

### In This Guide

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

### 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 TRAILBLAZER will be within the 350-750L range.

For additional resources to extend your students' learning, visit EXPLORER's website, [natgeo.org/explorermag-resources](http://natgeo.org/explorermag-resources).

### Your Subscription Includes:

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

## 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



#### Attitudes

*National Geographic kids are:*

**CURIIOUS** 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.



#### 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.



#### 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 630L

### Standard Supported

- Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently. (CCSS.RI.3.5)

### 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**
- **seaway**
- **sediment**

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. With a partner, have them scan the article to locate each bold word in the text.

Instruct partners to find and record text and visual clues in the article related to each vocabulary word. Then instruct each student to record his or her own idea about what each word means. 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. Encourage them to 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 determined that the object in this photo is a dinosaur fossil. If we had any doubts, the deck made it clear. But that's not all we can learn from the deck. It says that this was an armored, plant-eating dinosaur. And finding it was an important discovery. Those are all important facts, and they were easy to find because they were in large print in the deck.*

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. Point out to students that they will need to 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) *Why is this fossil special?* (It was preserved in its lifelike form.) 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.* Challenge students to make accurate statements using each of the vocabulary words. Encourage them to use their **Vocabulary Assessment Masters** as a resource. Remind students 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 to 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.

- *How was this dinosaur fossil discovered?*
- *What have paleontologists learned about the dinosaur so far?*
- *What surprised you about what you read?*

# Turned to Stone

## SCIENCE

### Standard Supported

- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (NGSS.3-LS4-1)

### 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, where it lived, and how it became a fossil.

### 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.) Divide the class into small groups. Instruct groups to scan the article for details that tell what a nodosaur was like. Invite them to share what they learned with the class.

#### Recognizing How Environments Change

Display the maps on page 5 of the projectable magazine. As a class, compare how the world looks today to what it was like 110 million years ago. Examine how the continents have moved and changed. Point out that some features, such as the large seaway in the middle of North America have disappeared. **Say:** *According to the article, what Earth looks like isn't the only thing that has changed. Environments have changed, too. This fossil was found in Canada. But the nodosaur lived in a warm, humid environment. As a class, discuss how Canada's environment is different today. Brainstorm ideas about why the environment has changed so much.*

#### Understanding the Process of Fossilization

Display the Wordwise feature on page 7 of the projectable magazine. Highlight the word *fossil*. As a class, review what a fossil is. **Say:** *Most dinosaur fossils are only bones. This nodosaur is different. Because of how and where it died, it looks almost like it would have in real life.* Display pages 6-7 of the projectable magazine. Review the diagram as a class. Then give each student a copy of the **Content Assessment Master**. Instruct students to put events in the correct order to explain how the nodosaur became a fossil. Challenge them to answer questions about the fossil and how it was preserved.

### 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. Divide the class into small groups. Instruct groups to conduct research to identify other types of fossils. Challenge them to find examples of each. Invite groups to share and compare their results with the class.

#### Extend Your Thinking About Fossils

Remind students that the nodosaur fossil featured in the article is a big chunk of rock. The dinosaur's skeleton is hidden because it is covered by fossilized skin and encased in body armor. Discuss reasons why this would make it difficult for paleontologists to study anything but the outside of the dinosaur fossil.

### EVALUATE

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

- *What is a seaway?* (an inland waterway connected to a sea)
- *How was this dinosaur fossil discovered?* (A miner struck the fossil when he was digging at a mine.)
- *Why does the nodosaur fossil look almost like the dinosaur did when it was alive?* (It was buried quickly so it wasn't eaten and didn't rot. Over millions of years, minerals took the place of its armor and skin.)

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					

**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		

**CONTENT ASSESSMENT: Turned to Stone**

Put these events in the correct order. Show how the nodosaur became a fossil.

_____	The nodosaur's body was washed out to sea.
_____	Minerals seeped into its tissues, preserving its shape.
_____	The nodosaur's body sank to the ocean floor.
_____	A flood swept the nodosaur's body into a river.
_____	The nodosaur died.
_____	The nodosaur's body was quickly covered by sediment.

Answer each question.

1. Why is it important that the nodosaur's body was buried quickly?

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2. What preserved its shape?

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**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?  
Ⓐ 10 million years ago  
Ⓑ 100 million years ago  
Ⓒ 110 million years ago
  
2. What did a nodosaur have on its back?  
Ⓐ wings  
Ⓑ armored scales  
Ⓒ textured pads
  
3. Where was this nodosaur buried?  
Ⓐ in a forest  
Ⓑ in a sea  
Ⓒ on a mountain
  
4. Which of these statements is true?  
Ⓐ Nodosaurus ate other animals.  
Ⓑ Nodosaurus walked on two feet.  
Ⓒ Nodosaurus lived in warm, humid places.

