

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
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- Teacher's Guides
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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 "In Search of the Lost City."

MINDSET OF AN EXPLORER

KEY FOCUS AREAS

A — 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.

S — Skills

National Geographic kids can:

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

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

COLLABORATE with others to achieve goals.

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

K — Knowledge

National Geographic kids understand:

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

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

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

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 7)
- Language Arts Assessment Master (page 8)

Summary

- The article "Sailing With the Blue Fleet" introduces readers to a variety of creatures known as the "Blue Fleet" that spend their entire lives drifting on the surface of the ocean.

BUILD VOCABULARY AND CONCEPTS

- **countershading**
- **pleustal zone**
- **polyp**
- **tentacle**

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

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

Instruct students to find and record text and visual clues in the article related to each vocabulary word. Then have each student record his or her own idea about what each word means. Invite volunteers to read aloud the definitions from the Wordwise feature on page 9 of their student magazines. Have students record the definitions on their worksheets. Encourage them to compare the definitions they wrote with the definitions from the text.

READ

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. Tell students that everything in the article is connected to the main idea. The main idea is supported with key details in the text.

Display pages 2-3 of the projectable magazine. Model how to identify the main idea of the article. **Say:** *To figure out what this article is about, I need to look for clues. The first clue is the photo. It shows some sort of creature floating on top of water. The headline mentions sailing and something called the "Blue Fleet." This creature does look blue. And I guess you could say it's sailing on the water. The word "fleet" makes me think of a group of ships. Does that mean the creature I see here is part of a group? Or, more precisely, part of a big, blue group? To know for sure, I need to look for more clues. Invite a volunteer to read aloud the deck. **Say:** *This is extremely useful information. Now I know that the creature in the photo is an animal. The water it's floating on is the ocean. And there are others like it, so it is part of a group. The article must tell about that big, blue group. As I read the article, I'm sure I'll find many interesting details that support this idea.**

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 record key details in each section.

The Blue Fleet

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about the "Blue Fleet." **Ask:** *What is the "Blue Fleet?"* (animals that live their entire lives on the surface of the ocean) *Why are wind and waves important to many members of the "Blue Fleet?"* (Many members of the "Blue Fleet" can't move on their own. Wind and waves move them across the water so they can find food.) Invite students to share what else they learned about the "Blue Fleet."

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

- **Identify Main Ideas** Remind students that the article has a main idea, and the main idea is supported by key details found in the article. Assign each student a partner. Have pairs review the key details they recorded on their **Language Arts Assessment Masters**. Based on those details, challenge partners to identify the main idea of the article.

- **Summarize the Text** Tell students that summarizing is also a good strategy to check their understanding of a text. **Say:** *When you summarize, you restate the major ideas of the article in your own words. If you are unable to do this, you may not fully understand what you just read.* Based on the details they recorded, instruct each student to write a brief summary of the article on their **Language Arts Assessment Masters**. Then have students turn and talk with their partners to share the summaries they wrote. If partners find that their summaries are vastly different, encourage them to review the article together, analyze each summary, and rewrite one or both of their ideas.

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 is the subhead "Many Parts, One Animal" a good description of the blue button jellyfish?*
- *How is the blue dragon like other members of the "Blue Fleet?" How is it different?*
- *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-LS1-1)

Resources

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

Science Background

Many animals live in the ocean. Some thrive in the shallows and others flourish in the deepest seas. A few spend their entire lives on the surface of Earth's warmer oceans. They live in the pleustal zone, the thin space between seawater and air. These animals are known as the "Blue Fleet."

The "Blue Fleet," a name coined by British marine biologist Sir Alister Hardy, is an assortment of strange creatures. As the name suggests, many of these animals are blue. And sometimes, fueled by wind and ocean currents, they are pushed together into large groups.

Some members of the "Blue Fleet" are not singular creatures but colonies of smaller animals. Good examples are the blue button jellyfish and the Portuguese man-of-war. Both are groups of smaller animals that live together but could not survive on their own.

Most "Blue Fleet" members are immobile. They just drift on the water. But each has found a way to get food and defend itself. The blue button jellyfish, Portuguese man-of-war, and by-the-wind sailor all have stinging tentacles. So does the blue dragon sea slug. But the poison in this mobile creature's tentacles comes from the man-of-war, which it eats.

The violet sea snail doesn't have tentacles. It has color. Its shell is dark on the bottom and lighter on top. This helps the snail blend in and hide from predators searching for prey above and below.

ENGAGE

Tap Prior Knowledge

Invite students to imagine that they are tiny animals living on the surface of the sea. They can float, but they can't move by themselves. They can eat, but they can't pursue food. And since they're always on top of the water, there is no place they can go to hide from predators. Brainstorm ideas about how a simple animal like this could survive.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Read aloud the headline and deck. Then invite students to examine the photo. **Say:** *According to the text, this animal drifts on the open sea.* **Ask:** *Why do you think that is? (It can't move on its own.) What do you think causes it to drift? (wind and water currents) Just by looking at the animal, how do you think its body is built in a way that helps it drift on the sea? (The thin part at the top looks like a boat sail. As wind pushes against that part, the animal moves.)* Have students examine the long, thin parts hanging from the bottom of the animal's body. Brainstorm ideas about what those parts do. Tell students that they will learn more about this creature and other members of a group called the "Blue Fleet" as they read the article.

