. Brainstorm reasons why it's important to "reduce, reuse, and recycle" every day.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *Where do people find minerals? Why?* (They find minerals in rocks. Almost every rock on Earth is a mixture of minerals.)
- *What do people make out of talc? Why?* (People make talcum powder out of talc. Talc is a very soft mineral.)
- *Why do people put diamonds in drill bits?* (Diamonds are very hard minerals. They can cut through many things.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

Name _____ Date _____

VOCABULARY ASSESSMENT: Mineral Mania

Record information from the article about each vocabulary word.

Word	Familiarity with the Word			Knowledge of the Word	
	I know the word very well.	I've seen or heard the word before.	I don't know the word.	What I think the word means:	How the article defines the word:

Name _____ Date _____

LANGUAGE ARTS ASSESSMENT: Mineral Mania

Use these question words to ask and answer questions about minerals.

Question Word	My Question	My Answer
Who?		
What?		
Where?		
When?		
Why?		
How?		

Name _____ Date _____

CONTENT ASSESSMENT: Mineral Mania

Draw a picture of something that is made out of a mineral from the article.
Then answer each question.

1. What did you draw? _____

2. What mineral does it contain? _____

3. What is a property of this mineral? _____

_____

_____

4. Why does that property make this mineral a good choice to use in that product?

_____

_____

_____

_____

Name _____ Date _____

COMPREHENSION CHECK: Mineral Mania

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What kind of material are all minerals?

   Ⓐ solid

   Ⓑ liquid

   Ⓒ gas

2. Where do people find minerals?

   Ⓐ in trees

   Ⓑ in animals

   Ⓒ in rocks

3. Which of these is a property of diamonds?

   Ⓐ feathery

   Ⓑ hard

   Ⓒ metallic

4. Which of these minerals does your body need?

   Ⓐ calcium

   Ⓑ topaz

   Ⓒ amethyst

5. Why do people use quartz in watches?

_____

_____

_____

_____

Frozen... Again!

LANGUAGE ARTS LEXILE 550L

Standard Supported

- Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text. (CCSS.RI.2.2)
- Write narratives in which they recount a well elaborated event or short sequence of events, including details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure. (CCSS.W.2.3)

Resources

- Vocabulary Assessment Master (page 23)
- Language Arts Assessment Master (page 24)

Summary

- The article "Frozen... Again! " introduces readers to Jade Hameister as the teen explorer tackles Greenland, the second leg of her Polar Hat Trick.

BUILD VOCABULARY AND CONCEPTS

Display pages 22-23 of the projectable magazine. Point out to students that there is no Wordwise feature in this article. **Say:** *That doesn't mean, however, that there will be no unfamiliar words.*

Give each student a copy of the **Vocabulary Assessment Master**. As students read the article, instruct them to record each word they find difficult to understand. **Say:** *These may be words you've never seen before or they may be words you do know that are used in a new way.*

Instruct students to circle three words on their lists and write a definition for each word. Tell them to write a sentence using each word, based on the definitions they wrote. Then have students look each word up in a dictionary and record its actual definition. If a word has multiple definitions, provide assistance as needed to ensure that students select the correct definition. Instruct students to write a new sentence based on the definition they found.

Instruct students to review their before and after sentences in small groups. As a class, discuss how investigating definitions helped students better understand each word.

READ

Give students a few minutes to scan the article in their student magazines. **Then ask:** *What do you think this article is about? Why?* Encourage students to share their ideas.

Explain to students that what they just attempted to identify was the main idea or overall topic of the article. Everything in the article is connected to the main idea. Point out that paragraphs have a main idea, too. Everything in a paragraph is connected to its main idea.

Display pages 16-17 of the projectable magazine. **Say:** *When you read, the first thing you want to do is identify the main idea. In other words, you want to figure out what the article is about. Sometimes, that's easy. The photo might show you or the headline might tell you. Other times, it's not quite so obvious.* Highlight the article's headline. Invite students to share their ideas about what it might mean. Encourage students to offer any additional clues they see in the photo.

Then invite a volunteer to read aloud the deck. Give students a moment to scan the rest of the article. **Say:** *Now, we have some good clues. According to the deck, this article is about a teenager named Jade Hameister. She's already skied to the North Pole. Now, she's going to ski across Greenland. This article is about Jade's trip.*

Give each student a copy of the **Language Arts Assessment Master**. Tell students to record the main idea of the article. (Teenager Jade Hameister skied across Greenland.) Then have them select two paragraphs in the article. Challenge them to write the main idea of each paragraph.

