



**TEACHER'S GUIDE**  
**Pathfinder and Adventurer**  
**Vol. 19 No. 5**

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Educational consultant **Stephanie Harvey** has helped shape the instructional vision for this Teacher's Guide. Her goal is to ensure you have the tools you need to enhance student understanding and engagement with nonfiction text.

**Lexile® Framework Levels**

<b>Pathfinder</b>	
Whale Sharks.....	760
Ocean Supercrop .....	700
Snapshot of Space .....	700
<b>Adventurer</b>	
Whale Sharks.....	870
Ocean Supercrop .....	830
Snapshot of Space .....	770

**Standards Supported**

- Common Core State Standards (CCSS)
- Next Generation Science Standards (NGSS)
- C3 Framework for Social Studies State Standards (C3)

**See each lesson for the specific standard covered.**



Looking for a fun way to test your student's recall? Each story in this issue of Explorer has an accompanying Kahoot! quiz.

Log in at **ExplorMag.org**  
 to access additional resources including:

- Interactive Digital Magazine with videos and activities
- Projectable PDF for one-to-one instruction

## 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.

## MINDSET OF AN EXPLORER: KEY FOCUS AREAS

### Attitudes



**CURIOSITY** An explorer remains curious about how the world works throughout his or her life. An explorer is adventurous, seeking out new and challenging experiences.

**RESPONSIBILITY** An explorer has concern for the welfare of other people, cultural resources, and the natural world. An explorer is respectful, considers multiple perspectives, and honors others regardless of differences.

**EMPOWERMENT** An explorer acts on curiosity, respect, responsibility, and adventurousness and persists in the face of challenges.

### Skills



**OBSERVATION** An explorer notices and documents the world around her or him and is able to make sense of those observations.

**COMMUNICATION** An explorer is a storyteller, communicating experiences and ideas effectively through language and media. An explorer has literacy skills, interpreting and creating new understanding from spoken language, writing, and a wide variety of visual and audio media.

**COLLABORATION** An explorer works effectively with others to achieve goals.

**PROBLEM SOLVING** An explorer is able to generate, evaluate, and implement solutions to problems. An explorer is a capable decision maker—able to identify alternatives and weigh trade-offs to make a well-reasoned decision.

### Knowledge



**THE HUMAN JOURNEY** An explorer understands where we came from, how we live today, and where we may find ourselves tomorrow.

**OUR CHANGING PLANET** An explorer understands the amazing, intricate, and interconnected systems of the changing planet we live on.

**WILDLIFE AND WILD PLACES** An explorer reveals, celebrates, and helps to protect the amazing and diverse creatures we share our world with.

# LANGUAGE ARTS Infer the Meaning of Unfamiliar Words and Ideas

## Fourth Grade Standard Supported

- **CCSS Reading Informational Text:** Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. (4-4)
- **CCSS Reading Informational Text:** Explain how an author uses reasons and evidence to support particular points in a text. (4-8)

## Fifth Grade Standard Supported

- **CCSS Reading Informational Text:** Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area. (5-4)
- **CCSS Reading Informational Text:** Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-8)

## What You'll Need

- "Whale Sharks: Sink or Swim?" (pages 2–9)
- Think Sheet (Teacher's Guide, page 6)
- Clipboards
- Pencils

## CONNECT & ENGAGE (20 minutes)

Kids are in a group in front of you.

**Say:** *Does anyone know what it means to infer? Turn and talk about what you think it means to infer.*

Kids turn and talk. Some may have an idea about inferring; others may not.

**Say:** *We infer when we try to figure out something we don't know for sure. One way we infer while reading is when we come across an unfamiliar word, phrase, or idea. There is a kind of equation you can use to help you infer the meaning of an unfamiliar word, phrase, or idea. You can think about what you already know—that's your background knowledge—and combine that with clues in the text to infer, or figure out, the meaning. A simple way to remember that equation is  $BK + TC = I$  (Background Knowledge + Text Clues = Inference).*

**Say:** *Another thing about inferring is that you have to think about whether or not your inference makes sense. If it doesn't, you can look for more clues or more information. By using the clues in the text and combining that with what you already know, you become someone who infers instead of guesses. Turn and talk about why you think inferring is more helpful than guessing.*

Kids turn and talk and then share out. Kids should mention that inferring is more likely to help you understand what you are reading.