Set a Purpose and Read

Have students read the article in order to understand what the "Blue Fleet" is and recognize special structures that help members of the "Blue Fleet" survive.

EXPLAIN

Understanding the "Blue Fleet"

Display page 4 of the projectable magazine. Zoom in on the last two paragraphs in the second column. Invite a volunteer to read the paragraphs aloud. **Ask:** *What is the "Blue Fleet?"* (mostly blue animals that live their entire lives on the surface of the ocean) Invite students to examine the article's photos in their student magazines. Encourage them to note the blue coloring on each animal. Whenever possible, have students also identify the waterline, or the ocean's surface. **Say:** *The place where these animals live, between ocean water and air, is called the pleustal zone. Animals that live here are called pleustons.* Give students time to scan the article. Encourage them to share other facts they learn about the "Blue Fleet."

Recognizing Special Structures

Display page 5 of the projectable magazine. **Say:** *The Portuguese-man-of-war might look like one animal, but it's actually a colony of tiny organisms working together.* Review the diagram as a class. Then, encourage students to scan the section "To Battle!" for details about each animal that is part of a man-of-war. Guide students to understand that none of these animals could live on its own. The animals need each other to survive. Assign each student a partner. Then give each student a copy of the **Content Assessment Master.** Tell pairs to name and draw each animal in the article. Have them identify special parts each animal has. Then challenge students to explain how the parts help the animals survive. Encourage students to share their results in small groups.

ELABORATE

Find Out More

Remind students that countershading helps several members of the "Blue Fleet" survive. But these organisms are not the only ones that have this adaptation. Divide the class into small groups. Instruct groups to conduct research to identify other organisms that use countershading. Challenge them to find photographs of these organisms and then write a description telling how countershading helps each organism survive. Invite groups to share what they learned with the class.

Extend Your Thinking About the "Blue Fleet"

Remind the class that several members of the "Blue Fleet" are actually colonies of animals that live together in order to survive. As a class, discuss what would happen to animals like these if one organism in the colony disappeared. Then discuss what would happen to the "Blue Fleet" as a whole, given that some members prey upon others to survive.

EVALUATE

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

- *Which member of the "Blue Fleet" can move on its own?* (blue dragon sea slug)
- *How does coloring help the by-the-wind sailor survive?* (Deep-blue pigment protects it against the sun's ultraviolet rays.)
- *How does the violet sea snail build a raft with its foot?* (Its foot stirs up water to make bubbles on the ocean's surface. Then, it oozes mucus from its foot, which binds the bubbles together into a floating raft.)

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

Name _____

Date _____

VOCABULARY ASSESSMENT: Sailing With the Blue Fleet

Record information from the article about each vocabulary word.

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

LANGUAGE ARTS ASSESSMENT: Sailing With the Blue Fleet

Use this organizer to record key details in each section of the article.

Subhead	Key Details
Introduction	
Many Parts, One Animal	
To Battle!	
Strong Sailor	
Life Upside Down	
Deadly and Mobile	
Sharing Space	

What is the main idea of the article? _____

Summarize the article. _____

Name _____

Date _____

CONTENT ASSESSMENT: Sailing With the Blue Fleet

Name and draw each animal in the article. Identify special parts and explain how they help the animal survive.

Name	Draw	Identify	Explain

COMPREHENSION CHECK: Sailing With the Blue Fleet

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

- 1. Where do members of the "Blue Fleet" live?
 - Ⓐ tidal zone
 - Ⓑ pleustal zone
 - Ⓒ coastal zone

- 2. Which of these "Blue Fleet" animals is actually a colony of smaller animals?
 - Ⓐ violet sea snail
 - Ⓑ blue dragon sea slug
 - Ⓒ blue button jellyfish

- 3. How are the blue button jellyfish and Portuguese man-of-war alike?
 - Ⓐ Both have polyps.
 - Ⓑ Both have a part called a float.
 - Ⓒ Both are jellyfish.

- 4. What do a blue dragon sea slug's cerata do?
 - Ⓐ store venom
 - Ⓑ make air bubbles
 - Ⓒ ooze mucus

5. Explain how countershading helps some "Blue Fleet" animals survive.

Standard Supported

- Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (CCSS.RI.4.1)

Resources

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

Summary

- The article "In Search of the Lost City" relates how archaeologists used new technology to locate ancient ruins in the rain forests of Honduras and Nicaragua.

BUILD VOCABULARY AND CONCEPTS

- **archaeologist**
- **culture**
- **excavation**

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each vocabulary word as you read it aloud from the Wordwise feature on page 15.

Point out to students that they may have heard some or all of these words before. Using that background knowledge as a base, instruct students to predict and write a definition for each word. Then have them write a sentence for each word, based on the definitions they wrote.

Display the Wordwise feature on page 15 of the projectable magazine. First, instruct students to make sure they spelled each word correctly. Then review the definitions as a class. Have students add these definitions to their worksheets. Instruct them to write a new sentence for each word that accurately reflects how it was defined in the article.