NATIONAL GEOGRAPHIC Explorer

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about Jade Hameister and her journey. **Ask:** *Why is Jade skiing across Greenland?* (She wants to complete a Polar Hat Trick, or complete three polar journeys.) *What treks make up the three parts of her goal?* (North Pole, Greenland, South Pole) *How will Jade be unique if she completes the Polar Hat Trick?* (She will be the youngest person to ever do this.) Encourage students to share other interesting facts they learned about Jade and her journey.

• **Identify Main Ideas** Remind students that the main idea is the topic, or what something is about. Both articles and paragraphs within an article have main ideas. And the main idea in each paragraph is an important detail that supports the main idea of the article. Have students share and compare their **Language Arts Assessment Masters** in small groups. As a class, analyze how the main ideas of each paragraph support the main idea of the article.

• **Write a Narrative** Inform students that when writers write, they often tell about their own experiences. **Say:** *This type of writing is easy to spot. Sentences contain the words "I" and "we." As you read stories like this, you can see, hear, and feel just what the writer did when the story happened.* Point out that writers can also write about something that happened to someone else. **Say:** *When writers write about someone else, they don't use the word "I." This article is a good example. The writer calls Jade "she" instead.* Instruct students to take out their **Language Arts Assessment Masters**. Tell them to imagine that they are with Jade on her journey. Challenge them to write about something exciting they did on the trip. Encourage them to use lots of details as they describe what they did.

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *What is a Polar Hat Trick?*
- *What are three things Jade took with her on her trip? Why was each item necessary?*
- *What surprised you about what you read?*

Frozen... Again!

SCIENCE

Standard Supported

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (NGSS.K-2-ETS1-2)

Resources

- Content Assessment Master (page 25)
- Comprehension Check (page 26)

Science Background

Greenland, the world's largest island, is located between the Arctic Ocean and the North Atlantic Ocean. Two-thirds of its land mass lies within the Arctic Circle. And about 80 percent of the island is covered in ice.

In fact, Greenland has the second largest ice cap in the world. Its ice sheet covers about 1.8 million square kilometers (700,000 square miles) and is 3.2 kilometers (2 miles) thick at its center. Only Antarctica's ice sheet is bigger.

Crossing this frozen terrain is not easy. In addition to the expected—blizzards, icefalls, and below-freezing temperatures—there's the potential threat of polar bears. But that's just the sort of challenge 15-year-old explorer Jade Hameister anticipated as she and her team set out to cross Greenland in the summer of 2017.

Greenland was part two in Hameister's plan to score a Polar Hat Trick, or to conquer three extremely difficult polar treks. She tackled the first journey, skiing to the North Pole, the year before. The third leg, reaching the South Pole, is scheduled for December 2017.

Altogether, the three treks in Hameister's journey cover well over 1,000 kilometers (621 miles) of polar landscape. If she completes all three, she will be the youngest person ever to achieve this goal.

ENGAGE

Tap Prior Knowledge

Instruct students to imagine that they just finished skiing 150 kilometers (93 miles) to the North Pole. In addition to skiing that distance, they had to pull a heavy sled, climb over tall piles of ice and make a raft to cross a patch of open sea. It was so cold that their hair froze. And it was hard to navigate because they were traveling across floating ice. After they finished, would they want to do something like this again? Why or why not?

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable magazine. Invite a volunteer to read aloud the headline and deck. As a class, brainstorm a list of challenges people might face if they tried to ski across the world's second largest polar ice cap.

Set a Purpose and Read

Have students read the article in order to understand what Greenland is like and explain how Jade and her team solved problems they encountered on their journey.

Frozen... Again!

SCIENCE

EXPLAIN

Understanding Greenland

Display pages 18-19 of the projectable magazine. Review with the class where Greenland is located on the map and the route Jade Hameister and her team took across the island during their expedition. **Say:** *Greenland is the world's largest island. It is mostly covered in thick ice. At its center, the ice sheet is 3.2 kilometers (2 miles) thick.* Identify landmarks in your area that are that far apart to give students perspective on how thick the ice really is. Then draw students' attention to the photo of Jade's team carrying a sled. **Ask:** *If there's so much ice on Greenland, why are they carrying a sled over rocky land?* (A lot of the ice had melted because temperatures were warmer than usual.) Ask students to scan the article for more details about what it is like in Greenland. (Possible responses: There are icefalls. It is very cold, snowy, and windy. Winds howl during blizzards.)

