



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.

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 "Passport to Wonder."

MINDSET OF AN EXPLORER

KEY FOCUS AREAS



Attitudes

National Geographic kids are:

CURIOS 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.

Standard Supported

- Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (CCSS.RI.3.7)

Resources

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

Summary

- The article “Lively Lizards” introduces readers to geckos and investigates how a gecko’s body parts help it survive.

BUILD VOCABULARY AND CONCEPTS

- **adaptation**
- **food chain**
- **habitat**
- **nocturnal**
- **predator**
- **species**

Display the Wordwise section on page 7 of the projectable magazine. Invite volunteers to read aloud the words and their definitions. Encourage students to share what they know about each word.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each word and its definition. Then have them think about how the vocabulary words are related. Tell them to record three connections they see. For example: Some species are nocturnal. That means they are active in their habitats at night.

After reading the article, divide the class into small groups. Have students share the connections they predicted before reading the article. Instruct them to reevaluate each connection based upon what they have learned. If necessary, have students rewrite their ideas to more accurately reflect connections between different vocabulary words.

READ

Display pages 2-3 of the projectable magazine. Tell students to look at the photo. **Say:** *When I look at this photo, I see a small animal. The headline tells me it’s a lizard. The deck tells me that it’s a gecko, which is one type of lizard. According to the headline, a gecko is a lively lizard. According to the deck, it can climb and scamper across branches. That’s quite a bit of information already. But I can learn even more if I study the photo.* Invite students to describe the gecko in the photo as well as its surroundings.

Say: *When people read, they usually focus on the words. But photos can tell you a lot, too. For example, This photo shows me that geckos have four legs. They have big, round eyes. They also have flat toes.* **Ask:** *What else can you learn about the gecko by looking at this photo?* Encourage students to share their ideas.

Inform students that the purpose of this article is to teach them about geckos. **Say:** *Many times, readers can get information from photos, captions, maps, and other text elements in an article. That information can quickly answer some of the questions they have.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article in small groups. As they do, instruct them to use the text and photos to learn more about geckos.

Lively Lizards

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about geckos. **Ask:** *Where did the first geckos live?* (in warm rain forests) *What kinds of habitats do they live in now?* (rain forests, deserts, jungles, suburbs, and cities) *How are geckos able to survive in all of these different habitats?* (They have adapted in different ways.) Encourage students to share other interesting facts they learned about geckos.

- **Finding Connections** Explain to students that reading definitions tells people what words mean. But readers can get a more thorough understanding if they recognize how important words are connected. Point out that this is exactly what they did when they wrote sentences about the vocabulary words in the article. Instruct students to turn and share the sentences they wrote on their **Vocabulary Assessment Masters** in small groups. Encourage them to discuss similarities and differences in their sentences to get an even deeper understanding of the vocabulary words.

- **Integrate Information** After reading the article, have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the information they recorded. Have students discuss how using text and photos helped them learn about geckos. As a class, identify other sources that could help them learn even more about geckos.

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.

- *In what ways are geckos lively lizards?*
- *What are some special features of geckos?*
- *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.C)

Resources

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

Science Background

Geckos are colorful lizards. These reptiles live on all continents except for Antarctica. Although they originated in warm rain forests, they have adapted to survive in habitats ranging from dry deserts to cold mountain slopes.

There are more than 1,000 different species of geckos. Each species is unique, but most have a short, stout body with a big head and low, wide limbs that stick out of their sides.

Geckos are carnivores. They eat insects, worms, and spiders. To avoid becoming prey themselves, geckos have developed a variety of adaptations.

Chief among those adaptations is the gecko's feet. Gecko toes are covered with millions of tiny curved "hairs" called setae. These hairs make gecko feet super sticky. They can climb up sheer walls, hang from ceilings, and even grip onto glass. They just change the angle of the hairs to detach and spring forward.

Most geckos are nocturnal, or active at night. Over time, their eyes have adapted to see color in the dark. Their tails, which geckos use to balance when they climb and leap, also help geckos escape. If a predator grabs a gecko's tail, the gecko detaches the tail and scampers away. The tail will regrow to its original shape.

To avoid this predicament, geckos communicate with one another. Their voices, which range from weak chirps to loud barks, can warn others of danger. They also use their calls to find mates.

ENGAGE

Tap Prior Knowledge

Instruct students to each think of a gecko. Invite volunteers to describe the geckos they are thinking of. Identify traits that all of the geckos they envisioned share. As a class, discuss how a gecko is like other animals. Challenge students to identify interesting ways that geckos are different.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Invite a volunteer to read the deck aloud. **Say:** *I'm curious. Not many animals can move like a gecko.* **Ask:** *How do you think it's possible for a gecko to move like this?* Instruct students to observe the photograph for clues. Then encourage them to share their ideas. **Ask:** *Why do you think geckos need to move in these particular ways?* (Possible response: To avoid predators.) Tell students that they will learn more about geckos as they read the article.