READ

Tell students that as they read, they will come across many facts that are stated clearly in the text. These facts are explicit statements. But they will also encounter clues that require them to make an inference, or educated guess. To do this, they must combine what the text says with what they already know to reach a logical conclusion.

Display pages 10-11 of the projectable magazine. Read aloud the headline. Then model how to identify an explicit statement and make inferences. **Say:** *According to the headline, someone is searching for a lost city. That is an explicit statement, or a stated fact. But cities are large. How can you lose a city? And who is trying to find the city? To figure that out, I'll have to search for clues.*

Invite students to examine the photo. Then read aloud the deck. **Say:** *I found the answer to one of my questions. Archaeologists are searching for the lost city. That is stated directly in the text. Tell students that between the photo and text you can make an inference that will help you answer your other question. **Say:** As you can see in the photo, archaeologists are searching for the lost city in a valley filled with trees. It would be hard to find anything here. But a key word in the text tells me why it's an even bigger challenge. That word is "ruins." The archaeologists are searching for ruins, or the remains of a city that existed long ago. My guess is the city didn't go anywhere. It was abandoned and the forest grew back where the city once stood. To find out if my inference is correct, I'll need to read 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 five explicit statements and make five inferences about the lost city.

TURN AND TALK

Have students turn and talk to discuss what they learned about the search for the lost city. **Ask:** *What is an archaeologist?* (a scientist who studies human history through the excavation of sites and the study of artifacts and other remains) *Who started the legend of the lost city?* (the first Spanish explorers in Central America) *What did they say the lost city was?* (a city built of white stone in the Central American rain forest) Invite students to share what else they learned about the search for the lost city.

- **Predicting Definitions** Have students turn and talk to discuss what they learned about the article's vocabulary words. Encourage them to compare the before and after sentences they wrote for each word. As a class, examine how new knowledge contributes to students' understanding of each word.

- **Making Inferences** Remind students that making inferences is a strategy that can help them understand what they read. **Say:** *Understanding what you just read is important. But interpreting information from a writer's clues takes practice. If you can't follow the clues, you might need to reread the text.* Have students compare their **Language Arts Assessment Masters** with a partner. Did students identify the same explicit statements? Did they find the same clues? If so and they developed different inferences, encourage students to review the text once again. Challenge them to explain to their partners how the clues they found helped them reach each logical conclusion.

WRITE AND ASSESS

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

- *How was archaeologist Chris Fisher's search for the lost city different from Theodore Morde's expedition in the 1940s?*
- *Who were the Mosquitia people?*
- *What surprised you about what you read?*

Standard Supported

- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (NGSS.3-5-ETS1-2)

Resources

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

Science Background

The story of the White City, or "Ciudad Blanca," started when the Spanish first came to Central America. They told of a city with white walls that was filled with treasure, hidden deep in the jungle. Over time, it became a legend.

People have searched for the White City. But in the past, that was no easy task. The rain forests in the Mosquitia region of Honduras and Nicaragua are filled with dense vegetation, dangerous animals, and deadly diseases. But now, thanks to modern technology, the ruins of real lost cities have been discovered.

Archaeologist Chris Fisher had a site in mind. So he used a new technology called lidar, which stands for "light detection and ranging," to search. Lidar sends pulses of light toward the ground. Most reflect off of the treetops. But some make it to the ground before they bounce back up. The time it takes for the light to return creates a "point cloud" that helps make a picture of what lies below the canopy.

In this case, lidar revealed the ruins of two ancient sites. There were roads, farming terraces, canals, and a reservoir. The jungle had revealed its secrets.

Fisher and filmmaker Steve Elkins trekked through the jungle to their target sites. When they got there, they found the outlines of buildings and an assortment of carved stone objects. Their discovery will help them learn about the ancient people who once lived here.

ENGAGE

Tap Prior Knowledge

Prior to conducting this activity, write the following words on notecards: *legend*, *jungle*, *treasure*, *hidden*, *lost*, *city*, and *explore*. Display the cards one at a time. Invite students to share what they know about each word. As a class, brainstorm ideas for a legend that features all of the other words.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Read aloud the headline and deck as students examine the photo. **Ask:** *How would you even begin to search for a lost city in this jungle?* Encourage students to share their ideas. As a class, discuss reasons why archaeologists would want to search for a lost city. Brainstorm ideas about what they might see if they found one.

Set a Purpose and Read

Have students read the article in order to recognize who the Mosquitia people were and understand how scientists are using new technology to collect information about their lost cities.

EXPLAIN

Recognizing the Mosquitia people

Poll the class to see how many students have heard of the Maya, an ancient people who lived in Central America. (Most, if not all, students are likely to raise their hands.) Take a second poll to see how many students have heard of the Mosquitia, another ancient Central American group. (Few, if any, hands are likely to go up.) Brainstorm ideas about why people know so much more about the Maya. Then display pages 14-15 of the projectable magazine. As a class, read and review the sidebar to learn about the Mosquitia people. Invite students to examine the photos and describe what they see. **Say:** *Today, we learn about ancient cultures through artifacts, or the objects people left behind. If nearly everything the people built disappears, it is easy for that culture to be forgotten.* As a class, discuss reasons why it would particularly difficult to find the few remaining artifacts of the Mosquitia people in this rain forest.

