



In This Guide

In this guide, you will find language arts and science lessons for the stories in the January-February issue of EXPLORER PIONEER.

Explorer Magazine

EXPLORER magazine is a classroom magazine specifically written for each grade, 2-5. Each grade's magazine contains a grade-appropriate reading experience, develops literacy skills and teaches standards-based science content. Great storytelling and stunning photographs teach your students about our planet and the people, plants, and animals that live on it. Use EXPLORER in your classroom to encourage students to explore our world and make it a better place.

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Kelp Kingdom

LANGUAGE ARTS

Objectives

- Students will predict definitions and then write sentences to better understand unfamiliar words.
- Students will identify the main topic of a text and of specific paragraphs within a text
- Students will explore how using the pronoun *you* impacts the telling of a story.

Resources

- Vocabulary Assessment Master (page 6)
- Language Arts Assessment Master (page 7)

Summary

- The article “Kelp Kingdom” takes readers on a journey through the Monterey Bay kelp forest to examine one of the most productive and dynamic ecosystems on Earth.

BUILD VOCABULARY AND CONCEPTS

- **ecosystem**
- **kelp**
- **marine biologist**

Give each student a copy of the **Vocabulary Assessment Master**. Invite students to share what they know about each vocabulary word.

Divide the class into pairs. Using what they already know as a base, instruct pairs to 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 9 of the projectable magazine. Review the definitions as a class. Have students add these definitions to their worksheets. Instruct pairs to write new sentences, using each word as it is defined in the article.

Invite volunteers to read aloud the before and after sentences they wrote for each word. As a class, examine how new knowledge expanded students’ understanding of each word.

READ

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

Explain to the class that what they just tried to identify was the main idea of the article. **Say:** *The main idea is the main topic, or what the article is about. Every article has a main idea. And every paragraph in the article has a main idea, too.* Inform students that important details in the text help readers identify the main idea of each paragraph. The main idea of each paragraph helps them identify the main idea of the text.

Display pages 2-3 of the projectable edition. Read aloud the headline. **Say:** *To figure out the main idea on these pages, I have to search for clues. The first clue is the headline. I know what a kingdom is. If I’m unfamiliar with kelp, I have to search for more clues.*

Read aloud the text. **Say:** *According to the text, this kingdom is an underwater forest. Seals, otters, and fish live here. In the photo, I see something that looks like a tall plant. That must be the kelp!*

Point out the comprehension strategy in the upper right corner of the screen. Read it aloud. **Say:** *I didn’t notice this clue at first. But it’s important because it helps me put all of the pieces together. The main idea of this article must be that living things depend on a kelp forest. To learn why, I’ll have to search for more clues as I read the article.*

Give each student a copy of the **Language Arts Assessment Master**. Have students record what they think is the main idea of the article. (Possible response: Living things depend on a kelp forest.) Then have students read the article with a partner. As they read, encourage students to record important details from the article. After reading, instruct students to review their notes and rewrite the main idea of the article in their own words.

Kelp Kingdom

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about the kelp forest. **Ask:** *What is kelp?* (a type of seaweed) *How does it create an underwater forest?* (Many kelp live together. The seaweed provides a safe place for young animals to live.) As a class, discuss why this is important. Guide students to recognize that the young animals that live here couldn't survive in the open ocean.

- **Identify Main Ideas** Remind students that the article has a main idea. But each paragraph has a main idea, too. Explain that they can find the main idea of a paragraph the same way they found the main idea of the article. They must search for important clues. As a class, review each paragraph individually. Challenge students to identify the main idea of each. Discuss how the main idea of each paragraph supports the main idea of the article.