**Say:** *Great! Inferring also keeps your mind active with good questions and wonderings while you read. A guess isn't based on much, is it? Not much thought is put into a guess, but an inference is based on good thinking that uses what you already know as well as clues you are finding in the text. Remember that good readers are good thinkers!*

## MODEL (10 minutes)

Kids sit in a group with you in front of them.

**Say:** *Today I'm going to model how I infer the meaning of an unfamiliar word, phrase, or idea by using clues in the text, or context clues.*

Have kids turn to pages 2–3, the first pages of "Whale Sharks: Sink or Swim?"

**Say:** *As I read, I'm going to use a chart with three columns. I'll write any unfamiliar words, phrases, or ideas I come across in the first column. In the second column, I'll write what I infer. In the third column, I'll write the clues I used to help me infer the meaning.*

**Say:** *Okay, now I'm ready to read and show you how I do this. First of all, there isn't a lot of text on these pages, but since the title is here, I'm going to start with that. The title is "Whale Sharks: Sink or Swim?" There is a lot about that title that I'm not sure about. I can see by the picture what a whale shark looks like, but the idea of sink or swim has me puzzled. Plus, there is a question mark at the end of the title. I'm going to read the small text on pages 2–3 to see if I can get any clues.*

Read aloud the text on pages 2 and 3.

**Say:** *The text gives me a few clues. I understand now that there are two points of view that will be presented in this article, and I'll need to form my own opinion, based on the evidence and by comparing and contrasting the important ideas. I'm inferring that is what "Sink or Swim?" must mean. The question mark is there because I will need to make up my own mind about the different points presented about whale shark tourism in a small Philippine fishing town.*

**LANGUAGE ARTS** Infer the Meaning of Unfamiliar Words and Ideas

**Say:** Also, I'm not exactly sure what whale shark tourism is. I'll write down the phrase whale shark tourism in the first column of my chart. Then I'm going to look for clues. As I read page 4, I do find some clues. I read about what tourists do when they visit the small fishing village and the whale sharks. I'm going to use my background knowledge (what I already know) and clues in the text to make an inference. I already know that tourism is when tourists travel to and learn about new places. The clues in the text let me know what is involved in tourism that is focused on whale sharks in this fishing town in the Philippines. In the second column of my chart I'll write this inference: "Whale shark tourism is when tourists learn about and swim with whale sharks."

**Say:** In the third column of my chart, I'll write some of the clues in the text: "Tourists learn about whale sharks. . ." "You grab a mask and snorkel. . ." ". . . you see what you've been hoping for." "With your head underwater you can see an immense shark swim past!"

**Say:** Can you see how the context clues and my background knowledge helped me infer what whale shark tourism means? Turn and talk about that.

Kids turn and talk.

**GUIDE (10 minutes)**

Hand out Think Sheets and have kids attach them to their clipboards. Kids remain in a group in front of you on the floor.

**Say:** You each have your own three-column chart on your Think Sheet. Now let's try this together. I'm going to keep reading. Let's look at page 6. This page gives us information that is for whale shark tourism.

Read page 6.

**Say:** Hmm, this idea that whale shark tourism has improved lives is interesting. Turn to a partner and talk about what you infer about this idea that whale shark tourism is a positive thing.

Kids can share their thoughts with their partners and then with the class.

**Say:** Text clues can help us infer meaning, but in nonfiction we have other features, such as photographs, that can give us additional clues. Take a look at the photos on pages 5 and 6 to see if they offer more clues about the idea of what is positive about whale shark tourism. Turn and talk again to discuss how these picture clues give you more information to use to infer.

Kids turn and talk and further develop their inferences, based on the photos.

**Say:** Great thinking and excellent inferences. Let's talk about what should go in the three-column chart. As we discuss this together, you can each fill in the chart on your own Think Sheet.

With the class, go through the columns in the chart. Fill in words/phrases/ideas in column one and come up with an appropriate inference based on the discussions kids had with one another and with the class. Then spend some time fleshing out the clues they used from the text and photos to determine their inferences.

Name \_\_\_\_\_ Date \_\_\_\_\_

**THINK SHEET**

Use this chart when you come across unfamiliar words, phrases, or ideas.

