



In This Guide

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

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 PATHFINDER will be within the 450-850L 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:

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.

Standard Supported

- Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (CCSS.RI.4.7)

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 five connections they see. For example: Being nocturnal is an adaptation that causes some species to be active 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, scamper upside down, and glide through the air. 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, just by looking at this photo I know that this gecko is a small animal. How do I know this? To me, the plants in the background look like grass and the grass is taller than the gecko. I also know that the gecko has green and brown skin. It has big, bulging eyes, a pointed tongue, and flat feet with round 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:** *As you read, you’ll learn much about geckos from the text. But you’ll get information from photos, captions, a diagram, and other items in an article, too. That information can quickly answer some of the questions you have.*

Give each student a copy of the **Language Arts Assessment Master**. Review the questions on the worksheet with the class. Then have students read the article on their own. As they do, instruct them to record each answer and find four additional facts about geckos. Tell students to record where they found each answer or fact in the article.

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** with a partner. Encourage them to discuss similarities and differences in their sentences to get an even deeper understanding of the vocabulary words.

- **Interpreting Information** After reading the article, remind students that articles contain much more than text. They often contain photos, diagrams, captions, and other text elements, too. These text elements usually highlight important points in the text. Because of that, readers can often find answers to questions more quickly if they study the text elements on the page. Have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the answers they recorded for each question. If their answers differ, suggest that they revisit the text they elements identified as sources and reevaluate their responses.

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 built for survival?*
- *How have some geckos adapted in ways that changed their looks?*
- *What surprised you about what you read?*

Standard Supported

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (NGSS.4.LS1.A)

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 geckos use their body parts in ways that help them 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 other than the one shown in the diagram and identify its parts. Challenge students to write a brief explanation telling how the gecko's parts help it survive.

(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 make the feet sticky. All have toe joints that can bend in the opposite direction of our fingers and toes.) As a class, discuss how these adaptations allow a gecko move in different ways that help it survive.

A Closer Look: Gecko Tails

Display pages 6-7 of the projectable magazine. **Say:** *When a gecko leaps, it spreads its legs wide so it can glide. It uses its tail to steer, just like the rudder of a boat.* Invite a volunteer to describe how the gecko uses its tail to leap from one rock to another in the photo at the top of the page. Then instruct students to review the section "A Terrific Tail" with a partner. Challenge them to identify another tail adaptation that helps geckos survive. (If attacked by a predator, they can detach their tails. That allows the gecko to get away.)

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?* (Rods are cells in eyes that pick up black and white. Cones are cells that pick up other colors. Nocturnal geckos don't have any rods. They have three extra-large cones. This allows them to see in color at night.) Zoom in on the photo of the gecko eye at the top of page 7. **Ask:** *How would the gecko's eye look different if this photo had been taken in the dark?* (The pupil would be much wider.) *Why is that important?* (A wider pupil allows more light to enter the eye. Eyes need light to see.)

ELABORATE

Find Out More

Point out to students that the article identified one other unique gecko adaptation: They use their voices to communicate. Divide the class into pairs. Instruct partners to go online to find recordings of gecko voices. Invite them to share the recordings in small groups. Have students compare and contrast the sounds different types of geckos make. Rejoin as a class. Do all gecko voices sound the same? Why or why not?

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.

- *How do we know that most geckos are nocturnal?* (They are active at night.)
- *What sounds do geckos make? Why do they make these noises?* (They bark, squeak, hiss, or croak to find mates, ward off predators, and send messages to one another.)
- *Why are gecko feet sticky?* (Their toes are covered with tiny hairs that can stick to surfaces.)

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 five sentences to tell how different words are connected.

1. _____

2. _____

3. _____

4. _____

5. _____

LANGUAGE ARTS ASSESSMENT: Lively Lizards

Answer each question about geckos. Record where you found the information in the article.

	Answer	Source
How did geckos adapt to survive in warm rain forests?		
How have geckos become an important part of food chains?		
What is an "egg tooth"? Why is it important?		
List four other facts you learned about geckos.	1. 2. 3. 4.	1. 2. 3. 4.

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 kind of animal is a gecko?
Ⓐ a lizard
Ⓑ a snake
Ⓒ a mammal

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

3. Which word best describes gecko feet?
Ⓐ stiff
Ⓑ smooth
Ⓒ sticky

4. Which of these statements is true?
Ⓐ Geckos eat plants.
Ⓑ Geckos lay eggs.
Ⓒ Geckos are all alike.

5. Explain why nocturnal geckos can see in color at night.

Standard Supported

- Determine the main idea of a text and explain how it is supported by key details; summarize the text. (CCSS.RI.4.2)

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

- capital
- 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.