Set a Purpose and Read

Have students read the article in order to understand how gecko's characteristics help it survive.

EXPLAIN

Identify a Gecko's Adaptations

Display pages 8-9 of the projectable magazine. Inform students that this diagram identifies adaptations of the Madagascar giant day gecko. Review the adaptations and discuss how each one helps the gecko survive. Point out that other geckos have similar adaptations, but not all are exactly the same. Instruct students to review the article's photos to see. Then give each student a copy of the **Content Assessment Master**. Have students draw a picture of a gecko and label the parts identified in the diagram. Instruct them to record facts about each body part.

(continued)

EXPLAIN

(continued)

A Closer Look: Gecko Feet

Display page 5 of the projectable magazine. As a class, compare and contrast the three photos of gecko feet. **Ask:** *How are these three types of gecko feet different?* (The toes are round, split, and webbed.) *How are they the same?* (Responses will vary.) Review the section "The Gecko Grip" and ask once again: *How are the three types of gecko feet the same?* (They are all wide and flat. All of their toes are covered with tiny "hairs" called setae that can stick to surfaces.) As a class, discuss how geckos use their toes when they move.

A Closer Look: Gecko Tails

Display pages 6-7 of the projectable magazine. **Say:** *When a gecko leaps, it uses its tail to stay balanced.* Point out the photo at the top of the page. Invite a volunteer to describe how a gecko's body moves when it leaps. Encourage them to point out how the gecko uses its tail to stay balanced. Then instruct students to review the section "A Terrific Tail" in small groups. Challenge them to identify another tail adaptation that helps geckos survive. (If attacked by a predator, they can detach their tails. The rest of the gecko can escape.)

A Closer Look: Gecko Eyes

Display pages 6-7 of the projectable magazine. Review the section "Night Vision" with the class. **Ask:** *Why can nocturnal geckos see in color at night?* (Most eyes have rods, that pick up black and white, and cones, which detect colors. Nocturnal geckos do not have rods, only cones. These cones give them super color vision.) Zoom in on the photo of the gecko eye at the top of page 7. Discuss how the pupil would get wider to let in more light at night.

ELABORATE

Find Out More

Remind students that geckos use their voices to communicate. Divide the class into small groups. Instruct groups to go online to find recordings of gecko voices. Invite them to share the recordings with the class. Encourage students to identify differences in the gecko voices. Explain that having a unique call would allow a gecko to find other geckos of the same species.

Extend Your Thinking About Geckos

As a class, make a list of the different gecko adaptations identified in the article. (voice, eyes, skin, feet, legs, tail) **Ask:** *Which of these gecko adaptations would you like to have? Why?* Encourage students to share their opinions.

EVALUATE

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

- *What is an adaptation?* (a behavior or body part that helps an animal survive)
- *What adaptation helps geckos communicate with each other?* (their voice) *How?* (They bark, squeak, hiss, or croak to find mates, send messages, and ward off predators.)
- *What kinds of habitats do geckos live in?* (warm rain forests, deserts, jungles, suburbs, and cities)

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

VOCABULARY ASSESSMENT: Lively Lizards

Record each vocabulary word and its definition.

Word	Definition

Write three sentences to tell how different words are connected.

1. _____

2. _____

3. _____

Name _____

Date _____

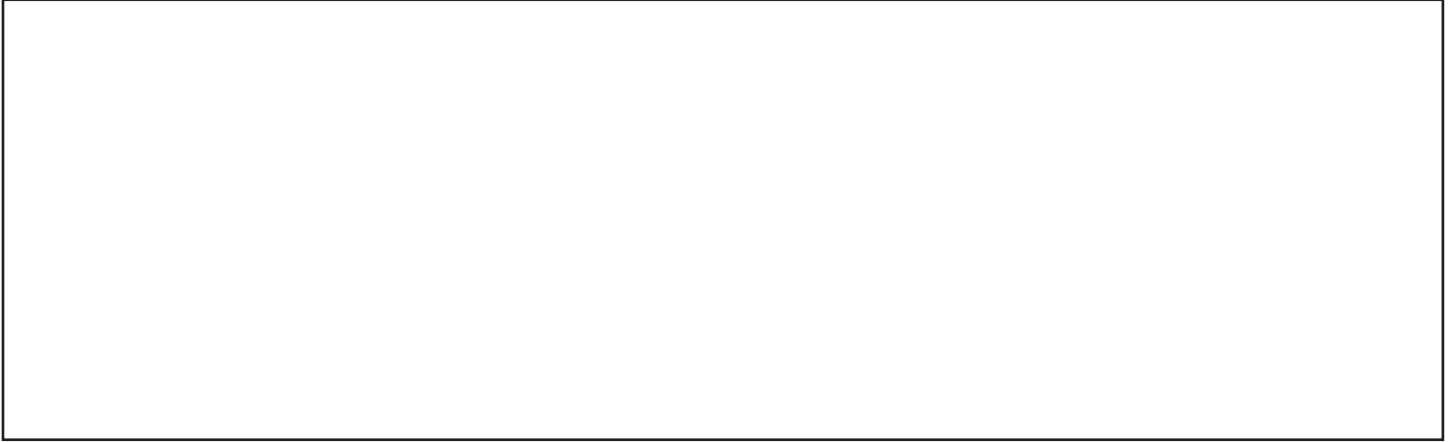
LANGUAGE ARTS ASSESSMENT: Lively Lizards

Use this organizer to record information about geckos. Include facts from the text and photos.