5. How was this nodosaur preserved in its lifelike form?

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### Standard Supported

- Ask and answer questions to demonstrate understanding of a text referring explicitly to the text as the basis for the answers. [CCSS.RI.3.1]

### 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

- **atom**
- **gem**
- **geologist**
- **mineral**
- **mixture**

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.

Instruct students to 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.

### 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) *Why isn't plastic a mineral?* (Minerals occur naturally in Earth. Plastic doesn't.) *How does a mineral become a precious gem?* (They are shaped and polished by craftspeople.) Have students share other facts they learned about minerals.

- **Strengthen Understanding** Inform students that it is essential for readers to understand the scientific 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 scientific terms 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. But remind them to be original. Students should not restate sentences from the article. They should create new sentences of their own.

- **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.

- *What is a gem?*
- *What are three ways people use minerals?*
- *What surprised you about what you read?*

### Standard Supported

- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. (NGSS.3-5-ETS1-1)

### 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, like iron and calcium, 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 page 11 of the projectable magazine. Review the section "Mineral Mania" and discuss the five characteristics of all minerals. (Minerals are solid, occur naturally on Earth, cannot come from or be made by a living thing, are made of one or more chemical elements, and have atoms that line up in an orderly pattern.) Based on these characteristics, challenge students to explain why objects such as plastic (man-made), cotton (comes from a living thing) or milk (not a solid) cannot be classified as 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, texture, and luster, or how light shines off of a mineral, are all properties of minerals. 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, hardness, ability to glow in the dark)*

#### Recognizing How People Use Minerals

Display pages 12-13 of the projectable magazine. Review the diagram on the Mohs scale. **Say:** *The Mohs scale classifies minerals based on their hardness. How hard a mineral is determines how it can be used. Talc, for example, is a very soft mineral. People use it to make talcum powder. But diamonds are very hard. That's why they are used in drill bits. Diamonds are hard enough to cut their way through almost anything. As a class, discuss how other properties could affect what people can make out of different types of minerals. 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 students to identify a property of that mineral and explain why that property makes this mineral a good choice for making 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. They are not human-made. **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.

- *Why is talc ranked No. 1 on the Mohs Scale? (It's the softest mineral on the scale.)*
- *What is a property? (what you can observe about something with your senses)*
- *What is an interesting property of quartz? (If squeezed, quartz vibrates, emitting tiny electrical pulses.)*

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:

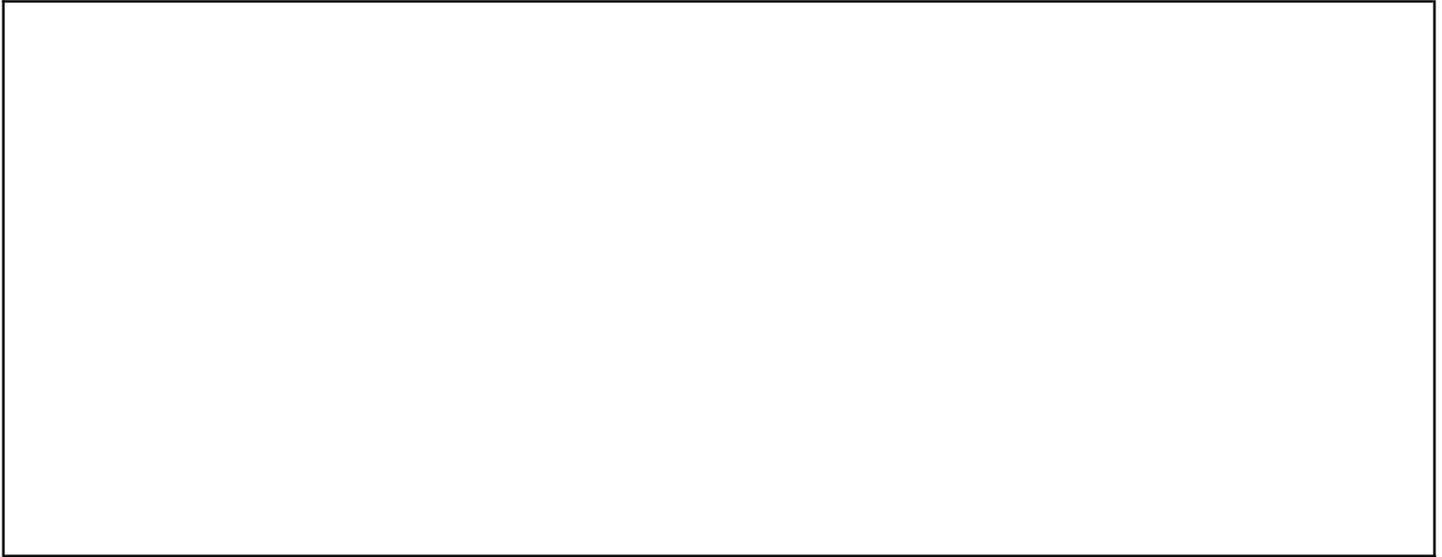
**LANGUAGE ARTS ASSESSMENT: Mineral Mania**