Understanding New Technology

Display pages 12-13 of the projectable magazine. As a class, review the feature "Archaeology From Above." Guide students to recognize that the numbered steps explain how new lidar technology helps archaeologists find ancient ruins. The lettered items identify different structures they have found in a valley in Mosquitia. Challenge students to identify the outlines of those structures in Steps 4 and 5. Then give each student a copy of the **Content Assessment Master**. Instruct students to draw their own pictures of a rain forest canopy. Then encourage them to add layers to show the ground below the canopy, traces of buildings, and the remains of a lost city. (Students may find it easier to start with the image of the lost city and work backward.) Remind students that any features they draw on the ground must match up with the structural outlines in their lost cities. When students are finished drawing, instruct them to add a map key to identify key structures in their lost cities.

ELABORATE

Find Out More

Point out to students that excavation, or digging, has traditionally been how archaeologists made new discoveries. But now, with lidar technology, they have a new tool that makes the search for the past easier, safer, and more precise. Divide the class into small groups. Instruct groups to conduct research to learn more about lidar technology and how it's helping archaeologists make new discoveries. Invite groups to share what they learned with the class.

Extend Your Thinking About Observation

Display the National Geographic Learning Framework feature on the magazine's back cover. Discuss what observation is. Tell students that when people observe, they notice things. When scientists observe, they document what they see. Studying these notes helps scientists understand their observations. Take the class outside. Instruct students to pick a plant or animal and observe it for a while. Encourage students to take notes and draw pictures of what they see. Invite students to share their observations with the class. As a class, discuss what students' observations reveal about the area.

EVALUATE

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

- *What is culture?* (the customs, arts, social institutions, and achievements of a particular nation, people, or social group)
- *What does lidar information help scientists see?* (the shape of the land below the trees)
- *What did scientists see when they used lidar technology?* (the remains of two settlements, roads, farming terraces, canals, and a reservoir)

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

Name _____

Date _____

VOCABULARY ASSESSMENT: In Search of the Lost City

Use this organizer to study each vocabulary word in the article.

Word			
Predicted Definition			
Sentence			
Definition from the Article			
Sentence			

LANGUAGE ARTS ASSESSMENT: In Search of the Lost City

Record five explicit statements and make five inferences about the search for the lost city.

Explicit Statements	
1.	
2.	
3.	
4.	
5.	

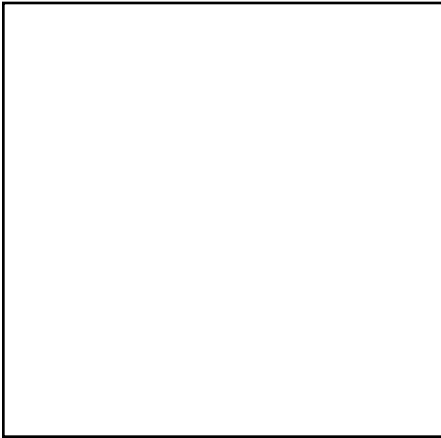
Inferences

What the Text Says	What I Already Know	Inferences I Can Make

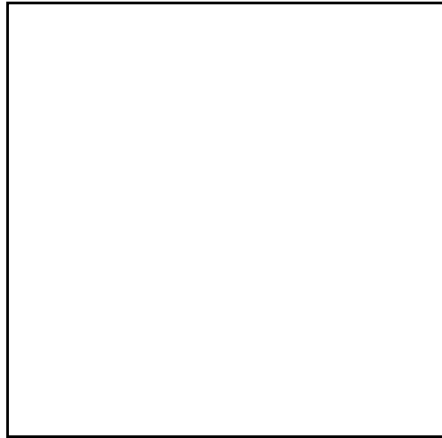
CONTENT ASSESSMENT: In Search of the Lost City

Use pictures to show how lidar technology works. Draw a rain forest canopy, the ground below it, signs of life, and a lost city. Add a map key to identify structures in your lost city.