Question	Text	Photos
How are all geckos alike?		
Where do geckos live?		
How do geckos move?		
How do geckos stay safe?		

CONTENT ASSESSMENT: Lively Lizards

Draw a picture of a gecko. Label the voice, eyes, skin, legs, feet, and tail.



Record facts about each gecko body part.

Part	Facts
voice	
skin	
eyes	
legs	
feet	
tail	

COMPREHENSION CHECK: Lively Lizards

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

1. What do geckos use to communicate?
Ⓐ their feet
Ⓑ their eyes
Ⓒ their voices

2. In which type of habitat did geckos first appear?
Ⓐ deserts
Ⓑ cities
Ⓒ rain forests

3. What makes gecko toes sticky?
Ⓐ tape
Ⓑ hairs
Ⓒ wax

4. Which of these statements is true?
Ⓐ Geckos give birth to live babies.
Ⓑ Geckos can see in color at night.
Ⓒ All geckos look alike.

5. Explain why a gecko's tail is a special adaptation.

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)

Resources

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

Summary

- The article “Passport to Wonder” introduces students to seven archeological wonders that voters around the world selected as new Wonders of the Ancient World.

BUILD VOCABULARY AND CONCEPTS

- **continent**
- **dynasty**
- **independence**

Read aloud each of the vocabulary words. As you do, poll the class to see how many students are familiar with each word. Then challenge volunteers to provide an academic definition of each term.

Point out that this task was most likely easier with some of the words than others. **Say:** *As students, your vocabulary is constantly expanding. But many of the words you learn have multiple meanings. When reading about academic topics, it's important to understand the technical definition. And a great way to remember that more technical definition is to study the word in multiple ways.*

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to use this worksheet to explore the vocabulary words in four different ways: writing definitions, restating the definition in their own words, using the term in a sentence, and then drawing a picture to help them remember what the word means. Have students complete the worksheet in small groups.

READ

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

Tell students that what they just tried to do was identify the main idea of the article. The main idea is important because it tells readers what the article is about. To identify the main idea, they must search for clues. **Say:** *The most obvious place to find a clue is the article's headline. Sometimes it tells you exactly what the article is about. Other times it doesn't. When that happens, you have to search for more clues.*

Inform the class that good readers search for clues in the deck, subheads, photos, and captions. If the article has a diagram or sidebar, those text elements can help, too. **Say:** *Articles are full of information. But some details are more important than others. These are the key details. Key details always support the main idea. And they are the best clues to use when you're trying to figure out the main idea of the article.*

Give each student a copy of the **Language Arts Assessment Master**. Instruct students to read the article on their own. As they do, encourage them to record what they consider to be the three most important, or key, details in the article. After reading, instruct students compare notes with a partner. Then, have them use the details both partners collected to identify the article's main idea. Challenge them to summarize how the key ideas they recorded supported the main idea of the article.

TURN AND TALK

Have students turn and talk to discuss what they learned about the world treasures identified in the article. **Ask:** *Which of the items are located in Asia? (Taj Mahal, the Great Wall of China, and Petra) Which are in South America? (Machu Picchu and Christ the Redeemer) Why is "Labor of Love" an appropriate subhead for the section about the Taj Mahal? (A ruler built it to show his love for his wife.)* Invite students to share what else they learned about bananas.

- **Exploring Meanings** Inform students that it's essential for readers to understand the technical definition of words when reading about academic topics. Without that knowledge, it's very difficult to understand the text. **Say:** *Once you do understand what technical terms mean, not only can you follow along with the text but you can use the words correctly in new 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 shouldn't restate sentences from the article. They should create new sentences of their own.

- **Identify the Main Idea** Remind students that the main idea is the topic, or what something is about. The article has a main idea. Each section has a main idea, too. Have students share their **Language Arts Assessment Masters** in small groups. Encourage them to compare the main ideas they recorded for each section and for the article itself. Did they record the same main ideas? If not, have groups re-read the article so they can come up with a common response.

- **Support the Main Idea** Remind students that key details are important details in a text. They support the main idea of the text. Have students share their **Language Arts Assessment Masters** in small groups. Encourage groups to analyze the reasons they recorded for how each key detail supports the main idea of 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.