Word/Phrase/Idea	Inference	Text Clues

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National Geographic Explorer, Pioneer/Trailblazer Page 6 Vol. 19 No. 5



**COLLABORATE (25 minutes)**

**Say:** *Now it's time for you to work with a partner to read about the information that tells why some people are against whale shark tourism. Read page 7. Then talk about what you infer about this idea that whale shark tourism is a negative thing.*

When you come across unfamiliar words, phrases, or ideas, stop and talk about them and practice using context clues to infer meaning. Remember that context clues can be found in pictures as well as in the text. Use your Think Sheet to record your thinking on the three-column chart. And don't forget the equation:  $BK + TC = I$  (Background Knowledge + Text Clues = Inference). Some words/phrases/ideas kids might address:

- Some scientists worry that feeding sharks from 6 a.m. to noon 364 days a year might be disruptive. (idea)
- disruptive (word)
- Researchers worry that whale sharks might start to depend on people for food. (idea)
- Sharks might associate boats with food and be drawn to boats with propellers. (idea)
- propeller (word)
- Tourists break the rules. (idea)
- controversial (word)

Partners work together. Move around the room, conferring with partners.

**SHARE THE LEARNING (10 minutes)**

Kids join a sharing circle with you and share out, using respectful language.

**Say:** *Okay, flip through the article and consult your Think Sheet and choose a word, phrase, or idea that you didn't understand and describe how you inferred the meaning. We are going to share using respectful language. After you share, ask if anyone has any comments or questions. Then you can invite someone else to share.*

Kids share out and invite others to share, always using respectful sharing language. There should be time for about 3 or 4 kids to share out with the whole group. Once they are finished, have everyone turn and share with the person next to them, so that all have a chance to be heard.

**Say:** *We learned so much today about inferring. We also learned that there can be two sides to an issue and that people can be for or against it and present good evidence for their side. Turn and talk about what opinion you formed after reading about shark whale tourism.*

Kids turn and talk and then share out.

**Say:** *Great work and great thinking today!*

**THINK SHEET**

Use this chart when you come across unfamiliar words, phrases, or ideas.

Word/Phrase/Idea	Inference	Text Clues

# LESSON FRAME Infer the Meaning of Unfamiliar Words and Ideas

## What You'll Need

- Nonfiction text
- Think Sheet template
- Clipboards and pencils

This frame is a kind of template of the lesson we just worked on. It has the instructional moves and language of the lesson, but the specific content has been removed. This way you can use the Lesson Frame for the other articles in the issue or for any nonfiction text you might be teaching.

## ENGAGE (20 minutes)

Kids are in a group in front of you.

**Say:** *Does anyone know what it means to infer? Turn and talk about what you think it means to infer.*

Kids turn and talk. Some may have an idea about inferring; others may not.

**Say:** *We infer when we try to figure out something we don't know for sure. One way we infer while reading is when we come across an unfamiliar word, phrase, or idea. There is a kind of equation you can use to help you infer the meaning of an unfamiliar word, phrase, or idea. You can think about what you already know—that's your background knowledge—and combine that with clues in the text to infer, or figure out, the meaning. A simple way to remember that equation is  $BK + TC = I$  (Background Knowledge + Text Clues = Inference).*

**Say:** *Another thing about inferring is that you have to think about whether or not your inference makes sense. If it doesn't, you can look for more clues or more information. By using the clues in the text and combining that with what you already know, you become someone who infers instead of guesses. Turn and talk about why you think inferring is more helpful than guessing.*

Kids turn and talk and then share out. Kids should mention that inferring is more likely to help you understand what you are reading.

**Say:** *Great! Inferring also keeps your mind active with good questions and wonderings while you read. A guess isn't based on much is it? Not much thought is put into a guess, but an inference is based on good thinking that uses what you already know as well as clues you are finding in the text. Remember that good readers are good thinkers!*

## MODEL (10 minutes)

Kids sit in a group with you in front of them.

**Say:** *Today I'm going to model how I infer the meaning of an unfamiliar word, phrase, or idea by using clues in the text, or context clues.*

Have kids turn to page(s) \_\_\_\_\_.