Understanding How to Prepare and Adapt

Remind the class that part of Jade Hameister's plan when she and her team skied across Greenland was that they would do it all on their own. **Say:** *They didn't use vehicles or sled dogs. They carried all of their own things. And when they had problems, they only had themselves and the supplies they'd brought with them to find a solution.* Point out that sheer muscle power helped them overcome some obstacles, but other problems required more creative solutions. Give each student a copy of the **Content Assessment Master**. Instruct students to identify two problems Jade and her team encountered while crossing Greenland. Instruct them to describe each problem and explain how the team found a solution.

ELABORATE

Find Out More

Inform students that the Greenland Ice Sheet is the second largest polar ice cap in the world. It formed over thousands of years as layers of snow piled up into thick masses of ice. As the article points out, rising temperatures are causing Greenland's ice cap to melt. As a class, conduct research to learn more about how rising temperatures are affecting Greenland's ice cap and what that means for the rest of the world.

Extend Your Thinking About Collaboration

Display the National Geographic Learning Framework feature on the back cover of the magazine. Challenge students to explain what collaboration is. (working together to achieve a goal) Discuss reasons why Jade Hameister had to collaborate with others to achieve her goals. Then divide the class into small groups. Encourage each group to pick a goal and write a plan telling how they can achieve their goal. Make sure each group member has a role. Give students an opportunity to work together to achieve their goals.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What are the three parts in Jade Hameister's Polar Hat Trick?* (North Pole, Greenland, South Pole)
- *What are icefalls?* (slopes of rough ice) *How did the team overcome them?* (They took of their skis and drug their sleds uphill.)
- *Greenland is the second largest polar ice cap. What is the largest?* (Antarctica)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

Name _____ Date _____

VOCABULARY ASSESSMENT: Frozen... Again!

Record unfamiliar words from the article. Circle three words on the list.
Use the organizer to investigate the meaning of those words.

Unfamiliar Words			
Word			
Predicted Definition			
Sentence			
Dictionary Definition			
Sentence			

Name _____ Date _____

LANGUAGE ARTS ASSESSMENT: Frozen... Again!

Record the main idea of the article. Pick two paragraphs and record the main idea of each.

Article	
Paragraph	Paragraph

Imagine that you are with Jade Hameister as she skis across Greenland.
Write about something exciting you did on the trip.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Name _____ Date _____

CONTENT ASSESSMENT: Frozen... Again!

Identify two problems Jade Hameister and her team faced as they skied across Greenland.
Describe the problems. Explain the team's solutions.

	Problem 1:	Problem 2:
Describe		
Explain		

Name _____ Date _____

COMPREHENSION CHECK: Frozen... Again!

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What is Greenland?

Ⓐ a pole

Ⓑ an island

Ⓒ a continent

2. What covers most of Greenland?

Ⓐ rocks

Ⓑ ice

Ⓒ water

3. What supply helped Jade's skis move more smoothly on the ice?

Ⓐ spiked metal plates

Ⓑ boots

Ⓒ butter

4. What threat put Jade and her team on high alert?

Ⓐ icefalls

Ⓑ polar bears

Ⓒ a blizzard

5. Identify a problem Jade and her team faced. Describe their solution.

_____

_____

_____

_____

Understanding Maps

NORTH AMERICA

Standard Supported

- Identify some cultural and environmental characteristics of specific places. (NCSS. D2.Geo.6.K-2))

Resources

- Content Assessment Master (page 28)
- Comprehension Check (page 29)
- North America Physical Map poster (teacher's edition)
- North America Political Map poster (teacher's edition)

Social Studies Background

Spatial thinking is an essential skill for students to develop as they learn about geography and Earth and environmental sciences. Developing spatial concepts takes time and practice. Recognizing that, each month Explorer magazine will introduce students to a new set of physical and political maps. Use the accompanying lessons to guide students as they learn to recognize spaces and places in the natural world.

ENGAGE

Tap Prior Knowledge

Ask students how many countries there are in North America. How many guessed three? (U.S., Canada, Mexico) Did anyone guess the correct answer? (23) Discuss where those countries could be.