- *Which of these new World Wonders would you like to visit? Why?*
- *Do you agree that it was important to make a new list of World Wonders? Why or why not?*
- *What surprised you about what you read?*

Standard Supported

- The learner can describe how people create places that reflect ideas, personality, culture, and wants and needs as they design homes, playgrounds, classrooms, and the like. (NCSS.III.g)

Resources

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

Social Studies Background

In 2007, the New7Wonders Foundation, founded by Swiss filmmaker and museum curator Bernard Weber, held a contest. The objective: to identify seven new Wonders of the World made by humans in order to protect them. Nearly a hundred million people voted, and the results garnered structures from around the world:

- Taj Mahal, a marble palace in Agra, India, built as a monument to a ruler's love for his wife;
- The Great Wall of China, a long, winding wall built along China's northern border nearly 3,000 years ago;
- Petra, an ancient city in Jordan that was carved out of tall sandstone cliffs;
- The Colosseum, a stadium in Rome, Italy, in which up to 50,000 spectators once came to cheer while gladiators fought;
- Chichen Itza, a famous temple city of the Mayas located in southern Mexico;
- Machu Picchu, a 15th century Inca settlement high in the Andes mountains of Peru; and
- Christ the Redeemer, a 38-meter-tall (105-foot-tall) statue that sits high above Rio de Janeiro, the capital of Brazil.

The Pyramids of Giza in Egypt are the only remaining survivor of the original seven wonders list, which was compiled by Greek scholars more than 2,000 years ago.

ENGAGE

Tap Prior Knowledge

Challenge students to identify one item that they think is the most amazing one-of-a-kind thing people have ever built. Discuss reasons why the object is so remarkable. Then have students imagine that it is 300 years in the future. That thing still exists, but it's falling apart. Should people of the future try to preserve it? Why or why not?

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Poll the class to see if any students can identify the building in the photo. **Say:** *This building is called the Taj Mahal. As the map shows, it is located in Asia. People around the world voted to include this building on a new list of World Wonders.* **Ask:** *What do you think is so special about this building?* Invite students to share their ideas. Tell them that they'll learn more about the Taj Mahal and the other items on the list as they read the article.

Set a Purpose and Read

Have students read the article to describe how each of the new World Wonders reflects the time and culture in which it was created. Students will also think about why it is important to protect the engineering wonders of other cultures.

EXPLAIN

Describing How Places Reflect Culture

Instruct students to compare and contrast the photos of the Taj Mahal (pages 10-11) and the Great Wall of China (page 12) in their student magazines. Point out that the Taj Mahal is a beautiful marble structure. It contains domes, scrolls, and arched windows and doorways. The Great Wall is a long, strong mass of brick and stone. **Say:** *The Taj Mahal and the Great Wall of China are opposites in many ways. While one reflects love, the other was created for war.* As a class, identify other things each structure reveals about the history and culture of the people who built it. Give each student a copy of the **Content Assessment Master**. Instruct students to select one World Wonder from the article. Have them draw a picture of the structure. Then, based on information in the article, challenge students to describe why the structure was important to the people who made it.

Thinking About Our Responsibility to the Past

Remind students that objects featured in the article are not part of the original list of World Wonders. **Say:** *The ancient Greeks created a list more than 2,000 years ago. Only one of those items, the Pyramids of Giza in Egypt, remains. Nature and humans destroyed the rest.* Point out that this is why the new list of World Wonders was created. The structures may be archeological wonders, but they are still in danger of being destroyed. As a class, brainstorm a list of things people can do to protect relics from the past. Discuss reasons why this is important. Then have students take out their **Content Assessment Masters**. Challenge them to explain why they think it is important for people to protect the World Wonder they selected.

ELABORATE

Find Out More

Remind students that people all over the world voted to select which items would appear on the new list of World Wonders. Seven were chosen, but many more were likely nominated. Divide the class into small groups. Instruct each group to conduct research to identify one other item they think should have been on the list. Encourage groups to make a list of reasons why the structure they chose should have been on the list.

Extend Your Thinking About World Wonders

Instruct students to imagine that instead of holding a worldwide vote, just a few people got to pick which seven items to include on the new list of World Wonders. They are one of those people. Challenge students to write a list of criteria they could use to pick the seven most deserving structures.

EVALUATE

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

- *How are Petra and Machu Picchu alike?* (Both are cities.) *How are they different?* (Possible response: Petra was carved from a rock cliff in Asia. Machu Picchu was built on top of a tall mountain in South America.)
- *Why is Christ the Redeemer seen as a symbol of welcome today?* (It's a statue of Christ with his arms spread wide.)
- *What would you see if you visited Chichén Itzá at certain times of the year?* (a snake-like shadow going down its steps))

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

VOCABULARY ASSESSMENT: Passport to Wonder

Use this organizer to examine each vocabulary word.

Write the definition.	Restate in your own words.
What is the word?	
Draw a picture.	Write a sentence.