**Say:** *As I read, I'm going to use a chart with three columns. I'll write any unfamiliar words, phrases, or ideas I come across in the first column. In the second column, I'll write what I infer. In the third column, I'll write the clues I used to help me infer the meaning.*

**Say:** *Okay, now I'm ready to read and show you how I do this. The title is "\_\_\_\_\_." There are some things about the title that I'm not sure about. I'm going to read the text on page(s) \_\_\_\_\_ to see if I can get any clues.*

Read aloud the text on page(s) \_\_\_\_\_.

**Say:** *The text gives me a few clues. I understand now that \_\_\_\_\_.*

**Say:** *Also, I'm not exactly sure what \_\_\_\_\_ is. I'll write down the word/phrase \_\_\_\_\_ in the first column of my chart. Then I'm going to look for clues. As I read page \_\_\_\_\_, I do find some clues. I read about \_\_\_\_\_ . I'm going to use my background knowledge (what I already know) and clues in the text to make an inference. I already know \_\_\_\_\_. The clues in the text let me know \_\_\_\_\_.*

## LESSON FRAME Infer the Meaning of Unfamiliar Words and Ideas

**Say:** *In the second column of my chart I'll write this inference: "\_\_\_\_\_."*

**Say:** *In the third column of my chart, I'll write some of the clues in the text.*

**Say:** *Can you see how the context clues and my background knowledge helped me infer what \_\_\_\_\_ means? Turn and talk about that.*

Kids turn and talk.

### GUIDE (10 minutes)

Hand out Think Sheets and have kids attach them to their clipboards. Kids remain in a group in front of you.

**Say:** *You each have your own three-column chart on your Think Sheet. Now let's try this together. I'm going to keep reading. Let's look at page(s) \_\_\_\_\_. This gives us information about \_\_\_\_\_.*

Read page(s) \_\_\_\_\_.

**Say:** *Turn to a partner and talk about what you infer about this.*

Kids can share their thoughts with their partners and then with the class.

**Say:** *Text clues can help us infer meaning, but in nonfiction we have other features, such as photographs, that can give us additional clues. Take a look at the photos on page(s) \_\_\_\_\_ to see if they offer more clues about \_\_\_\_\_. Turn and talk again to discuss how these picture clues give you more information to use to infer.*

Kids turn and talk and further develop their inferences, based on the photos.

**Say:** *Great thinking and excellent inferences. Let's talk about what should go in the three-column chart. As we discuss this together, you can each fill in the chart on your own Think Sheet.*

With the class, go through the columns in the chart. Fill in words/phrases/ideas in column one and come up with appropriate inferences based on the discussions kids had with one another and with the

class. Then spend some time fleshing out the clues they used from the text and photos to determine their inferences.

### COLLABORATE (25 Minutes)

**Say:** *Now it's time for you to work with a partner to read about \_\_\_\_\_. Read page(s) \_\_\_\_\_. Then talk about what you infer about \_\_\_\_\_.*

**Say:** *When you come across unfamiliar words, phrases, or ideas, stop and talk about them and practice using context clues to infer meaning. Remember that context clues can be found in pictures as well as in the text. Use your Think Sheet to record your thinking on the three-column chart. And don't forget the equation:  $BK + TC = I$  (Background Knowledge + Text Clues = Inference).*

Partners work together. Move around the room, conferring with partners.

### SHARE THE LEARNING (10 minutes)

Kids join a sharing circle with you and share out, using respectful language.

**Say:** *Okay, flip through the article and consult your Think Sheet and choose a word, phrase, or idea that you didn't understand and describe how you inferred the meaning. We are going to share using respectful language. After you share, ask if anyone has any comments or questions. Then you can invite someone else to share.*

Kids share out and invite others to share, always using respectful sharing language. There should be time for about 3 or 4 kids to share out with the whole group. Once they are finished, have everyone turn and share with the person next to them, so that all have a chance to be heard.

Kids turn and talk.

**Say:** *Great work and great thinking today!*



# Whale Sharks

## SCIENCE

### Standards Supported

- **NGSS Science and Engineering Practices:**  
**Engaging in Argument from Evidence:** Construct an argument with evidence, data, and/or a model. (4-LS1-1)
- **NGSS ESS3.C: Human Impacts on Earth Systems:** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

### Resources

- Projectable PDF or interactive digital magazine
- Content Assessment Master (page 10)
- Article Test (page 15)

### Science Background

Measuring up to 9.8 meters (32 feet) long and weighing up to 9 metric tons (20,000 pounds), whale sharks are the largest fish in the ocean. But these gentle giants feed on the tiniest prey. They are filter feeders that scoop in plankton, one colossal mouthful at a time.