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

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

**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?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**COMPREHENSION CHECK: Mineral Mania**

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

- Which of these is a characteristic of all minerals?  
 Ⓐ made by humans  
 Ⓑ comes from a living thing  
 Ⓒ is a solid
- What do you call someone who studies rocks and minerals?  
 Ⓐ a biologist  
 Ⓑ a geologist  
 Ⓒ a paleontologist
- What is the hardest mineral on the Mohs Hardness Scale?  
 Ⓐ diamond  
 Ⓑ gypsum  
 Ⓒ talc
- What does luster describe?  
 Ⓐ color  
 Ⓑ shininess  
 Ⓒ hardness
- Name two everyday products that contain minerals. Identify the minerals they contain.

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### Standard Supported

- Determine the main idea of a text; recount the key details and explain how they support the main idea. (CCSS.RI.3.2)
- Write narratives to develop real or imagined experiences or events using effective techniques, descriptive details, and clear event sequences. (CCSS.W.3.3)

### 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.*

Tell students to circle three words on their lists. Have them predict and write a definition for each word. Next, instruct students to write a sentence using each word, based on the definitions they wrote. Then have students find each word in a dictionary and record its definition. If a word has multiple meanings, challenge students to use context clues in the article to select the correct definition. Have students write a new sentence based on the definition they found.

Invite volunteers to identify the words they defined and read aloud their before and after sentences. As a class, examine 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. Those ideas are supported by key details in the text.

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 teenager Jade Hameister. She's already skied to the North Pole. Now, she's going to ski across the world's second largest polar ice cap. 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.) Point out that as they read, they may decide to expand their thoughts and revise what they have recorded as the main idea. Then have students read the article on their own. As they read, instruct students to record key details that support the main idea of the article.

# Frozen... Again!

## 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 and Support the Main Idea** Remind students that the main idea is the topic, or what something is about. A writer uses details to support the main idea. **Say:** *It's easy to fill a page with details. The challenge for writers is to pick details that are important. The challenge for readers is to recognize important details when they see them.* Have students share and compare their **Language Arts Assessment Masters** in small groups. Did they identify the same main idea? Did they record the same details? If not, which important details did students miss? As a class, discuss how the key details support the main idea of the article.

- **Write a Narrative** Inform students that a narrative is a story that tells about an experience or series of events. **Say:** *People can write narratives about their own lives or they can write about something that happened to someone else. This article is a narrative. It tells about Jade Hameister's journey across Greenland. But Jade didn't write this article. We know that because this article is not written from the first-person point of view.* Explain what first-person is. If necessary, point out that Jade would have referred to herself as *I* if she had written the article. Instead, the writer calls her *she*. Have students take out their **Language Arts Assessment Masters**. Tell them to imagine that they are with Jade on her journey. Challenge them to write a brief narrative describing their experience. Instruct them to write about the event from the first-person point of view.

### 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?*
- *Where is Greenland and what is it like?*
- *What surprised you about what you read?*

### Standard Supported

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (NGSS.3-LS4-3)

### 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 the environment is like in Greenland and to explain how Jade Hameister and her team prepared for and adapted to conditions so they could survive the trip across Greenland.

### 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 second largest polar ice cap. 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 across rocky terrain?* (A lot of ice had melted because the temperatures were warmer than usual.) Ask students to scan the article for more details about Greenland's environment. (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, sled dogs, or helicopters to drop off supplies. So when they encountered obstacles, they had to figure out how to overcome them on their own.* 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 pick two problems Jade and her team encountered while crossing Greenland. Challenge them to explain how the team prepared for each problem before they left and how they had adapted in each case once they got there.