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.

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. Each section has a main idea, too. Everything in a section is connected to the main idea of that section.

Display pages 10-11 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. Then poll the class to see if anyone can identify the building in the photo. **Say:** *In this case, you need to dig a little deeper to figure out what the article is about.**

Invite a volunteer to read aloud the introduction. Give students a minute to scan the rest of the article. **Say:** *Now, we have some good clues. According to the introduction, the article is about identifying and protecting special objects around the world that people have built.*

Give each student a copy of the **Language Arts Assessment Master**. Tell students to record the main idea of the article. (People identified and are now protecting their most treasured man-made items around the world.) Then have students read the article on their own. As they read, instruct students to select two sections of the article and record important details in each that support the main idea of the text. After reading each section, challenge students to analyze the information they collected and write a brief summary telling what they learned.

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.

- **Support the Main Idea** Point out to students that 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 their **Language Arts Assessment Masters** in small groups. If any group members examined the same sections, encourage them to compare their results. Did they record the same details? If not, what important details did students miss?

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.

- *Now that you've read the article, why is "Passport to Wonder" a headline for this topic?*
- *Why did the Swiss adventurer want to create a new list of World Wonders? Do you agree that it was important to make this list?*
- *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 is a testament to war.* As a class, identify other things each structure reveals about the history and culture of the people who built it. Then 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 write a proposal nominating the item they selected for inclusion 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.

- *Why are parts of the Great Wall of China missing?* (Sand, storms, and earthquakes have damaged it. People have taken bricks and stones as souvenirs.)
- *Why did people abandon the city of Petra?* (It was destroyed by an earthquake.)
- *Which new World Wonder has a pyramid that served as a calendar for the people who built it?* (Chichén Itzá) *How?* (The pyramid has 365 steps, one for each day of the year. On the first day of fall or spring, the sun casts a shadow down its steps. This helped them keep track of the seasons.)

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

Name _____

Date _____

VOCABULARY ASSESSMENT: Passport to Wonder

Use this organizer to examine each vocabulary word.

Write the definition.	Restate in your own words.
Word	
Draw a picture.	Write a sentence.

Write the definition.	Restate in your own words.
Word	
Draw a picture.	Write a sentence.

Write the definition.	Restate in your own words.
Word	
Draw a picture.	Write a sentence.

Write the definition.	Restate in your own words.
Word	
Draw a picture.	Write a sentence.

LANGUAGE ARTS ASSESSMENT: Passport to Wonder

Write the main idea of the article. Then pick two sections of the text. Record important details from each. Summarize what you learned in each section.

Main Idea of the Article	
---------------------------------	--

Section	
Important Details	
Summary	

Section	
Important Details	
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. What is the Taj Mahal?
 Ⓐ a pyramid
 Ⓑ a tomb
 Ⓒ a wall
2. What do Petra and Machu Picchu have in common?
 Ⓐ Both are about 2,000 years old.
 Ⓑ Both are in Asia.
 Ⓒ Both were once cities.
3. Which of the new World Wonders was a stadium?
 Ⓐ the Roman Colosseum
 Ⓑ Chichén Itzá
 Ⓒ Christ the Redeemer
4. Which continent is home to the most new World Wonders?
 Ⓐ Europe
 Ⓑ Asia
 Ⓒ South America

5. Explain why the Swiss adventurer wanted to create a new list of World Wonders.

A-maize-ing Grain

LANGUAGE ARTS 770L

Standard Supported

- Explain how an author uses reasons and evidence to support particular points in a text. (CCSS.RI.4.8)

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.

Instruct students 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

Write the words *reasons* and *evidence* on the board.

Then ask: *What’s the difference between these two words?* Invite students to share their ideas. Guide the class to understand that a reason tells why something happened. Evidence shows how.

Tell students that valid reasons and solid evidence are crucial elements of any text. Writers use them to support key points on the topic.