Write the definition.	Restate in your own words.
What is the word?	
Draw a picture.	Write a sentence.

Write the definition.	Restate in your own words.
What is the word?	
Draw a picture.	Write a sentence.

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LANGUAGE ARTS ASSESSMENT: Passport to Wonder

Write the main idea of the article. Record three key details from the text. Explain how they support the main idea.

Main Idea:



Detail

Detail

Detail

Summary:

CONTENT ASSESSMENT: Passport to Wonder

Draw a picture of one new World Wonder from the article.



Describe why it was important to the people who made it.

Explain why you think it is important for people to protect it.

COMPREHENSION CHECK: Passport to Wonder

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

1. Who created Chichén Itzá?
Ⓐ the Incas
Ⓑ the Chinese
Ⓒ the Mayans and Toltecs

2. Which of these is the world's largest human-made structure?
Ⓐ the Taj Mahal
Ⓑ the Great Wall of China
Ⓒ the Roman Colosseum

3. Which new World Wonder was a stadium?
Ⓐ Machu Picchu
Ⓑ Chichén Itzá
Ⓒ the Roman Colosseum

4. Which continent is home to the most new World Wonders?
Ⓐ Europe
Ⓑ Asia
Ⓒ South America

5. Identify one of the new World Wonders. Tell why it is special.

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 23)
- Language Arts Assessment Master (page 24)

Summary

- The article “A-maize-ing Grain” examines corn. By using technology, people have found ways to use this grain in everything from toothpaste to tires.

BUILD VOCABULARY AND CONCEPTS

- cob
- ear
- ethanol
- kernel
- maize
- teosinte

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 write what they think each word means on their worksheets. Then display the Wordwise feature on page 21 of the projectable magazine. Have students write those definitions on their worksheets and compare them with the definitions they wrote.

READ

Inform students that the purpose of this article is to help them understand why corn is such an amazing grain. As they read, they will learn about the history of corn, how it is used, and why it would be difficult going through one day without using a product that contains corn.

Explain to students that good readers ask questions before, during, and after they read. They ask questions, in particular, when they encounter something they don’t understand or something they want to learn more about. Usually, they can find the answer in the text.

Display pages 18-19 of the projectable magazine. Model how to ask and answer questions. **Say:** *When I look at these pages, the first thing I notice is the illustration. I recognize that it shows a bag of corn. But why does one ear of corn look like a tube of toothpaste? Why does another look like a bottle of soda? Why is there a paint brush on one? And what’s that white spot on the other?* Read aloud the headline and deck. **Say:** *This information answered a few of my questions. Corn is used in all kinds of products. There must be corn in toothpaste, soda, and paint. But I still don’t know what that white spot is. And, now I wonder what else is made from corn. To find answers to those questions, I’ll have to read the article.*

Give each student a copy of the **Language Arts Assessment Master**. Explain to student how they can use the worksheet to record questions and answers they have before, during, and after they read the article.

As a class, brainstorm a list of questions about the article. Instruct students to record the questions in the appropriate section of their worksheets. Then have students read the article on their own. As they do, instruct them to record additional questions and any answers they find in the text. If students still have questions about corn after reading the article, instruct them to record those questions, too.

TURN AND TALK

Have students turn and talk to discuss what they learned about corn. **Ask:** *What is maize?* (another word for "corn") *When did the first corn grow?* (more than 6,000 years ago) *How is the corn that grows today different from the first corn?* (The ear is bigger and has more rows of kernels.) Encourage students to share other facts they learned about corn as they read the article.

• **Understand Definitions** Poll the class to see how many students feel that they are more familiar with the article's vocabulary words now that they have studied their definitions. Point out that doing this not only taught them new words. It ensured that they had a good understanding of each word's definition.

Say: *One way to see if you fully understand a new word or idea is to try to tell someone else about the topic. If you can't explain the concept, you might need to read the article again.* Have students turn and talk to define each vocabulary word in their own words to a partner. Encourage them to go a step further by giving details and examples related to each word. Prompt discussion with questions such as: *What is ethanol? How is it used? Which part of corn do you think might be used to make ethanol? Why?*

• **Ask and Answer Questions** Remind students that asking and answering questions is a strategy to help them understand what they read. **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 and re-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 corrections necessary.

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 do farmers plant more corn than any other crop worldwide?*
- *How has corn become part of different cultures?*
- *What surprised you about what you read?*

A-maize-ing Grain

SCIENCE

Standard Supported

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (NGSS.3-5.ETS1.A)

Resources

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

Science Background

Corn, also called maize, is an edible grain. Although corn originated in the Americas, it has become one of the most widely grown crops around the world.

Corn is a tall annual grass. It has a long stem and narrow leaves. Male flowers grow in the tassel at the top of the stem. They pollinate the ears, or the female parts that grow as spike-like fruit up the stem. Each ear averages about 800 seeds, or kernels, in 16 rows.