- **Exploring the Pronoun "You"** After reading the article, ask a volunteer to identify the first word in the article. (you) Point out how many times this pronoun was used in the article. Inform students that the writer did this on purpose. **Say:** *When writers write, they often tell about their own experiences. They write sentences like, "I swam in the ocean." Sometimes writers tell what someone else did. To do this, they might write, "He swam in the ocean." But once in a while, writers use the word you to pull readers right into the action. For example, in this article, a marine scientist isn't swimming through the kelp, you are! You are the main character as the story unfolds.* Encourage students to explain how using the pronoun *you* affected their enjoyment or interpretation of the article.

WRITE AND ASSESS

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

- *What is kelp?*
- *What did the divers see in the kelp forest?*
- *What surprised you about what you read?*

SCIENCE

Objectives

- Students will understand what kelp is.
- Students will identify different living things that depend on the kelp forest.
- Students will recognize species that cause problems and provide solutions in a kelp forest.

Resources

- Content Assessment Master (page 8)
- Comprehension Check (page 9)

Science Background

The Monterey Bay Marine Sanctuary is a protected area covering roughly 15,800 square kilometers off the coast of California. It includes one of the deepest and largest canyons in North America and provides a home for a multitude of plant and animal species.

One important member of this cold, coastal environment is kelp, a type of seaweed. Two types of kelp grow in the sanctuary, giant kelp and bull kelp. Together, they cover about 65 square kilometers, creating a giant kelp forest.

Kelp grows fast. Giant kelp can grow up to 18 inches a day. Each specimen has three main parts: the holdfast, which anchors kelp to the ocean floor; a stipe, which looks like the stem of a plant; and blades, which are similar to leaves and flutter in the ocean currents. Gas-filled sacs allow the blades to float in the water.

Kelp forests are diverse ecosystems. The sheer mass they contain minimizes wave action, creating a safe place for plants and animals to live. In essence, kelp forests protect plants and animals in the ocean just as forests filled with trees do on land.

Also like land forests, kelp forests have layers. The top layer, or canopy, is where most animals live. Snails and other organisms live in the understory in the middle. Sea urchins and brittle stars are two of the more common organisms found near the holdfast on the kelp forest floor.

ENGAGE

Tap Prior Knowledge

Instruct students to close their eyes and imagine that they're walking through a forest thick with trees. They see birds on the branches and small animals on the ground. The wind is blowing gently through the leaves. Suddenly they enter a large clearing where the wind is blowing hard. Discuss why. (The trees are no longer blocking the wind.) Instruct students to examine the photos in the article. Encourage them to compare this underwater forest to a forest full of trees.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Give students a moment to examine the photo. **Ask:** *What animal do you see here?* (a seal) Inform students that there is another living thing in this photo. Challenge them to identify what it is. (kelp) Inform the class that many different plants and animals live in kelp forests. As they read the article, they will learn what kelp is and how it creates an underwater ecosystem where these organisms can live.

Set a Purpose and Read

Have students read the article in order to identify living things that depend on a kelp forest to live.

EXPLAIN

Understanding Kelp

Instruct students to examine the images in the article. Encourage them to describe kelp. **Ask:** *What is kelp?* (a type of seaweed) Display the diagram of kelp on page 5 of the projectable magazine. **Ask:** *What parts of kelp does this diagram show?* (blade, gas sac). Invite volunteers to identify these kelp parts in the photos. *What other parts of kelp does the article mention?* (stem, roots) *What do you think these parts do?* (Possible response: Gas sacs connect to the stem, which extends the length of kelp. The stem connects to the roots, which hold kelp to the seafloor.)

EXPLAIN

(continued)

Identify Living Things in a Kelp Forest

Display pages 2-3 of the projectable magazine. Highlight the words *seals*, *otters*, and *fish* in the text. Inform students that these are just three types of animals that live in a kelp forest. Instruct students to scan the article to identify more. Then challenge students to spot the one text feature that summarizes why living things depend on kelp forests. (Fast Fact on page 6: Kelp forests provide food and shelter for other living things.) As a class, review the article. Highlight sentences that support this Fast Fact.