EXPLORE

Preview the Lesson

Display the **North America Physical Map poster** and the **North America Political Map poster**. Cover the captions. Have students examine the photos. Discuss what each photo tells about North America.

Set a Purpose and Read

Have students examine the posters in order to understand that physical and political maps can be used to describe the cultural and environmental characteristics of a location.

EXPLAIN

Explore the Physical Map

Display the **North America Physical Map poster**. Read aloud the text in the "Landforms" box at the top of the poster. As a class, find the Appalachian and Rocky Mountains on the map. Find and identify other mountain ranges and landforms in North America. Ask questions to help students make connections between items in the photos and the continent's physical features. **Ask:** *Where is the Belize Barrier Reef?* (Central America) Invite students to share other connections they made about the physical features of North America.

Explore the Political Map

Display the **North America Political Map poster**. Point out the numerous countries in Central America and the Caribbean. Then invite volunteers to read aloud the captions below the photos and text in the boxes at the top of the poster. Discuss what each item reveals about North America.

ELABORATE

Find Out More

Explain to students that while physical and political features are different, they are often connected. For example, Greenland is the least densely populated country in the world (political) because most of it is covered by a giant ice sheet (physical). As a class, identify more links between the physical and political features of North America.

Extend Your Thinking About South America

Give each student a copy of the **North America Map Content Assessment Master**. Have students create a physical or political map of North America, including a map key. Have them write two questions that they can answer by looking at their maps.

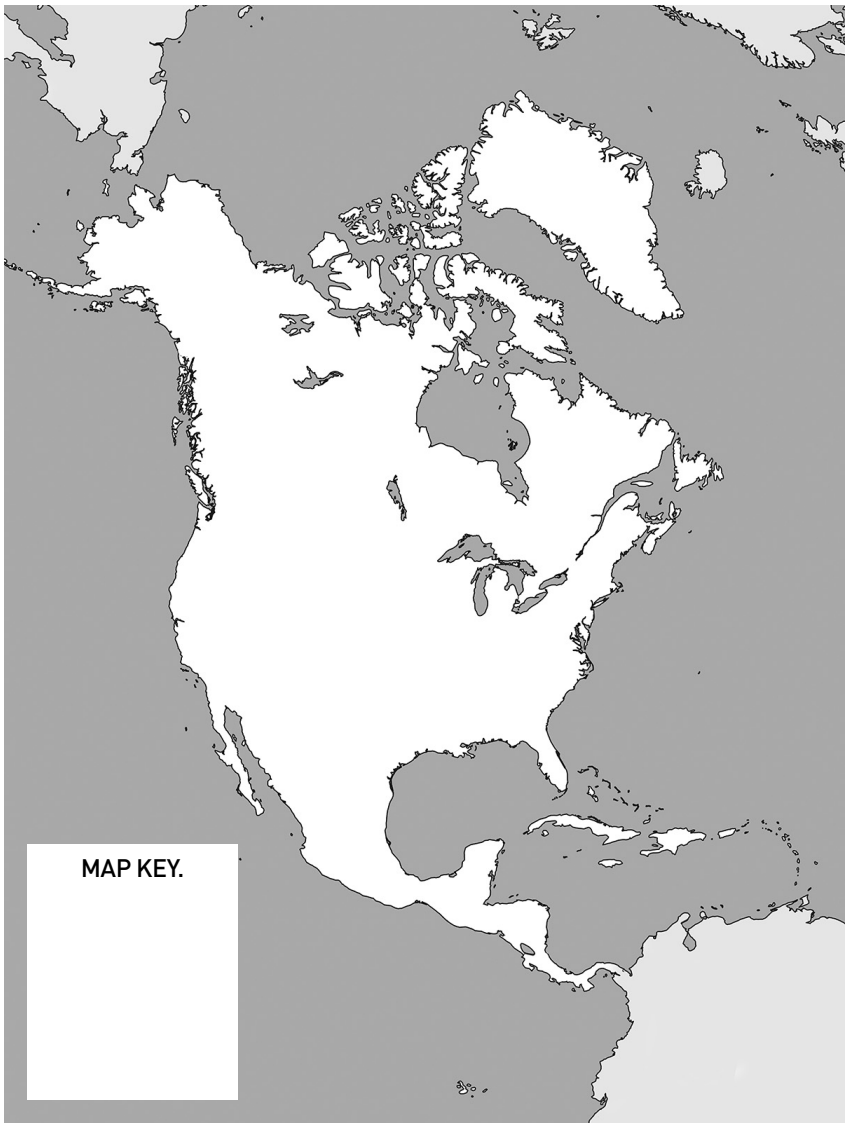
EVALUATE

Have students ask and answer questions about the physical and political maps. If you wish, have them complete the **Comprehension Check** to assess their knowledge of North American geography.