### 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. Divide the class into small groups. Instruct groups to 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 identify a goal and write a plan explaining how they could achieve that 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 treks in Jade Hameister's Polar Hat Trick?* (North Pole, Greenland, South Pole)
- *Why wasn't the team able to ski as soon as they reached Greenland's coast?* (There was no ice.) *Why?* (The coastal ice had melted because of climate change.)
- *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.

## 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			
<b>Word</b>			
<b>Predicted Definition</b>			
<b>Sentence</b>			
<b>Dictionary Definition</b>			
<b>Sentence</b>			

Name \_\_\_\_\_

Date \_\_\_\_\_

## LANGUAGE ARTS ASSESSMENT: Frozen... Again!

Record the main idea and key details from the article.

<b>Main Idea</b>
<b>Key Details</b>

Imagine that you are with Jade Hameister as she skis across Greenland.  
Write about your trip. Remember to describe it from your point of view.

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Name \_\_\_\_\_

Date \_\_\_\_\_

**CONTENT ASSESSMENT: Frozen... Again!**

Identify two problems Jade Hameister and her team faced as they skied across Greenland. Tell how they prepared for each problem. Explain how they adapted to find a solution.

	Prepare	Adapt
Problem 1:		
Problem 2:		

**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 covers most of Greenland?  
Ⓐ trees  
Ⓑ sand  
Ⓒ ice
  
2. What is Greenland?  
Ⓐ a pole  
Ⓑ an island  
Ⓒ a continent
  
3. What was the first problem Jade and her team faced on the trip?  
Ⓐ The ice was too cold.  
Ⓑ The ice was too thick.  
Ⓒ The ice had melted.
  
4. Which of these did Jade see on her journey?  
Ⓐ icefalls  
Ⓑ polar bears  
Ⓒ sled dogs

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

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# Understanding Maps

## NORTH AMERICA

### Standard Supported

- Use maps of different scales to describe the locations of cultural and environmental characteristics. (NCSS.D2.Geo.3.3-5)

### 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:** *Why is most of Greenland white on the map?* (It's covered by an ice cap.) 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.

## 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: \_\_\_\_\_

**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?  
Ⓐ Canada  
Ⓑ Saint Kitts and Nevis  
Ⓒ Honduras
2. Which North American country has the most people?  
Ⓐ Mexico  
Ⓑ Greenland  
Ⓒ United States
3. What long mountain range is in eastern North America?  
Ⓐ Rocky Mountains  
Ⓑ Coast Mountains  
Ⓒ Appalachian Mountains
4. What river runs part way down the middle of the Great Plains?  
Ⓐ Rio Grande River  
Ⓑ Missouri River  
Ⓒ Colorado River

5. Write three facts about North America.

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### 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

**seaway:** an inland waterway connected to a sea

**sediment:** sand and stones deposited by water, wind, or a glacier

Text clues, visual clues, and what students think each word means may vary. Evaluate answers for accuracy.

#### Assess Language Arts, page 8

Students' questions and answers will vary depending on which text feature they use.

#### Assess Content, page 9

The correct order of events is: 3, 6, 4, 2, 1, 5.

**Question 1:** Because the nodosaur's body was buried so quickly, sea animals weren't able to eat it and its body didn't rot.

**Question 2:** Minerals took the place of the dinosaur's armor and skin, preserving its shape.

#### Comprehension Check, page 10

1. C; 2. B; 3. B; 4. C; 5. Possible response: The nodosaur was buried so quickly sea animals weren't able to eat it and its body didn't rot. Over time, minerals took the place of its armor and skin.

### 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.

**atom:** the smallest particle of a substance that has all the properties of that substance

**gem:** a crystal of a mineral that has been cut and polished

**geologist:** a person who studies rocks and minerals

**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

#### 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. C; 2. B; 3. A; 4. B; 5. Answers will vary.

### Frozen... Again!

#### Assess Vocabulary, page 23

All unfamiliar words must appear in the article.

Predicted definitions and sentences will vary.

Students may use a printed or online dictionary to find each word's actual definition.

#### Assess Language Arts, page 24

Students may record the main idea identified before reading the article. (Teenager Jade Hameister skied across Greenland.) Or, they may adapt their thoughts to mention the Polar Hat Trick. Key details 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 and explain how the team planned for the problems and adapted to overcome them as they made their way across Greenland.

#### Comprehension Check, page 26

1. C; 2. B; 3. C; 4. A; 5. Answers will vary depending on which problems students select.

# Trailblazer

## ANSWER KEY

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(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. A; 2. C; 3. C; 4: B; 5: Facts will vary but should come from the North America Physical or Political Map posters.