Recognizing Problems and Solutions

Display pages 8-9 of the projectable magazine. Inform students that the two sections on these pages identify a problem and a solution found in kelp forests. Give each student a copy of the **Content Assessment Master**. With a partner, instruct students to use information on the two pages to answer the questions on their worksheets. Invite volunteers to share their answers with the class. **Ask:** *Why would it be a huge problem if there were no more otters in the kelp forests?* (Sea urchins would destroy all of the kelp. Plants and animals living there could no longer depend on kelp for food and shelter.)

ELABORATE

Find Out More

Point out to the class that many different plants and animals live in kelp forests. These organisms depend on the kelp to survive. In small groups, have students conduct research to identify more plants and animals that live in kelp forests. Challenge them to identify specific ways the organisms depend on kelp to live.

Extend Your Thinking About Kelp

Remind students that the kelp forest they read about in the article is located in the Monterey Bay National Marine Sanctuary. Encourage students to conduct research to learn what a marine sanctuary is and why it is important for marine biologists to study these ecosystems.

EVALUATE

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

- *Why is a kelp forest a safe place for young animals?* (The animals can hide from predators in the kelp blades.)
- *Why doesn't kelp float away in the ocean?* (The seaweed's stem is rooted to the seafloor.)
- *How do kelp forests provide food for other living things?* (Some animals eat kelp. Other animals eat living things found in the kelp forest.)

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

Name _____

Date _____

VOCABULARY ASSESSMENT : Kelp Kingdom

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

Word			
My Definition			
Sentence			
Definition from the Article			
Sentence			

LANGUAGE ARTS ASSESSMENT: Kelp Kingdom

Use this organizer to identify the main idea of the article.

Write what you think the main idea is.
List important details from the article.
Rewrite the main idea in your own words.

CONTENT ASSESSMENT: Kelp Kingdom

Answer questions about problems and solutions in a kelp forest.

1. Which animal hurts kelp forests?

2. What does this animal do?

3. Why is this a problem?

4. Which animal helps kelp forests?

5. What does this animal do?

6. Why is this a solution?

7. What would happen if this solution disappeared?

COMPREHENSION CHECK: Kelp Kingdom

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

1. What is kelp?
 Ⓐ a type of tree
 Ⓑ a type of seaweed
 Ⓒ a type of grass

2. Which of these are parts of kelp?
 Ⓐ trunk and branches
 Ⓑ flowers and stem
 Ⓒ blade and gas sac

3. What type of ecosystem does a marine biologist study?
 Ⓐ oceans
 Ⓑ land
 Ⓒ air

4. Which animal helps keep a kelp forest healthy?
 Ⓐ fish
 Ⓑ sea urchin
 Ⓒ otter

5. Describe how kelp forests provide food and shelter for other living things.

Robot Revolution

LANGUAGE ARTS

Objectives

- Students will recognize how vocabulary words are connected.
- Students will ask and answer questions about robots.
- Students will explain concepts based on information in the text.

Resources

- Vocabulary Assessment Master (page 14)
- Language Arts Assessment Master (page 15)

Summary

- The article "Robot Revolution" profiles a collection of robots created to address different human problems or meet specific needs.

BUILD VOCABULARY AND CONCEPTS

- **robot**
- **sensor**
- **technology**

Instruct students to turn to page 15 of their magazines. Tell them to read the vocabulary words in the Wordwise feature to themselves.

Then give each student a copy of the **Vocabulary Assessment Master**. Tell students to look at the diagram and think about the words. Encourage them to write the words and their definitions in the way they think matches the structure of the diagram. Instruct them to draw arrows to show how the words are connected. Then challenge them to explain why they organized the words as they did.

Have students compare their results in small groups. Allow students to revise their work if they decide another arrangement works better after consulting with classmates.

READ

Let students know that the purpose of this article is to learn about different types of robots that people have built to solve problems or meet specific needs.