Whale sharks are an endangered species that live in tropical waters all over the world. While fishing has greatly reduced their numbers, whale sharks have recently become the object of another potential threat: tourism.

The whale shark's size, striped and spotted body, and calm demeanor make it an alluring attraction for tourists eager to experience the world around them. Whale shark-viewing has become a growing industry that supports local economies. However, many scientists discourage the practice. Feeding whale sharks may disrupt their natural behaviors, such as migration. It also puts them in harm's way as they learn to approach boats looking for food.



Click here for the Kahoot! quiz:  
<https://play.kahoot.it/#/k/d05ad5b0-39da-41ac-abf0-06cafa114a52>

### ENGAGE

Encourage students to flip through the article and turn and talk with a partner to discuss what they see. Invite students to ask questions or share what they already know about whale sharks.

### EXPLORE

Display the **"Whale Sharks: Sink or Swim"** article with the projectable PDF or the interactive digital magazine. Poll the class to see how many students would want to swim with the biggest fish in the world. Encourage them to explain why.

### EXPLAIN

After reading, discuss what whale shark tourism is and how it got started. Then remind students that there is great debate on the ethics of this growing industry. **Ask:** *Why do some people think whale shark tourism is good?* (It supports the local economy. It also raises awareness of whale sharks as an endangered species.) *Why are other people against it?* (They worry that it changes whale sharks' natural behaviors, exposes them to chemical toxins from sunblock, and puts them at risk when they swim up to boats to get food.) Have students turn and talk as they discuss the issue with a partner. Then divide the class into two groups and formally debate the merits on each side of the issue.

### ELABORATE

Remind students that before people dive in to swim with whale sharks, local guides teach them about whale sharks. Then divide the class into pairs. Have partners review the **"What Are Whale Sharks?" feature** in their student magazines. Encourage them to conduct research to learn even more about whale sharks. Based upon what they learned, challenge them to create a tutorial about whale sharks. Invite partners to present their tutorials to the class to teach others about these curious and gentle giants that swim in the sea.

### EVALUATE

Have students complete the **Content Assessment** for this lesson. Then have them take the **Article Test**. Encourage them to share and compare their results in small groups.

## CONTENT ASSESSMENT: Whale Sharks

Use information from the article to answer each question.

Why is whale shark tourism such a controversial issue?

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List evidence that supports arguments for and against whale shark tourism.

For	Against

Which position do you support? Why?

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# Ocean Supercrop

## SCIENCE

### Standards Supported

- **NGSS ETS1.B: Developing Possible Solutions:** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)
- **NGSS ESS3.C: Human Impacts on Earth Systems:** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

### Resources

- Projectable PDF or interactive digital magazine
- Content Assessment Master (page 12)
- Article Test (page 16)

### Science Background

In the 1990s, Bren Smith earned his living fishing cod along the Atlantic seaboard. When overfishing depleted fish stocks, he started farming shellfish in the Long Island Sound. And when a duo of powerful hurricanes wiped out his business, he knew it was time for a change.

Searching for new crops to raise in the ocean—and a new way to grow them—Smith contacted a marine scientist who suggested he grow seaweed.

Wanting to take full advantage of the ocean's depth, Smith created a method of vertical aquaculture that he calls 3D ocean farming. Using a system of ropes and buoys, he grows kelp, scallops, mussels, clams, and oysters on a 40-acre plot in the Long Island Sound. Smith's approach has been so successful that in 2013, he started a nonprofit organization to train and support others as they get their own ocean farms started.



Click here for the Kahoot! quiz:  
<https://play.kahoot.it/#/k/4c2d8789-9220-4ea2-8679-6058c9e065ce>

### ENGAGE

Encourage students to flip through the article and turn and talk with a partner to discuss what they see. Invite students to ask questions or share what they already know about how plants and animals live in the ocean.

### EXPLORE

Display the "**Ocean Supercrop**" article with the projectable PDF or the interactive digital magazine. As a class, brainstorm ideas about what a supercrop is and how someone might grow one in the ocean.