Display pages 18-19 of the projectable magazine. Instruct students to examine the illustration. Then invite a volunteer to read aloud the headline and text. **Say:** *Sometimes when you read an article, you have to get a paragraph or two into the text before you can identify the key point the writer is trying to make. Not here. In this article, the writer has stated her main point loud and clear in the headline: Corn is an amazing grain.* Invite a volunteer to read aloud the deck. Then have students identify all of the different products depicted in the illustration. (toothpaste, a soft drink, paint, a crayon, popcorn.) Read aloud the introduction to find several more. **Say:** *According to the text, all of these products contain corn. I guess this proves that corn is used in all kinds of products. It’s also a strong reason to call corn an amazing grain. Each product listed provides more evidence to support this point.*

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As students read, encourage them to search for additional reasons and evidence that support the writer’s claim that corn is an amazing grain. Have students summarize what they learned in their own words.

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?*

• **Identifying Reasons and Evidence** After reading the article, remind students that reasons tell why something happened. Evidence explains how. Invite students to share their **Language Arts Assessment Masters** in small groups. Challenge them to examine one another's results to determine whether or not all reasons are valid, all evidence is solid, and both support the writer's point that corn is an amazing grain.

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 that are shown or mentioned in the article. (toothpaste, soft drinks, paint, crayons, popcorn, cornflakes, margarine, beef, tortilla chips, cornmeal, corn syrup, corn starch, corn sweeteners, car tires, ethanol, chewing gum, flour corn, flint and dent corn, animal feed, corn on the cob, salad dressing, potato chips, pancake mix, plywood) 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:** *How do you know that corn was also an important part of native cultures?* (The Aztec decorated their hats with popcorn. 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 and found ways to use it 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. Then give each student a copy of the **Content Assessment Master**. Have students create an advertisement marketing their new product to consumers. Have group members compare their advertisements. Then have them share their ideas with the class. Encourage students to identify the products they think would be best at solving the problem. Challenge them to explain 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 10 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 is teosinte?* (a wild grass that may be corn's ancestor)
- *How was teosinte different from today's corn?* (It grew wild and had a small ear of corn with a row or two of small kernels. Modern corn is planted in fields. It has larger ears with larger kernels that grow in about 16 rows.)
- *How did corn move from North and South America to other parts of the world?* (Explorers took seeds from the Americas back home with them.)

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:

LANGUAGE ARTS ASSESSMENT: A-maize-ing Grain

Record reasons and evidence that prove corn is an amazing grain.
Summarize what you learned.