Tell students that the best way to learn more about robots is to ask themselves questions as they read the article. **Say:** *Good readers always do this. It helps them learn more about the topic. And asking questions isn't as hard as you might think. Many questions begin with the same six question words: Who? What? Where? When? Why? and How?*

Display pages 10-11 of the projectable magazine. Model how to ask and answer questions. **Say:** *When I look at this page, the first thing I notice is the image. What is it? Why does it look sort of like a human? What does it do?* Encourage students to introduce new questions of their own.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to write at least one question related to the article that begins with each question word. Challenge them to find the answers to their questions in the text. Instruct students to record the answers on their worksheets.

Robot Revolution

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about robots. **Ask:** *Why is each of these machines considered to be a robot?* (They are each machines that can do certain tasks.) *What do they all have in common?* (They help humans.) Encourage students to share what they learned about the different types of robots.

- **Ask and Answer Questions** Remind students that asking and answering questions is a strategy that will help them understand what they read. **Say:** *Even the best readers come across words and ideas they don't understand. Asking questions shows you which answers you need to search for as you reread the text.* Have students share and compare their **Language Arts Assessment Masters** with a partner. Did they have the same questions? Did they find the same answers? If not, encourage partners to compare where in the text they each found the answer to reevaluate the results.

- **Explain Concepts** After reading the article, **say:** *One way to see if you understand information 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 explain to a partner why some of the robots in the article are humanoid robots and some are not. Prompt discussion with questions.

WRITE AND ASSESS

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

- *What is a robot?*
- *How are all robots alike? How are some robots different from others?*
- *What surprised you about what you read?*

Robot Revolution

SCIENCE

Objectives

- Students will understand what a robot is.
- Students will identify important parts of a robot.
- Students will recognize the problems that different robots are designed to solve.
- Students will compare and contrast robots that people use.

Resources

- Content Assessment Master (page 16)
- "Robot Revolution" poster (Teacher's Edition)
- Comprehension Check (page 17)

Science Background

Robots are machines that perform human tasks or imitate human actions. While they may seem like a modern-day invention, the idea for robots has deep roots in history.

Muslim scientists developed simple robotic contraptions more than 1,000 years ago. Ancient Greeks and Romans built machines that moved by themselves. In the late 1400s, Leonardo da Vinci sketched plans for a humanoid robot, though the ability to build a robot like this was far into the future.

Advances in technology are allowing people to create robots as never before. The big, bulky, metal taskmasters of the past now have smaller counterparts that can comfort, carry, and disarm bombs. Some robots help surgeons perform procedures. And engineers are developing robots that work together as they canvas an area to search for survivors, inspect crops, or clean up environmental hazards.

Da Vinci's dream of a humanoid robot has also come true. These robots, which resemble humans, can perform many of the same tasks as people without the help of a brain. Other robots are designed to resemble animals. In Japan, many people keep these robots as pets.

ENGAGE

Tap Prior Knowledge

Give each student a piece of plain white paper and a pencil. Instruct students to draw a picture of a robot. Invite volunteers to share their sketches with the class. Compare the drawings to identify similarities and differences. Invite students to tell what each of their robots does.

EXPLORE

Preview the Lesson

Instruct students to read the headline and text and examine the photo on pages 10-11 of their magazines. Encourage them to describe the robot they see. **Ask:** *What problem does this robot solve?* (Possible response: It provides a friend for people who need one.) *How does the robot do this?* (It responds to people's moods.) *How might its design help people see it as a friend?* (It looks a little bit like a person.) Ask students if they would like to have a robot like this. Invite students to share their opinions.

Set a Purpose and Read

Have students read the article to learn about different types of robots and the problems they can solve.