### EXPLAIN

After reading, remind students that people have been harvesting food from the ocean for a long time. **Ask:** *How is Bren Smith's ocean farm different?* (It is an organized, multi-tiered way of growing different types of food on a small plot at different depths in the ocean.) **Ask:** *Why did Smith leave commercial fishing?* (overfishing; nets destroyed ecosystems) Have students turn and talk to discuss how and why Smith became an ocean farmer. (He wanted a sustainable system. A scientist advised him to grow seaweed and over time he developed his 3D ocean farm to grow seaweed and other ocean foods.) Encourage partners to explain to each other how Smith's 3D ocean farm works. Challenge them to identify reasons why it is good for the economy and the environment.

### ELABORATE

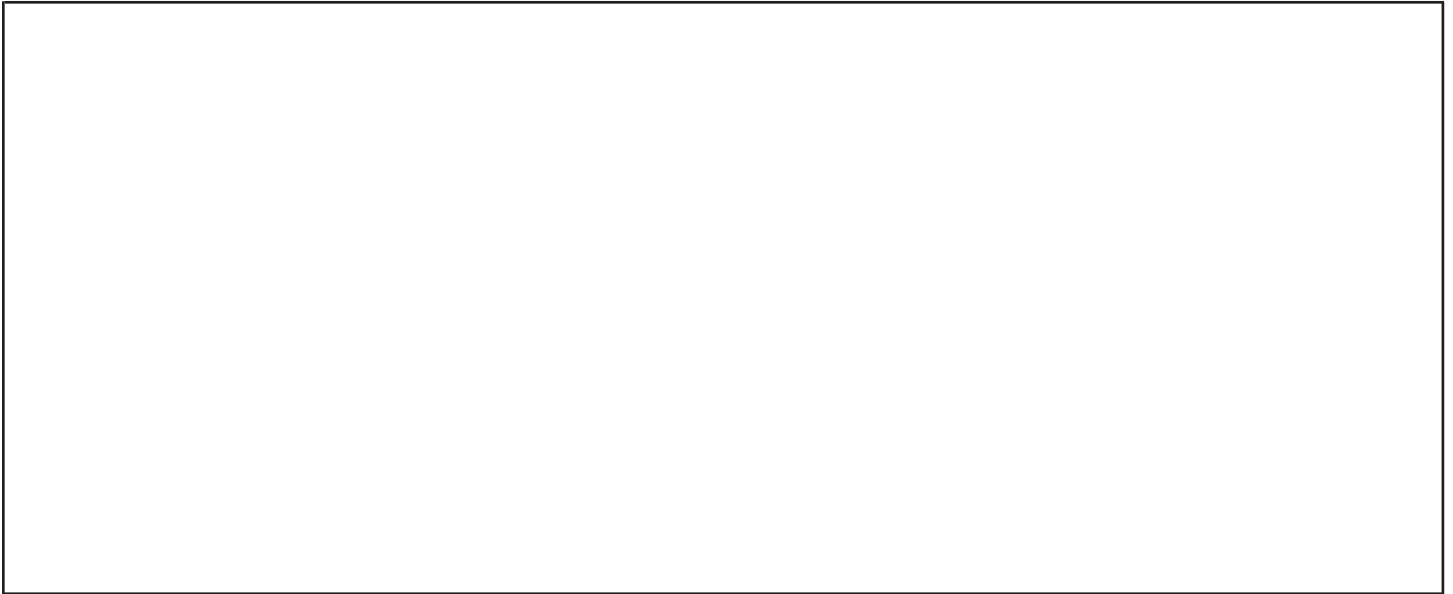
Point out to students that seaweed is a common part of some people's diets. But it might seem like a strange ingredient to others. Have students conduct research to find recipes that include seaweed in their list of ingredients. Encourage students to then create a menu that includes a seaweed-inspired dish for each course.

### EVALUATE

Have students complete the **Content Assessment** for this lesson. Then have them take the **Article Test**. Encourage them to share and compare their results in small groups.

**CONTENT ASSESSMENT: Ocean Supercrop**

Draw a picture of Bren Smith's 3D ocean farm. Label each type of food he grows.