Much corn is yellow or white. But corn kernels can also be red, black, blue, pink. Sometimes the kernels even have spots or stripes.

Over thousands of years, people have developed many different varieties of corn. Early Native Americans developed plants with bigger kernels for eating. They also developed flour corn for baking and flint and dent corn, which is used for animal feed as well as making sweeteners and cornstarch.

Because corn is so versatile, it is now found in everything from jelly beans to baby diapers. It is also one of the biggest food crops for people and animals around the world.

ENGAGE

Tap Prior Knowledge

Prior to conducting this activity, download images or collect samples of a crayon, a soft drink, paint, toothpaste, and a small piece of plywood. As you display the objects for the class, challenge students to guess what all of these products have in common. Tell them they will find out as they read the article.

EXPLORE

Preview the Lesson

Display pages 18-19 of the projectable magazine. Remind students that corn is used to make many different products, including those shown in the illustration. **Ask:** *How do you think it is possible to use corn in so many different ways? As a class, brainstorm ideas about how people have changed the corn plant to meet their needs.*

Set a Purpose and Read

Have students read the article in order to understand that corn is an important grain plant that people have changed and improved to meet a variety of needs.

EXPLAIN

Identify Products Made From Corn

Display pages 18-19 of the projectable magazine. Read aloud the first sentence in the text. Poll the class to see how many students think they could go a day without corn. Then divide the class into small groups. Give groups five minutes to make a list of all corn-containing products shown or mentioned on these pages. (toothpaste, soft drinks, paint, crayons, popcorn, cornflakes, margarine, beef, tortilla chips, cornmeal, corn syrup, corn starch, cotton shirts, corn sweeteners, car tires, ethanol) When time is up, poll the class again. Do fewer students now think they could go a day without corn? Why or why not?

(continued)

EXPLAIN

(continued)

Tracing the History of Corn

Inform students that corn has long history in North and South America. **Say:** *The first corn plants were actually a wild grass called teosinte that grew more than 6,000 years ago. Native peoples picked and ate the ears of wild teosinte. They started to grow their own and it became an important food source.* **Ask:** *Other than as a food, how was corn used in ancient native cultures?* (On special days, the Aztec put popcorn in their hats. The Inca decorated their gardens with statues of corn. Native Americans told legends about corn.) *How did corn spread to the rest of the world?* (Explorers who visited the Americas took corn seeds home with them.) Display pages 22-23 of the projectable edition. Review the diagram as a class. Discuss how corn now goes from field to store in the modern world.

Developing New Corn Products

Remind students that native people were the first to use science to develop a better ear of corn. Modern scientists took corn even further. They found ways to use corn in everything from salad dressing to rubber tires. **Say:** *Corn is a huge food crop. Because of that, some scientists are now trying to make corn even more nutritious and easier to grow.* Discuss how a new corn product like this could help solve the world food problem. Then challenge the class to identify a different problem that could be solved with a new product made from corn. Once the problem has been identified, divide the class into small groups. Encourage groups to brainstorm ideas for a corn-related product that could help solve the problem. Give each student a copy of the **Content Assessment Master**. Have students create an advertisement about their new corn product. Then have them share their ideas with the class. Poll the class to see which product students think would best solve the problem. Discuss why.

ELABORATE

Find Out More

Remind students that the article identifies several products that contain corn. But there are many more. For example, corn is used to make jelly beans, cosmetics, and disposable diapers. There's even corn in spark plugs. Divide the class into small groups. Give groups time to conduct research about corn. Challenge each group to identify five corn-containing products that were not mentioned in the article. Rejoin as a class to compare lists. Which product surprises the class the most?

Extend Your Thinking About Living on Corn

Point out to the class that many people eat corn. But corn is used to make many different non-food products. As a class, discuss whether or not corn should be used to make products other than food when there are hungry people all over the world.

EVALUATE

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

- *What does corn syrup do to foods?* (sweetens them)
- *Why are explorers an important part of corn's history?* (They took corn to other continents. Because of that, corn is grown all over the world.)
- *What is the woody center of an ear of corn called?* (the cob)