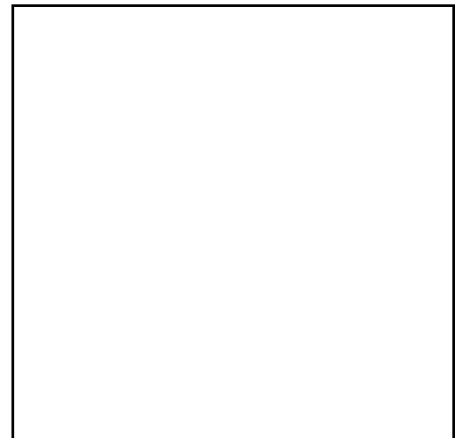
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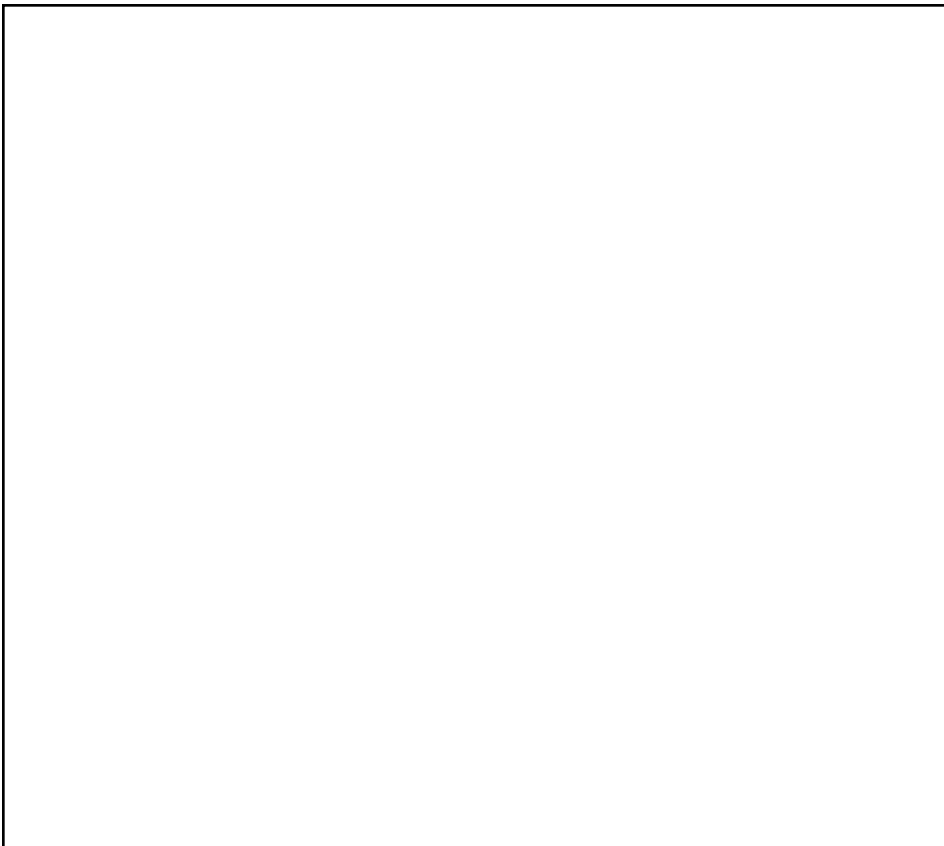
Ground



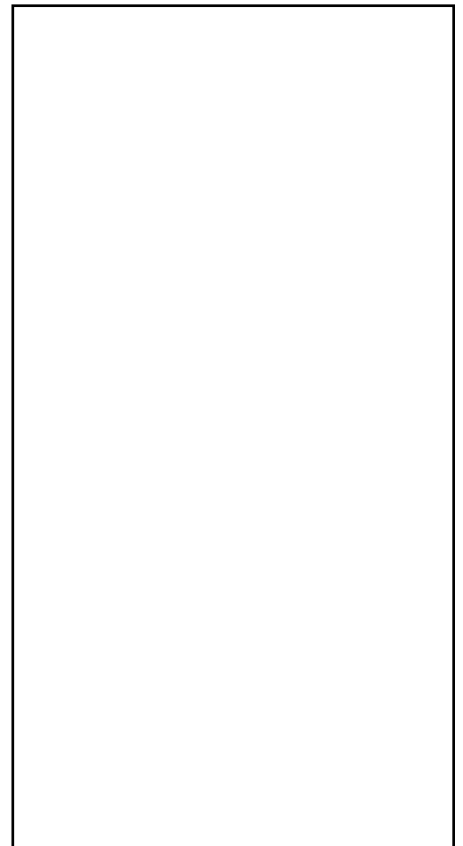
Signs of Life



Lost City



Map Key



COMPREHENSION CHECK: In Search of the Lost City

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

1. What is the landscape in the Mosquitia region like?
Ⓐ desert
Ⓑ grasslands
Ⓒ rain forest

2. What does lidar use to create a picture of the ground?
Ⓐ light
Ⓑ sound
Ⓒ colors

3. Which of the following did lidar show in Mosquitia?
Ⓐ white walls
Ⓑ terraces
Ⓒ trees

4. What did archaeologists find when they went to the site?
Ⓐ carved stone sculptures
Ⓑ big stone buildings
Ⓒ wooden bowls and cups

5. What does lidar show? What does it help scientists find?

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 "The Ups and Downs of Ramps" introduces readers to ramps, a type of simple machine, and explores how ramps help people do work more easily.

BUILD VOCABULARY AND CONCEPTS

- **effort**
- **inclined plane**
- **load**
- **simple machine**

Display the Wordwise feature on page 21 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. Discuss how the vocabulary words are related. Then challenge students to create a diagram that illustrates this connection. Have students label each word in their diagrams. Then invite students to share their ideas with the class.

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.

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

Display pages 16-17 of the projectable magazine. Invite a volunteer to read aloud the headline. Instruct students to then examine the photo and illustrations. Point out that the headline and photo work together to make one of the key points of this article: Ramps help people move things up and down.