List the main reasons Smith wanted to start an ocean farm. Identify the biggest problems he faced. Explain how his operation benefits the environment.

<b>Reasons</b>	<b>Benefits</b>
<b>Problems</b>	

# Snapshot of Space

## SCIENCE

### Standards Supported

- **NGSS Science and Engineering Practices: Planning and Carrying Out Investigations:** Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. [4-ESS2-1]
- **NGSS Connections to Nature of Science: Science Addresses Questions About the Natural and Material World:** Science findings are limited to questions that can be answered with empirical evidence. [5-ESS3-1]

### Resources

- Projectable PDF or interactive digital magazine
- Beyond Our Solar System poster (Teacher's edition)
- Test the Science: Stomp Rocket poster (Teacher's edition)
- Content Assessment Master (page 14)
- Article Test (page 17)

### Science Background

It has been 50 years since man first stepped on the moon. Since then, a combination of curiosity, determination, and ingenuity, have taken mankind beyond the moon, through the solar system, and into the vast unknown of interstellar space.

People haven't made most of these journeys themselves. Rather, they have built spacecraft that can land on asteroids and orbit planets. Components on the spacecraft take samples and shoot photos. They transmit the data or bring actual samples back to Earth for scientists to study. The results teach us about the universe so we better understand our tiny place within it.

### ENGAGE

Encourage students to flip through the article and turn and talk with a partner to discuss what they see. Invite students to ask questions or share what they already know about exploring outer space.

### EXPLORE

Display the "**Snapshot of Space**" article with the projectable PDF or the interactive digital magazine. As a class, brainstorm a list of objects the person in the photo might see as he looks through his telescope. Challenge students to list items people could see with a stronger telescope.

### EXPLAIN

After reading, remind students that it's been 50 years since humans first walked on the moon, but people began exploring space long before that. **Say:** *As new technologies have been developed, people have been able to explore space in new ways. We've explored further out and closer up than ever before.* Have students turn and talk to discuss how technology has allowed people to observe the moon, Mars, asteroids, Jupiter, Pluto, and beyond. Challenge them to identify what and how we have learned about each celestial body.

### ELABORATE

Display and review the "**Beyond Our Solar System**" poster. Have students identify each spacecraft and discuss what the images, data, and other information it sent back helped scientists discover about space. Then display and review the "**Test the Science: Stomp Rocket**" poster. Provide supplies and have students conduct the experiment with a partner. Rejoin as a class to analyze the results. Encourage students to explain how their rockets performed under different conditions. Discuss how understanding the principles of force helps scientists launch huge rockets into space.

### EVALUATE

Have students complete the **Content Assessment** for this lesson. Then have them take the **Article Test**. Encourage them to share and compare their results in small groups.



Click here for the Kahoot! quiz:  
<https://play.kahoot.it/#/k/60bd3db7-10a1-4b9d-9da7-0374e453efcb>



## CONTENT ASSESSMENT: Snapshot of Space

Make a checkmark to show if you think each sentence is true or false.  
Use information from the article to explain your answers.

Sentence	True	False	Explanation
1. Scientists have proven that Earth's mantle and the moon's mantle are made of the same substances.			
2. People have felt "marsquakes" on the surface of Mars.			
3. It is possible for spacecraft to bring materials from space back to Earth for study.			
4. Satellite photos revealed that Jupiter has large gas belts on its north and south poles.			
5. Spacecraft that landed on the surface of Pluto proved its mountains were made of water-ice.			
6. The spacecraft New Horizons, launched in 1977, is now studying interstellar space.			

**ARTICLE TEST: Whale Sharks**

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

1. Where do tourists go to swim with whale sharks?  
Ⓐ Thailand  
Ⓑ Philippines  
Ⓒ Australia
  
2. Why do they want to see and swim with whale sharks?  
Ⓐ Whale sharks are dangerous predators.  
Ⓑ Whale sharks are the largest fish in the ocean.  
Ⓒ Whale sharks are an extinct species.
  
3. Why do local guides say feeding whale sharks is good for all fish?  
Ⓐ It encourages people to catch more fish.  
Ⓑ It makes it easier for people to capture whale sharks.  
Ⓒ It means fewer people need to fish to make a living.
  