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

Name _____

Date _____

VOCABULARY ASSESSMENT: A-maize-ing Grain

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 _____

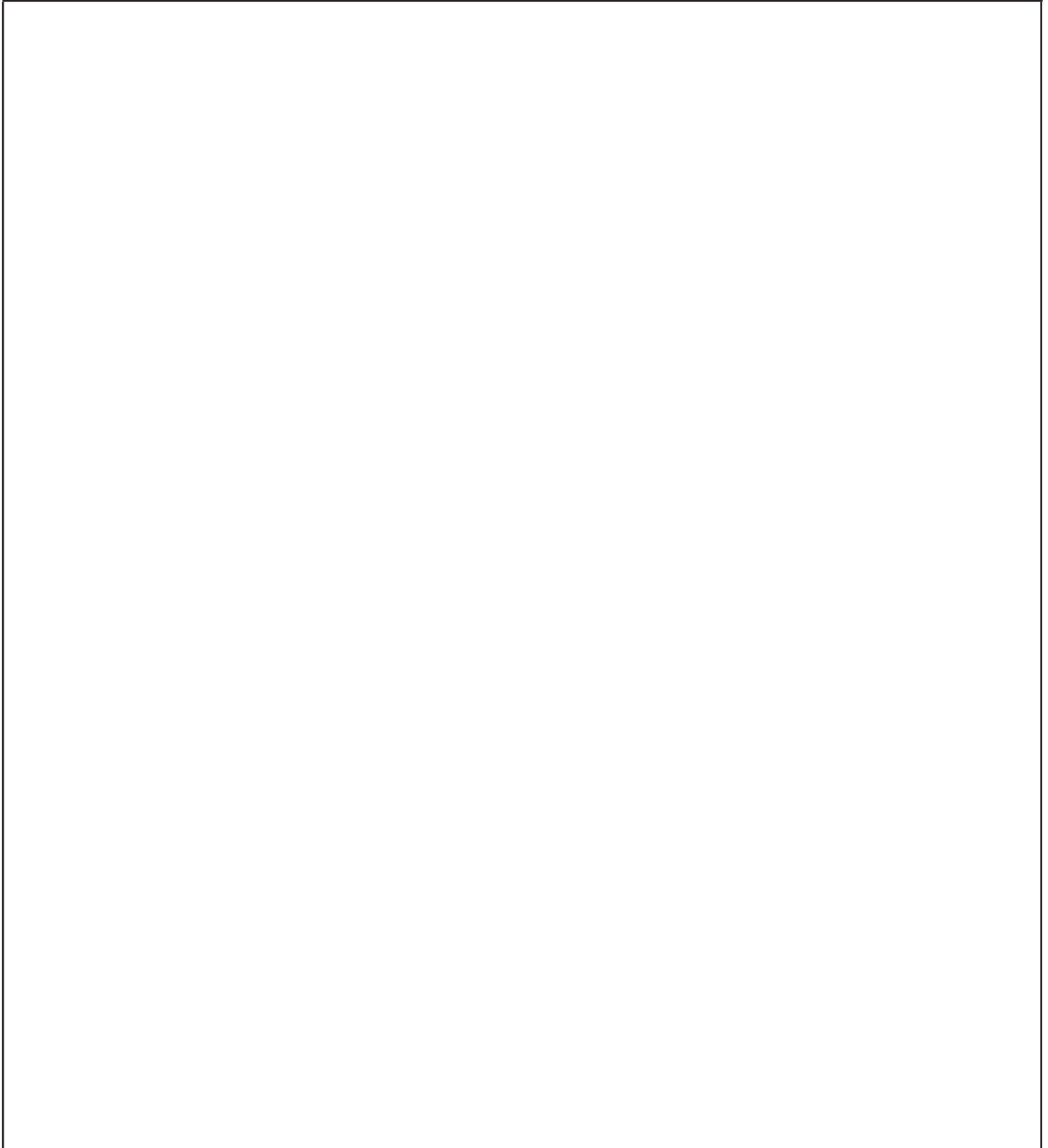
LANGUAGE ARTS ASSESSMENT: A-maize-ing Grain

Record questions you have about corn before, during, and after reading the article.
Search for answers in the text.

	Questions	Answers
Before		
During		
After		

CONTENT ASSESSMENT: A-maize-ing Grain

Think of a new corn product that could help solve a problem. Create an advertisement that tells about the new product.



COMPREHENSION CHECK: A-maize-ing Grain

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

1. How do scientists think corn started?

- Ⓐ as a tree
- Ⓑ as a wild grass
- Ⓒ as a flower

2. What is another word for corn?

- Ⓐ maize
- Ⓑ cob
- Ⓒ ear

3. Which part of a corn plant do people eat?

- Ⓐ the cob
- Ⓑ the kernels
- Ⓒ the teosinte

4. Who grew the first corn?

- Ⓐ scientists
- Ⓑ Europeans
- Ⓒ Native Americans

5. How did corn get from the Americas to other continents?

Understanding Maps

THE WORLD

Standard Supported

- Students will interpret, use, and distinguish various representations of Earth such as maps, globes, and photographs. (NCSS.III.b)

Resources

- Vocabulary Assessment Master (page 28)
- Language Arts Assessment Master (page 29)
- World Physical map poster (teacher's edition)
- World Political map poster (teacher's edition)

Background Information

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 and understand spaces and places in the natural world.

ENGAGE

Tap Prior Knowledge

Divide the class into pairs. Give each student a piece of paper and access to crayons. Challenge partners to draw a picture of a world map. Post the drawings on the board. Compare and contrast the results.