Give each student a copy of the **Language Arts Assessment Master**. Instruct students to record this key point. Then have students read the article on their own. As they read, challenge them to record two more key points. Encourage them to search for reasons and evidence that support all three key points made in the article.

Ramps

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about ramps. **Ask:** *What is another word for ramp?* (inclined plane) *How is an inclined plane different from other simple machines?* (It doesn't move.) *How do people get things to move with an inclined plane?* (They have to use force.) Encourage students to share other interesting facts they learned about ramps, or inclined planes.

- **Finding Connections** Explain to students that a word's definition tells you what the word means. 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 drew their diagrams. Instruct students to turn and share the diagrams they drew on their **Vocabulary Assessment Masters** with a partner. Encourage them to compare how they illustrated each word to show an overall relationship between each of the vocabulary words.

- **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 each other's results to determine whether or not all reasons are valid, all evidence is solid, and both support the key points they are connected to in the text.

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 is a ramp considered to be a simple machine?*
- *Identify one ramp you have used. How did it help you do work more easily?*
- *What surprised you about what you read?*

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 specific criteria for success or how well each takes the constraints into account. (NGSS.3-5-ETS1-1)

Resources

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

Science Background

When people think of machines, they generally picture complicated gadgets with lots of moving parts. But not all machines are this complex. Some, called "simple machines," only have a few parts. And they are extremely helpful when you want to get work done.

In this article, the second of a six-part series about simple machines, students will learn about inclined planes. An inclined plane is a ramp. It is, quite simply, just a sloping surface.

Inclined planes make it easier for people to move things from one level to another. If a ramp is long and the slope is gentle, less force is needed to move a load. But it takes more force if the ramp is short and the slope is steep.

People use inclined planes every day. A ladder is an inclined plane. So are stairs. If a driveway goes up a hill, it's an inclined plane, too.

Inclined planes make it easier to lift and load things. But sometimes, they just let you have fun. Slides are inclined planes. Roller coasters are one inclined plane after another. And many sports, such as skiing, snowboarding, and skateboarding, use inclined planes to help people gain speed so they can zip along or fly through the air.

ENGAGE

Tap Prior Knowledge

As a class, pick one place in the school where there are stairs. Tell students to imagine that same place without stairs. Brainstorm ideas about how people could now get from one level of the building to another. Discuss the pros and cons of each option.

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable magazine. Read aloud the headline and deck. Inform students that this article is about ramps, or inclined planes.

Ask: *What clues show or tell you what a ramp is?*

(The headline says ramps go up and down. The diagram shows what an inclined plane looks like. The diagram's header says an inclined plane is a simple machine. The deck says a ramp, or inclined plane, makes work easier to do.) Challenge students to identify the ramp in the photo (roller coaster). Brainstorm ideas about how roller coasters make it easier to do work.

Set a Purpose and Read

Have students read the article in order to recognize that inclined planes are simple machines and how inclined planes help solve problems. Students will also do an experiment to see how ramps make it easier to do work.

EXPLAIN

Recognizing Ramps as Simple Machines

Display the Wordwise feature on page 21 of the projectable magazine. Review the definitions of *inclined plane* and *simple machine*. Remind students that an inclined plane and a ramp are the same thing. **Say:** *According to the article, an inclined plane is actually the simplest of simple machines.* **Ask:** *Why do you think that is?* (Possible response: An inclined plane only has one part, whatever is used to create the ramp.) As a class, review the photos on pages 20-21. Challenge students to identify the inclined plane in each.

EXPLAIN

(continued)

Understanding How Ramps Solve Problems

Display the Wordwise feature on page 21 of the projectable magazine. Review the definitions of *inclined plane*, *effort* and *load*. Then display pages 18-19. Challenge students to identify the inclined plane (board), effort or force (people pushing and pulling), and load (piano) in the illustration. Then display pages 18-19. Invite volunteers to read aloud the problem and solution in the yellow box. Encourage them to summarize the problem and solution in this case. (Problem: moving the piano to the stage; Solution: using a long ramp) Point out that stairs are a ramp. A short board can be, too. But neither of those solutions worked in this case. **Say:** *Just because you have a ramp, it doesn't mean that ramp will solve the problem. You need the right tool for the job. In this case, the longer ramp did the trick. It took less effort to move the piano because the piano was moving up over a longer distance.* Have students examine the photos on pages 20-21 of their student magazines. Ask students to identify the ramp in each photo. Challenge them to identify the problem each ramp solves. (Photo 1: The road is the ramp. By winding down the mountain, it keeps cars from going too fast. Photo 2: This inclined plane is called a ramp. Its steep angle lets the skateboarder gain speed so he can do awesome moves on another ramp.)

Putting Ramps to Work

Prior to conducting this activity, gather the supplies noted on page 22 of the article. Divide the class into small groups. Provide each group with the necessary supplies. Give each student a copy of the **Content Assessment Master**. Then inform students that they are going to conduct an experiment to see how using a ramp makes it easier to do work. Instruct groups to follow the instructions on pages 22-23 of their student magazines. As they complete each step, instruct students to record data on their worksheets. When all groups are finished, encourage them to share and compare their results with the class.