Name _____ Date _____

CONTENT ASSESSMENT: North America Maps

Make a political or physical map of North America. Draw a map key.



Write two questions and answers about North America.

1. Q: _____

   A: _____

2. Q: _____

   A: _____

Name _____ Date _____

COMPREHENSION CHECK: North America Maps

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What is the largest country in North America?
   - Ⓐ Mexico
   - Ⓑ Canada
   - Ⓒ United States

2. Who were the first people to live in North America?
   - Ⓐ Europeans
   - Ⓑ Mexicans
   - Ⓒ Native Americans

3. Where can you find a tropical rain forest in North America?
   - Ⓐ Costa Rica
   - Ⓑ Greenland
   - Ⓒ Alaska

4. What is the national bird of the United States?
   - Ⓐ turkey
   - Ⓑ bald eagle
   - Ⓒ bluebird

5. Write three facts about North America.

_____

_____

_____

_____

ANSWER KEY

Turned to Stone

Assess Vocabulary, page 7
Students should record the words and definitions from the Wordwise feature on page 7.

fossil: part of an ancient plant or animal, or its shape, that has been preserved in rock
herbivore: an animal that eats plants
paleontologist: a scientist who studies fossils

Text clues, visual clues, and what students think each word means may vary.

Assess Language Arts, page 8
Students' questions and answers will vary depending on which text feature they use.

Assess Content, page 9
Students should draw a picture that resembles the nodosaur illustration on pages 4-5. They should note that the nodosaur lived millions of years ago and was big and bulky. It had thick scales on its back and long shoulder spikes on its sides. It was a herbivore. Scientists think its skin was reddish brown. Ideas about what else scientists can learn will vary.

Comprehension Check, page 10
1. B; 2. A; 3. A; 4: C; 5: The dinosaur died and was swept out to sea. It sank to the ocean floor. Sand and rocks covered it up. Over millions of years, it turned to stone. It became a fossil.

Mineral Mania

Assess Vocabulary, page 15
Students should record the vocabulary words from the Wordwise feature on page 15, make checkmarks to show how familiar they are with each word, and write definitions in their own words. Then they should record the definitions from the article.

gem: a crystal of a mineral that has been cut and polished
mineral: a natural, solid material that is not of plant or animal origin
mixture: two or more substances put together that do not form a new substance
property: something you can observe with your senses

Assess Language Arts, page 16
Questions should begin with the identified question words. Answers should come directly from the text.

Assess Content, page 17
Students should draw something made from a mineral mentioned in the article. Answers will vary depending on which mineral students choose. Explanations should show a direct correlation between the mineral's properties and the characteristics of the product.

Comprehension Check, page 18
1. A; 2. C; 3. B; 4: A; 5: If squeezed, quartz sends out iny electrical pulses. The pulses keep time.

Frozen... Again!

Assess Vocabulary, page 23
All unfamiliar words must appear in the article. Predicted definitions and sentences will vary. Students may use a print or online dictionary to find each word's actual definition.

Assess Language Arts, page 24
Students should record the main idea of the article. (Teenager Jade Hameister skied across Greenland.) Paragraph selections will vary. Narratives should incorporate details from the text and be written from the first-person perspective.

Assess Content, page 25
Answers will vary depending on which problems students identify. However, students should select specific examples from the article, describe the problem each problem, and explain each solution.

Comprehension Check, page 26
1. B; 2. B; 3. C; 4: B; 5: Answers will vary depending on which problems students select.

ANSWER KEY

(continued)

North America Map

Assess Content, page 28
Students should create a physical or a political map, including map keys, like those on the posters. Questions and answers should be accurate and relate to the physical or political features of the continent.

Comprehension Check, page 29
1. B; 2. C; 3. A; 4: B; 5: Facts will vary but should come from the North America Physical or Political Map posters.