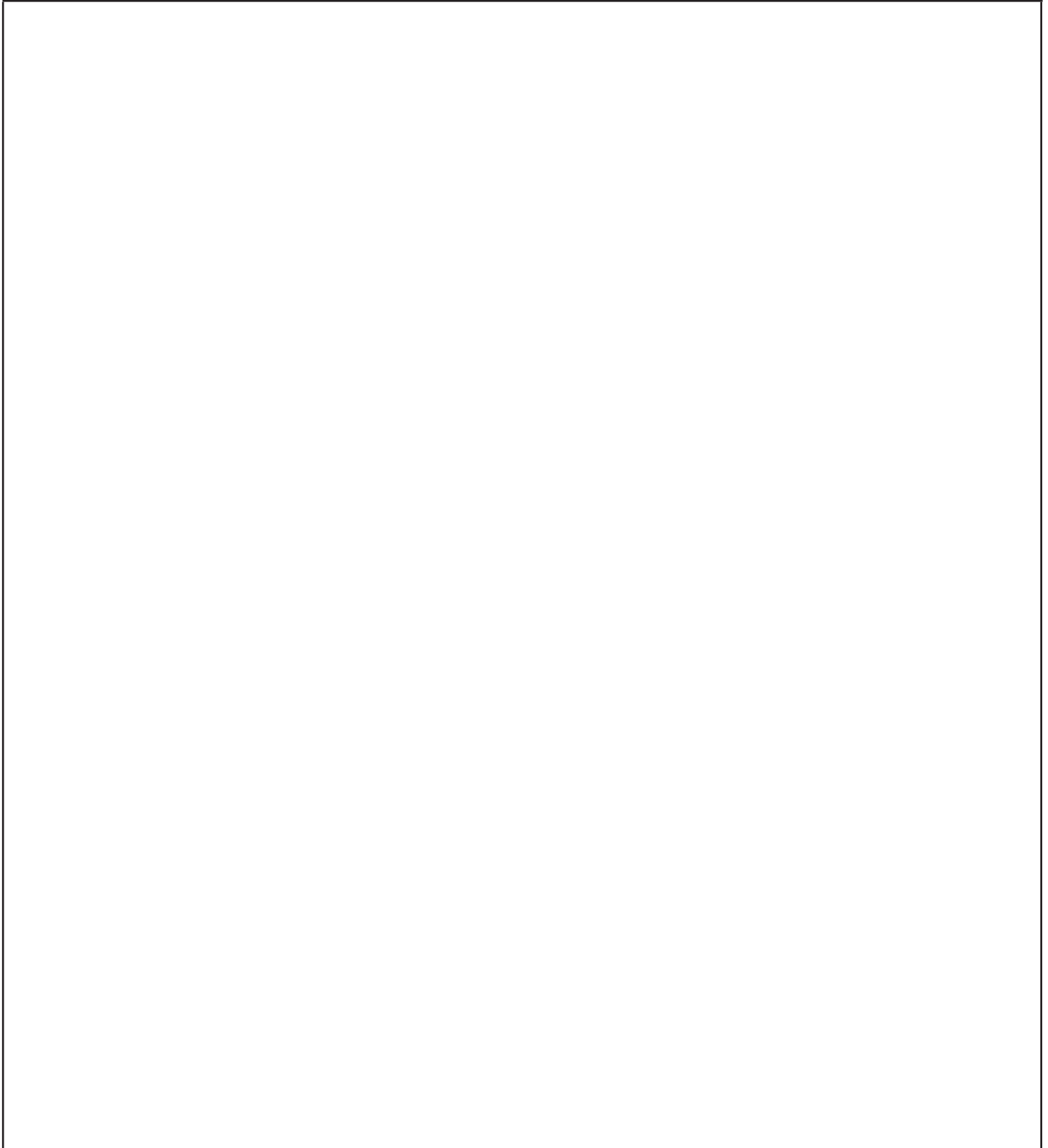
Reasons

Evidence

Summary

CONTENT ASSESSMENT: A-maize-ing Grain

Think of a new way that corn could be used or improved. Draw an advertisement that will get consumers to buy your 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. What is corn?
Ⓐ a flower
Ⓑ a grain
Ⓒ a tree
2. Which of these fuel products is made from corn?
Ⓐ gasoline
Ⓑ diesel
Ⓒ ethanol
3. Which part of a corn seed can grow into a plant?
Ⓐ the ear
Ⓑ the germ
Ⓒ the starch
4. Who developed the corn that we eat off the cob?
Ⓐ scientists
Ⓑ Europeans
Ⓒ Native Americans
5. What are the six steps that it takes for corn to go from field to store?

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

Give each student a piece of plain white paper and access to crayons. Challenge students to draw a picture of a world map. Post the finished 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

1. Answer: They developed special toes that let them scurry up slippery vines and legs that let them run quickly. They developed vision that helps them see colors in the dark. Some grew skin flaps that let them glide through the air. Geckos also became the only lizards with voices to communicate. **Source:** section "Special Features," p. 4

2. Answer: They eat insects, worms, and spiders. They are food for predators, like birds and snakes.

Source: section "Special Features," p. 4

3. Answer: An "egg tooth" is something at the end of a baby gecko's snout. It helps the gecko break out of its eggshell. **Source:** bottom right caption, p. 4

Students' facts will vary but should come from the article. A source should be cited for each.

Assess Content, page 9

Students' drawings should resemble a gecko from one photo in the article. Explanations will vary but should include information about each adaptation noted in the diagram on pages 8-9 of the article.

Comprehension Check, page 10

1. A; 2. C; 3. C; 4. B; 5. Rods are cells in eyes that pick up black and white. Cones are cells that pick up other colors. Nocturnal geckos don't have any rods. They have three extra-large cones. This allows them to see in color at night.

Passport to Wonder

Assess Vocabulary, page 15

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

capital: city where the government of a country or state is located

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

Students should record the main idea of the article. (People identified and are now protecting their most treasured man-made items around the world.)

Details and summaries will vary, depending on which sections students chose to investigate.

Assess Content page, 17

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

Comprehension Check, page 18

1. B; 2. C; 3. A; 4. B; 5: He wanted to get people excited about protecting the world's treasures.

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 colorless liquid made from corn and used for fuel

kernel: a seed

maize: corn

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

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A-maize-ing Grain

Assess Language Arts, page 24

Students should identify reasons and evidence that support the writer's point that corn is an amazing grain. Answers may vary, but they should all come directly from the text. Students should summarize what they learned in their own words.

Assess Content, page 25

Students advertisements will vary. However, all ads should depict a new way that corn could be used or improved and they should be targeted toward appropriate customers.

Comprehension Check, page 26

1. B; 2. C; 3. B; 4. C; 5: The six steps are planting, growing, harvesting, transporting, manufacturing, and distributing.

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.