ELABORATE

Find Out More

Display the "Thinking Like an Engineer" sidebar on page 19. Review the sidebar with the class. Then point out that engineers solve many problems with ramps. Divide the class into small groups. Challenge each group to find photographs of three problems that engineers have solved with ramps. Instruct them to conduct research to learn more about each example. Then have students identify the problem encountered in each example and summarize how the ramp provided a solution. Invite groups to share their work with the class.

Extend Your Thinking About Ramps

Point out to students that they use ramps, or inclined planes, every day. As a class, brainstorm a list of inclined planes in and around your school. Discuss how these ramps help people in the school move things faster, farther, and more easily.

EVALUATE

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

- *What is a simple machine?* (a machine with only a few parts)
- *What is effort?* (the force that makes a simple machine do work)
- *How do ramps make it easier to do work?* (Ramps increase the distance so you need to use less effort to get the work done.)


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

VOCABULARY ASSESSMENT: The Ups and Downs of Ramps

Record each vocabulary word and its definition.

Word	Definition

Draw a diagram that shows how the vocabulary words are connected.
Label each part of your drawing.



LANGUAGE ARTS ASSESSMENT: The Ups and Downs of Ramps

Record reasons and evidence that support this key point the writer makes.

Key Point: Ramps help people move things up and down.	
Reasons	Evidence

Identify two more key points in the article. Record reasons and evidence that support each.

Key Point:	
Reasons	Evidence

Key Point:	
Reasons	Evidence

CONTENT ASSESSMENT: The Ups and Downs of Ramps

Use this organizer to record data as you complete the experiment on pages 22-23 of your student magazine.

1. What is the problem you are trying to solve in this experiment?

2. Which supply is the load? _____

3. Which supply is the ramp, or inclined plane? _____

4. Where is the effort coming from? _____

5. In Step 5, how far did the rubber band stretch? _____

6. In Step 7, how far did the rubber band stretch? _____

7. Which way of lifting the object required less effort? Why?

8. Imagine that you did this experiment again with a shorter ramp. Would the rubber band stretch more or less than it did in Step 7? Why?

COMPREHENSION CHECK: The Ups and Downs of Ramps

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

1. What does an inclined plane help people do?
Ⓐ open a load
Ⓑ turn a load
Ⓒ raise or lower a load

2. What is the force that makes a simple machine do work called?
Ⓐ effort
Ⓑ ramp
Ⓒ load

3. What kind of ramp requires less effort to do work?
Ⓐ a long ramp
Ⓑ a short ramp
Ⓒ a steep ramp

4. Which of these tools is an inclined plane?
Ⓐ a hammer
Ⓑ a screwdriver
Ⓒ a ladder

5. Explain how ramps, or inclined planes, make it easier to do work.

Understanding Maps

AUSTRALIA AND OCEANIA

Standard Supported

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

Resources

- Content Assessment Master (page 28)
- Comprehension Check (page 29)
- Australia and Oceania Physical Map poster (teacher's edition)
- Australia and Oceania Political Map poster (teacher's edition)

Social Studies Background

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

ENGAGE

Tap Prior Knowledge

Have students list three things they would expect to see in Australia and Oceania—besides kangaroos and koala bears. Review the lists. Invite students to share what they know about Australia and Oceania.

EXPLORE

Preview the Lesson

Display the **Australia and Oceania Physical Map poster** and the **Australia and Oceania Political Map poster**. Cover the captions. Discuss what each photo tells about Australia and Oceania.

Set a Purpose and Read

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

EXPLAIN

Explore the Physical Map

Display the **Australia and Oceania Physical Map poster**. Read aloud the text in the "Landforms" box on the left side of the poster. Have students find the Great Dividing Range and the Australian Alps. Challenge students to identify and locate other mountain ranges in Australia and Oceania. Review the other boxes in this same way. Then read aloud the caption for each photo. Invite students to share what the map taught them about the physical characteristics of Australia and Oceania.

Explore the Political Map

Display the **Australia and Oceania Political Map poster**. Invite volunteers to read aloud the captions and text. As a class, find each location mentioned on the map. Challenge students to add another fact they know about each place.

ELABORATE

Find Out More

Display the **Australia and Oceania Political Map poster**. Invite a volunteer to locate New Caledonia. Point out "(France)" below the island's name. **Say:** *New Caledonia is not an independent country. It is a dependent nation controlled by another country, France. There are several dependent nations in Oceania.* As a class, conduct research to identify other dependent nations. Challenge students to find each place on a larger world map.

Extend Your Thinking

Give each student a copy of the **Australia and Oceania Map Content Assessment Master**. Have students create a physical or political map of this continent. Then have them conduct research to find and record four more facts.

EVALUATE

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

Name _____

Date _____

CONTENT ASSESSMENT: Australia and Oceania Maps

Create a physical or political map of Australia and Oceania. Record four new facts about the continent.