EXPLORE

Preview the Lesson

Display the **World Physical map poster**. Give students a few minutes to study it. Then display the **World Political map poster**. **Ask:** *How are these maps like the world map you drew? How are they different? How are they like and different from each other?* Encourage students to share their opinions.

Set a Purpose and Read

Have students explore a world physical map and a world political map so they learn how to interpret and use these two different representations of Earth.

EXPLAIN

Explore the Physical Map

Display the **World Physical map poster**. Read aloud the text. Discuss what a physical map is and what it shows. Point out the map key. Explain that a map key helps people identify physical features on a map. Review the text and photo for each physical feature. Have students match each one to the corresponding symbol on the map key. Challenge them to locate examples of each physical feature on the map.

Explore the Political Map

Display the **World Political map poster**. Read aloud and discuss the text. **Say:** *Political maps use colors to show different countries.* **Ask:** *What are the lines surrounding each country called?* (borders) Invite students to identify places on the map where they have been. Encourage them to identify places they would like to go. Challenge them to explain why.

ELABORATE

Find Out More

Inform the class that maps like these show features on land. Point out, however, that they also show one other major feature of Earth. What is it? (oceans) As a class, use the maps to identify Earth's oceans.

Extend Your Thinking About the World

Give each student a copy of the **World Map Content Assessment Master**. Have students make a physical map of the world and then draw borders and label two countries from the political map. They may use the posters as a guide. Assign partners. Without revealing their maps to their partners, have students describe the location of one country and name all of the physical features they would encounter as they traveled to the other. Challenge students to identify the two countries outlined on their partners' maps.

EVALUATE

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

Name _____

Date _____

CONTENT ASSESSMENT: World Map

Create a physical map of the world. Outline and label two countries.



COMPREHENSION CHECK: World Map

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

1. Which type of map shows where features of the land are?

- Ⓐ physical map
- Ⓑ political map
- Ⓒ both

2. Which type of map names countries?

- Ⓐ physical map
- Ⓑ political map
- Ⓒ both

3. What does a map key do?

- Ⓐ describe features
- Ⓑ identify places
- Ⓒ tell what map symbols mean

4. What type of physical feature covers Greenland?

- Ⓐ forests
- Ⓑ grasslands
- Ⓒ ice cap

5. What do the colors on this political map show?

Lively Lizards

Assess Vocabulary, page 7

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

adaptation: a behavior or body part that helps an animal survive

food chain: how food energy passes from one organism to another

habitat: a place where a plant or animal lives

nocturnal: active at night

predator: an animal that hunts and eats other animals

species: a type of plant or animal

Sentences will vary depending on the connections students identify.

Assess Language Arts, page 8

Answers will vary. However, students should record detail from both the text and photos when answering each question.

Assess Content, page 9

Students' drawings should resemble a gecko. They should record facts from the article that tell about each body part.

Comprehension Check, page 10

1. C; 2. C; 3. B; 4: B; 5: A gecko's tail helps it stay balanced. It also can detach so a gecko can escape if it's attacked by a predator.

Passport to Wonder

Assess Vocabulary, page 15

Students should record the words and definitions from the Wordwise feature on page 17.

continent: one of seven large areas of land on Earth, such as Asia

dynasty: line of kings or rulers in the same family

independence: freedom from being controlled by another country

Students should restate each definition in their own words. Sentences and drawings will vary but should accurately reflect the meaning of each word.

Assess Language Arts, page 16

As the main idea, students should note that people around the world voted to create a new list of World Wonders. Key details should focus on what the list is, why it was created, or why each structure was special enough to include on the list. Students should summarize why the key details they selected support the main idea of the article.

Assess Content page, 17

Drawings and answers will vary depending on which new World Wonder students select.

Comprehension Check, page 18

1. C; 2. B; 3. C; 4: B; 5: Answers will vary depending on which new World Wonder students select.

A-maize-ing Grain

Assess Vocabulary, page 23

Students should record the vocabulary words from the Wordwise feature on page 21, 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.

cob: the woody center of an ear of corn

ear: the spike-like fruit of a corn plant

ethanol: a liquid made from corn and used for fuel

kernel: a seed

maize: corn

teosinte: a wild grass that may be corn's ancestor

Assess Language Arts, page 24

Students' questions will vary, but all questions should relate to the article. All answers should come directly from the text.

Assess Content, page 25

Students advertisements will vary. However, all ads should depict a product made from corn that could help solve a problem.

Comprehension Check, page 26

1. B; 2. A; 3. B; 4: C; 5: Explorers too corn seeds home with them after they visited the Americas.

(continued)

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World Map

Assess Content, page 28

Students should include all of the features noted on the World Physical map. They should depict, as accurately as possible, the borders of any two countries. The countries should be labeled.

Comprehension Check, page 29

1. A; 2. B; 3. C; 4. C; 5: This colors on this political map show the size and shape of different countries.