EXPLAIN

Understanding What a Robot Is

Display page 15 of the projectable magazine. Zoom in on the Wordwise feature and read aloud the definition for *robot*. Inform students that all robots are machines, but not all machines are robots. To be classified as a robot, a machine must perform a human task or imitate a human action. **Say:** *A car is a machine, but a car can't do something that a human can. Someone needs to drive the car. Pepper is a robot. Pepper can sense how people feel. If you're feeling sad, Pepper will respond like a friend would.* Examine the other machines in the article. Challenge students to explain why each one is a robot.

Robot Revolution

SCIENCE

EXPLAIN

(continued)

Identify Parts of Robot

Display pages 12-13 of the projectable magazine. Highlight the word *technology* in the first paragraph of text. Remind students that *technology* means "using scientific knowledge to make or invent things." Highlight the words *cameras*, *microphones*, and *sensors* in the next sentence. **Say:** *Each of these is a type of technology. Each one is also a part of Pepper the robot.* Invite students to share their ideas about where these parts are located on the robot. Brainstorm a list of other parts that this robot might have. Then examine the other robots in the article. Challenge students to identify important parts of each one.

Recognize the Problems Robots Solve

Inform students that people build many different types of robots. All robots are designed to solve specific problems, but what a robot looks like and what it can do depends upon its purpose. Display the **"Robot Revolution" poster**. Review the information with the class. Then give each student a copy of the **Content Assessment Master**. Encourage students to record information about each robot. Challenge them to analyze that information to identify the problem each robot was designed to solve.

Compare and Contrast Robots

Give each student a piece of plain white paper. Instruct students to draw a Venn diagram. Then poll the class to identify students' two favorite robots. As a class, compare and contrast the two robots in as many ways as possible. Review the article and students' **Content Assessment Masters** for important details about each robot. Analyze the results.

ELABORATE

Find Out More

Tell students that the article identified four different robots. However, people use other types of robots to solve problems, too. As a class, conduct research to learn about other robots. Encourage students to identify the problem each robot can solve. Challenge them to identify important parts that allow each robot to accomplish this task.

Extend Your Thinking About Robots

Display pages 12-13 of the projectable magazine. Remind the class that Pepper is a robot designed to act like a friend. Have students draw the robot's structure. Discuss how Pepper's appearance might help it be accepted as a friend. Then examine Paro. Brainstorm a list of reasons why a robot designed to comfort people would be soft and cuddly.

EVALUATE

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

- *What is a robot?* (a machine that can do certain tasks)
- *How does Robo Sally save lives?* (It shuts down bombs.)
- *How does Pepper know how to respond to people's moods?* (It uses its sensors to detect or measure how people are feeling.)

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

VOCABULARY ASSESSMENT: Robot Revolution

Arrange the vocabulary words in a way that makes sense to you. Draw arrows to show how the words are connected. Explain your results.

<p>Word:</p> <p>Definition:</p>
--

<p>Word:</p> <p>Definition:</p>
--

<p>Word:</p> <p>Definition:</p>
--

<p>Explain:</p>

LANGUAGE ARTS ASSESSMENT: Robot Revolution

Ask and answer questions about the robots in the article that begin with each question word.

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

Name _____

Date _____

CONTENT ASSESSMENT: Robot Revolution

List the robots in the article. Record information about each. Identify the problem each robot solves.

Identify the Robot	What does it look like?	What does it do?	What problem does it solve?

COMPREHENSION CHECK: Robot Revolution

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

- 1. Why do scientists invent robots?
 - Ⓐ to stop technology
 - Ⓑ to solve problems
 - Ⓒ to sense machines

- 2. Which robots can make people feel better?
 - Ⓐ Pepper and Robo Sally
 - Ⓑ Robo Sally and Paro
 - Ⓒ Paro and Pepper

- 3. Which robot helps in dangerous situations?
 - Ⓐ Pepper
 - Ⓑ Robo Sally
 - Ⓒ Robobear

- 4. Which robot is soft and cuddly?
 - Ⓐ Robot Sally
 - Ⓑ Robobear
 - Ⓒ Paro

5. Pick a robot from the article. Describe how it solves a problem for people.

Seeing Eye to Eye

LANGUAGE ARTS

Objectives

- Students will create sketches to understand the meaning of unfamiliar words.
- Students will describe how eyes turn light into sight.