4. What natural behavior do scientists think feeding whale sharks might disrupt?  
Ⓐ migration  
Ⓑ hibernation  
Ⓒ digestion

5. Do you think it's good for tourists to swim with whale sharks? Why or why not?

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**ARTICLE TEST: Ocean Supercrop**

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

1. What happens to fish populations when people overfish in the ocean?

- Ⓐ They get larger.
- Ⓑ They get smaller.
- Ⓒ They grow too fast.

2. What is seaweed?

- Ⓐ a plant
- Ⓑ an animal
- Ⓒ a type of algae

3. What kind of seaweed does Bren Smith grow in his ocean farm?

- Ⓐ mussels
- Ⓑ scallops
- Ⓒ kelp

4. Why does growing seaweed help make the ocean less acidic?

- Ⓐ It's a zero-input food.
- Ⓑ It absorbs CO<sub>2</sub> as it grows.
- Ⓒ It grows fast.

5. Identify one food Smith grows in his ocean farm and tell how he grows it.

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**ARTICLE TEST: Snapshot of Space**

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

1. When did people first walk on the moon?  
Ⓐ 30 years ago  
Ⓑ 40 years ago  
Ⓒ 50 years ago
  
2. Which of these space objects does not orbit the sun?  
Ⓐ planets  
Ⓑ moons  
Ⓒ asteroids
  
3. How do scientists know there are vast, swirling storms at Jupiter's poles?  
Ⓐ A manned flight landed on Jupiter's surface.  
Ⓑ An unmanned spacecraft landed on Jupiter and took samples.  
Ⓒ A spacecraft flew by and took pictures.
  
4. What are Voyager 1 and Voyager 2 now exploring?  
Ⓐ marsquakes  
Ⓑ New Horizons  
Ⓒ interstellar space

5. How can studying asteroids in space potentially help people living on Earth?

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# Pathfinder and Adventurer

## ANSWER KEY

### Whale Sharks

#### Assess Content, page 10

**Question:** Possible response: Although whale shark tourism benefits the local economy, many people argue that it may harm the sharks.

**For:** The whale shark-viewing business earned more than \$18 million in its first five years; locals can now support their families and villages; guides claim it helps all fish because fewer people fish for a living; they claim it helps whale sharks because it raises awareness as people try to protect the endangered species

**Against:** Scientists say it disrupts the natural behaviors of whale sharks; the sharks don't migrate like they used to; the sharks approach boats for food and get injured; chemical toxins in sunblock can harm the sharks

**Position:** Answers will vary, but students should use ideas from the article to support their opinions.

#### Article Test, page 15

1. B; 2. B; 3. C; 4: A; 5. Answers will vary, but students should support their opinions with facts from the article.

### Ocean Supercrop

#### Assess Content, page 12

Students should draw a picture similar to the one on pages 14-15 of the article. They should label mussels, scallops, oysters, clams, and kelp.

**Reasons:** He wanted to earn his living on the ocean; He didn't want to fish because fishers were overfishing and their nets were destroying reefs and ocean ecosystems.

**Problems:** He had to figure out what to grow, how to grow it, how to farm the entire depth of the ocean, how to arrange everything in a small ocean plot, and how to run the farm so it helped the ocean instead of harming it.

**Benefits:** He produces a variety of nutritious foods; the kelp absorbs CO<sub>2</sub> as it grows, making the ocean less acidic; seaweed farms boost the economy.

#### Article Test, page 16

1.B; 2. C; 3. C; 4. B; 5: Answers will vary depending on which food item students choose to describe. Information should come from the article.

### Snapshot of Space

#### Assess Content, page 14

1. False: Scientists have just started to study rocks from the moon's mantle so they don't know what it's made of.
2. False: People have never been on the surface of Mars. Only spacecraft have felt "marsquakes" at this time.
- 3.True: Currently spacecraft are bringing samples from asteroids back to Earth for study.
4. False: The pictures revealed gas belts everywhere on Jupiter except for the poles.
5. False: Spacecraft flying by took photos that showed that the mountains were made of water-ice.
6. False: New Horizons launched in 2006. Voyager 1 and Voyager 2 launched in 1977 and are now exploring interstellar space.

#### Article Test, page 17

1. C; 2. B; 3. C; 4: C; 5. By studying asteroids, we learn what they are made of. Asteroids may have valuable minerals we could mine someday.