Sample Box #1

Sample Box #2

Sample Box #3

Sample Box #4

COMPREHENSION CHECK: Australia and Oceania Maps

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

1. What is the largest city in Australia and Oceania?
Ⓐ Auckland, New Zealand
Ⓑ Sydney, Australia
Ⓒ Melbourne, Australia

2. What is the primary language spoken in Australia and Oceania?
Ⓐ English
Ⓑ French
Ⓒ Australian

3. Which landform covers central Australia?
Ⓐ rain forest
Ⓑ desert
Ⓒ wetland

4. Which animal is only found on New Guinea, Australia, and surrounding islands?
Ⓐ kiwi
Ⓑ sea turtle
Ⓒ birds of paradise

5. Write one political fact and one physical fact you learned about Australia and Oceania.

Sailing With the Blue Fleet

Assess Vocabulary, page 7

Students should record the words and definitions from the Wordwise feature on page 9.

countershading: the development of dark colors on parts usually exposed to the sun and of light colors on parts usually shaded

pleustal zone: the region between ocean water and air where some animals live

polyp: a sedentary type of animal with a fixed base, column-like body, and free end with mouth and tentacles

tentacle: a flexible appendage in animals, especially invertebrates, that serves as an organ of touch

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

Assess Language Arts, page 8

Key details for each section may vary. Main ideas should be directly related to the content of each section. The main idea and summary of the article should reflect that the "Blue Fleet" is a group of animals that lives on the surface of the ocean.

Assess Content, page 9

1. blue button jellyfish; Drawings should resemble the animal on page 4; float and tentacles; The coloring of both parts helps the blue button jellyfish blend in with the ocean and hide from predators. Tentacles snag and sting prey.

2. Portuguese-man-of-war; Drawings should resemble the animal on page 5; float, polyps, and tentacles; The transparent float absorbs the sun's rays and helps the animal sail in the wind. Polyps contain the digestive and reproductive systems. They also help the man-of-war find and capture prey. Tentacles inject poison into prey.

3. by-the-wind sailor; Drawings should resemble the animal on page 6; vane and electric-blue disk; The vane catches the wind so the sailor can move. The disk has air-filled chambers that help the sailor float. Its deep-blue pigment protects the sailor from the sun's ultraviolet rays.

4. violet sea snail; Drawings should resemble the animal on page 7; foot and shell; The foot stirs

water to make bubbles and oozes mucus to bind the bubbles together so the snail floats. The shell's countershading helps the snail hide from predators.

5. blue dragon sea slug; Drawing should resemble the animal on page 8; cerata, stomach, and body; The cerata store venom and sting prey. The stomach stores air bubbles so the sea slug can float. The body has countershading to help the sea slug hide from predators.

Comprehension Check, page 10

1. B; 2. C; 3. B; 4. A; 5: Possible response: Countershading makes predators below think they're looking at the sky above and predators above think they're seeing the sea below.

In Search of the Lost City

Assess Vocabulary, page 15

Students' predictions and the sentences they write will vary. They should record the words and definitions from the Wordwise feature on page 15.

archaeologist: a scientist who studies human history through the excavation of sites and the study of artifacts and other remains

culture: the customs, arts, social institutions, and achievements of a particular nation, people, or social group

excavation: the act of excavating, or unearthing something by cutting, digging, or scooping

Assess Language Arts, page 16

Students should record five explicit statements and five inferences. Inferences may vary but should be logical and directly relate to information in the text.

Assess Content, page 17

Drawings will vary but students should follow the format presented in the "Archaeology From Above" feature on pages 12-13 of the article.

Comprehension Check, page 18

1. C; 2. A; 3. B; 4. A; 5: Lidar shows the shape of the land below the trees. It helps scientists find areas that may have been changed by people.

(continued)

The Ups and Downs of Ramps

Assess Vocabulary, page 23

Students should record the words and definitions from the Wordwise feature on page 21.

effort: the force that makes a simple machine do work

inclined plane: a surface that is slanted so that one end is higher than the other

load: an object that is to be moved or the work that is to be done

simple machine: a machine with no more than a few parts

Diagrams should show an accurate connection between the words. All terms should be labeled in the diagram.

Assess Language Arts, page 24

Students should identify reasons and evidence that support the key point that ramps help people move things up and down. Answers may vary, but they should all come directly from the text. Other answers will vary depending on which key points students identify.

Assess Content, page 25

1. Possible Response: I am trying to move the load up the ramp with the least amount of effort.
2. bag of rice
3. cardboard
4. I am pulling on the free end of the rubber band.
5. Answers will vary.
6. Answers will vary.
7. Students should note that less effort was required in Step 7. They pulled the load a longer distance, decreasing the amount of effort needed to move it.
8. Students should note that the rubber band would stretch more. The load would be traveling a shorter distance, increasing the amount of effort needed to move it.

Comprehension Check, page 26

1. C; 2. A; 3. A; 4. C; 5: Inclined planes allow you to move a load over a longer distance, which decreases the amount of effort you need to do work.

Australia and Oceania Maps

Assess Content, page 28

Students should create an accurate physical or political map of Australia and Oceania. Students should write four facts. Facts will vary, but they should relate to the type of map (physical or political) that the student chose to create.

Comprehension Check, page 29

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