Resources

- Vocabulary Assessment Master (page 22)
- Language Arts Assessment Master (page 23)

Summary

- The article “Seeing Eye to Eye” examines the anatomy of an eye and explains how eyes work. In addition, the article explores how the changes in the structure of the eye affects how people and animals see.

BUILD VOCABULARY AND CONCEPTS

- **iris**
- **pupil**
- **vision**

Display the vocabulary words on a word wall or on the white board. Point out to students that when they read they will come across words they don't know. Remind them that using context clues such as the sentences before and after an unknown word and photographs on the page can help them figure out what the unfamiliar word means.

Invite a volunteer to read the definition of *iris* in the Wordwise feature on page 23 of the article. Examine this word in context. Then give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write the word's definition and create a detailed sketch showing what it means. Inform students that their drawings won't all be the same. The point is for students to draw the word in a way that will help them remember its definition. Examine the other words in this way, too.

READ

Inform students that the purpose of this article is to explain how eyes work. As they read, they'll learn about parts of the eye and how those parts help people and animals see.

Display pages 16-17 of the projectable magazine. Invite a volunteer to read aloud the headline and subhead. **Ask:** *What do eyes do?* (turn light into sight) Invite students to share their ideas about how this is possible.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article in small groups. As students read, instruct them to search for information that tells how eyes work. Encourage group members to work together to write a full description detailing how eyes turn light into sight. If necessary, prompt them to focus on the information on page 19 of the article.

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about eyes. **Ask:** *What do eyes help animals do?* (See the world around them.) *How do eyes do this?* (With help from the brain, eyes turn light into sight) *Why aren't all eyes the same?* (Eyes come in many different sizes, shapes, and colors.)

- **Interpret Visual Information** Explain to students that reading definitions tells people what words mean. But sometimes readers have to "see" words to really understand them. Point out that this is exactly what they did when they drew sketches of the vocabulary words in the article. They drew the words in a way that had meaning to them. Instruct students to turn and share the sketches they created on their **Vocabulary Assessment Masters** with a partner. Encourage them to explain how their drawings reflect the meaning of each word.

- **Describe Connections** Remind students that this article describes the process of how eyes turn light into sight. In every process, there are steps. For the process to work correctly, the steps must occur in the proper order. Instruct two groups to compare the descriptions they recorded on their **Language Arts Assessment Masters**. Did they each record all of the steps? Did they record the steps in the proper order? If not, encourage students to reread the information on page 19 of the article. Once all groups are satisfied that their descriptions are accurate, review the process as a class to ensure that all students fully understand how eyes turn light into sight.

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 are most eyes alike?*
- *How are some eyes different from other eyes?*
- *What surprised you about what you read?*

SCIENCE

Objectives

- Students will identify parts of the eye.
- Students will recognize how variations in traits affect how animals see.

Resources

- Content Assessment Master (page 24)
- "Light Catchers" poster (Teacher's Edition)
- "Seeing Eye to Eye" Interactive Whiteboard (optional)
- Comprehension Check (page 25)

Science Background

At just 2.5 centimeters long and about seven grams, the human eye isn't large. Yet it's extremely powerful. An eye can capture light and transform it into an image for the brain to interpret. Eyes are our windows to the world.

An eye has several important parts. The cornea is a see-through dome that helps focus light. It lies in front of the iris, which is the colored part of the eye. Muscles attached to the iris help it change shape and control how much light enters the pupil, the black circle in its middle.

About two-thirds of an eye is filled with a gel-like material that gives the eye its shape.

The lens lies behind the iris. It focuses light onto the retina at the back of the eyeball. The retina contains millions of light-sensitive cells. It captures light and sends messages to the brain.

Eyes can do amazing things, but not all eyes are the same. Often, the differences have a purpose. For example, cats have an extra part in their eyes that lets them catch light twice. They can see up to eight times better in the dark than humans can. Birds of prey use their binocular vision to spot prey up to three kilometers away. And while humans can only see light in the visible spectrum, rattlesnakes can detect electromagnetic radiation in the infrared range. This helps them find prey.

ENGAGE

Tap Prior Knowledge

Give students 30 seconds to scan the room. As they do, compile a master list identifying everything students can see. Then turn off the lights. If this doesn't make the room dark, ask students to close their eyes instead. Instruct students to name everything they can see now. Turn the lights back on and compare the lists. Challenge students to explain why one list is so much longer than the other.

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable edition. Read aloud the subhead. Point out that it states that eyes turn light into sight. **Ask:** *How did the experiment we just did prove that this is true?* (Students could only see when it was light. When it was dark, they couldn't see anything—even if their eyes were open.) Tell students that they'll learn more about eyes as they read the article.

Set a Purpose and Read

Have students read the article in order to identify parts of the eye and recognize how variations in traits affect how animals see.

EXPLAIN

Identify Parts of the Eye

Display pages 18-19 of the projectable magazine. **Ask:** *How are all three diagrams the same?* (They all identify the same two parts of an eye.) *How are they different?* (The eyes they show are different shapes, colors, and sizes.) Read aloud the caption. Challenge students to describe how this information applies to the diagrams they see here. (The eyes all have a pupil and an iris. Most likely, the parts work the same way in each eye.)

Give each student a copy of the **Content Assessment Master**. Instruct students to draw close-up pictures showing an eye of four other animals in the article. Challenge them to identify the pupil and iris in each.

SCIENCE

EXPLAIN

(continued)

Recognizing Variations in Traits

Remind students that the eyes of different animals are different colors, sizes, and shapes. Point out that there are good reasons for these differences. Display page 20 of the projectable magazine. Zoom in on the photo. Explain to students that the slender loris's large eyes take in more light. That extra light helps it see well in the dark. The display page 21 of the projectable magazine. Discuss how the placement of the falcon's eyes, with both facing forward, allows the bird's eyes to work together. **Say:** *This helps the falcon figure out how far away prey is so it can catch food.*

Display the "**Light Catchers**" poster. Zoom in on the top left image, covering the caption. Poll the class to see if students can identify the animal shown in the image. Invite a volunteer to describe the animal's eyes. Challenge the class to explain how the animal's eyes help it survive in its environment. Then reveal the caption and invite a volunteer to read the information aloud. Learn about the other animals' eyes in this same way. When applicable, encourage students to identify an animal from the article that depicts similar traits.

ELABORATE

Find Out More

Display the image of the ghost crab on the "Light Catchers" poster. Have students compare the crab's eyes to those of the mouse and falcon on page 21 of their magazines. **Ask:** *How does the location of each animal's eyes affect what it sees?* (The crab can look in all directions. The mouse can see in two directions. The falcon can only see straight ahead.) As a class, conduct research to find more pictures of animals. Search for patterns in similar species. Brainstorm ideas about why having eyes in certain places helps different types of animals survive.

Extend Your Thinking About Sight

Review how different eye traits affect what and how animals see. Then invite a volunteer to read aloud the last paragraph of the article. Brainstorm with the class to identify ways scientists could use traits of these animals' eyes to create new inventions that affect how people see.

EVALUATE

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

- *What does the iris do?* (It controls how much light goes into the eye.)
- *What two parts do most eyes have?* (iris and pupil)
- *Why do large eyes help animals see at night?* (Large eyes catch more light.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article. You may also wish to examine the optional **Interactive Whiteboard** lesson that accompanies this article.

VOCABULARY ASSESSMENT: Seeing Eye to Eye

Record the definition of each vocabulary word. Create a sketch to help you remember what each word means.

Word	Definition	Sketch
iris		
pupil		
vision		

LANGUAGE ARTS ASSESSMENT: Seeing Eye to Eye

Describe how eyes turn light into sight.

First, _____

Next, _____

Then, _____

Finally, _____

CONTENT ASSESSMENT: Seeing Eye to Eye

Pick four animals from the article. Draw each animal's eye. Label the iris and pupil in each drawing.

<p>Animal: _____</p>	<p>Animal: _____</p>
<p>Animal: _____</p>	<p>Animal: _____</p>

COMPREHENSION CHECK: Seeing Eye to Eye

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

1. What is the colored part of the eye called?

- Ⓐ iris
- Ⓑ pupil
- Ⓒ brain

2. What does the pupil do?

- Ⓐ let in light
- Ⓑ close the eye
- Ⓒ change colors

3. What do eyes need to see?

- Ⓐ color
- Ⓑ darkness
- Ⓒ light

4. Which animal's eyes are biggest?

- Ⓐ ghost crab
- Ⓑ slender loris
- Ⓒ falcon

5. Why do falcon's have super vision?

ANSWER KEY

Kelp Kingdom

Assess Vocabulary, page 6

Students predicted definitions and sentences will vary. They should record the words and definitions from the Wordwise feature on page 9.

ecosystem: all living and nonliving things in an area and how they interact

kelp: a type of seaweed

marine biologist: a scientist who studies things that live in oceans

Assess Language Arts, page 7

Students should identify their initial thoughts on the main idea. Possible response: Living things depend on a kelp forest. Details will vary. Students should then rewrite the main idea in their own words.

Assess Content, page 8

1. sea urchins; 2. They eat kelp roots; 3. Soon there will be no kelp left; 4. otters; 5. They eat sea urchins; 6. This keeps the kelp forest healthy; 7. Answers will vary, but students should indicate that if the otters disappeared there would be too many sea urchins and the kelp forest would disappear.

Comprehension Check, page 9

1. B; 2. C; 3. A; 4. C; 5: Possible response: Some animals eat kelp. Other animals eat those animals. Some animals hide from predators in the kelp. This keeps them safe.

Robot Revolution

Assess Vocabulary, page 14

Students should record the words and definitions from the Wordwise feature on page 15.

robot: a machine that can do certain tasks

sensor: a device that detects or measures something and responds to it

technology: the use of scientific knowledge to make or invent things

Students may arrange the words in various ways. The most logical organization is: row 1: technology; row 2: robot and sensor. This is logical because a robots and sensors are types of technology.

Assess Language Arts, page 15

Students should write at least one question that begins with each question word. All questions should relate to the text. Answers should also come from the text.

Assess Content page, 16

Students should identify the four robots in the article: Pepper, Robo Sally, Paro, and Robobear. Descriptions, function, and problems solved should be based on information in the text and photos.

Comprehension Check, page 17

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

Seeing Eye to Eye

Assess Vocabulary, page 22

Students should record the words and definitions from the Wordwise feature on page 23.

iris: the colored part of the eye

pupil: the opening in the center of the eye that lets light in

vision: the ability to see

Sketches will vary depending on students' interpretations of each word. Evaluate each response for accuracy.

Assess Language Arts, page 23

Possible response: First, light enters the eye through the pupil. Next, the iris controls how much light goes into the eye. Then the iris, pupil, and other parts of the eye work together to make a picture for the brain to see. Finally, the brain gets an picture from the eye, flips it, and we see.

Assess Content, page 24

Students should select four animals from the article or poster and draw each animal's eye. They should label the iris and pupil in each drawing.

Comprehension Check, page 25

1. A; 2. A; 3. C; 4: B; 5: Possible response: Falcons have super vision because both eyes face forward. The two eyes work together to help falcons figure out how far away prey is.