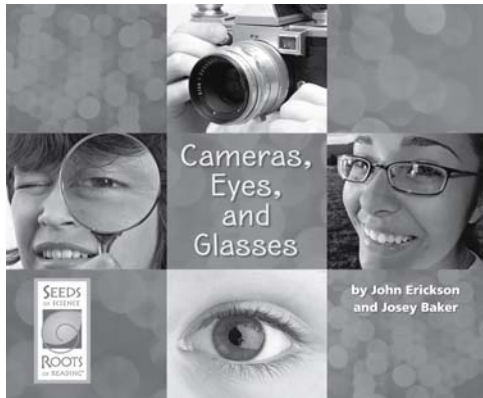


## Teaching Vocabulary with Science Texts

with *Cameras, Eyes, and Glasses*  
from *Seeds of Science/Roots of Reading*®



### Introduction

This strategy guide introduces an approach for teaching vocabulary with science texts. Knowing specialized vocabulary is necessary for understanding important concepts in content-rich texts. This guide includes an introductory section about teaching conceptually important vocabulary, a general overview of how to teach this strategy with many science texts, and a plan for teaching vocabulary with the *Seeds of Science/Roots of Reading*® book *Cameras, Eyes, and Glasses*.

### Book Summary

*Cameras, Eyes, and Glasses* is about three familiar objects that use lenses to bend, or refract, light. The book explains what lenses are and what they do. It describes in detail how the lenses in cameras, eyes, and eyeglasses work to refract light. Two types of lenses—concave and convex—are introduced. Photographs and ray diagrams help students understand how these types of lenses work. To further explain the concept of refraction, the book also includes suggestions for simple activities that readers can do to observe refraction in action. Readers come to understand refraction through the many real-world examples presented in the book.

### Science Background

Light travels in a straight line, but it can change direction when it passes from one transparent material into another. This is called refraction. For instance, when light goes from air to water, water to air, glass to water, or air to the cornea of the eye, we see the results of refraction. Refraction happens because light travels at different speeds through different substances. Refraction is observable in many everyday situations. For example, it causes the ripples of light on the bottom of a swimming pool and the distortion of an object viewed through a glass of water. Lenses use refraction to change the way an object appears or to focus an image of an object. A lens is a piece of clear material with curved surfaces that is thinner in some places and thicker in others. Cameras, eyes, and eyeglasses all contain lenses. The lenses in cameras, like the lenses in your eyes, focus an image. In your eyes, the image is focused on the retina in the back of your eye. The lenses in eyeglasses refract light to improve vision. If you are nearsighted, your glasses use concave lenses, which refract light outward. If you are farsighted, your glasses use convex lenses, which refract light inward. The lenses in microscopes and telescopes make objects look larger, or closer, than they actually are.

### About This Book

#### Reading Level

Guided Reading Level\*: R

#### Key Vocabulary

concave, convex, lens, light, refraction, transparent

#### Text Features

bold print, captions, diagrams, glossary, headings/subheadings, labels, photographs, table of contents

\*Guided Reading Levels based on the text characteristics from Fountas and Pinnell, *Matching Books to Readers*.

## About Vocabulary in Science Texts

Science texts often contain many specialized terms that may be unfamiliar to students. These terms represent important concepts that are central to understanding science; not knowing such words can impede students' ability to understand and learn from text. Vocabulary instruction that targets conceptually important words can increase students' understanding of complex ideas presented in text, while also broadening students' overall word knowledge. Students best learn vocabulary when they have multiple opportunities for meaningful exposure to a few select words. Thus, the most effective vocabulary strategies are those that provide opportunities for students to read, write, and discuss words in a variety of contexts. The ultimate goal of vocabulary instruction is to help students develop a deep understanding of vocabulary so they can use words to explain ideas when speaking and writing.


## Teaching Vocabulary with Science Texts

The following guidelines can be used to teach vocabulary with any science text.

- Choose a text that relates to a topic or unit of study. Texts that focus on a more narrow idea within a topic (e.g., vertebrates) work better than texts that survey a broad topic (e.g., animals).
- Familiarize yourself with the text, noting the main ideas and the number of difficult or specialized terms. Look for words that convey the most central ideas of the text. Then, select a few words on which to focus instruction.
- Think about how the words you chose relate to the concepts you are teaching. You may want to make a concept map that shows the relationship between words to help you conduct a vocabulary discussion with your class.
- Introduce the words to students and gauge their familiarity with each word. Prompt students to think about whether or not they know the word, have heard the word but do not know what it means, or have never heard the word before.

## Guidelines for Selecting Vocabulary to Teach with Science Texts

- Select words that convey the most important ideas from a text.
  - Choose words that can generate many examples (e.g., *planet*, *invertebrate*) rather than specific examples (e.g., *Jupiter*, *centipede*).
  - Choose words that relate to other words you are teaching (e.g., *erosion*, *rock*).
  - Focus on two to three words from each text. It is better to help students gain a deep understanding of a few words than to try to teach long lists of words.
- 
- Orally provide short, accessible definitions of the words before, during, or after reading. Initial definitions need not be complex or include many examples. Introduce each word to students so they understand its basic meaning.
  - Connect the word's usage to students' prior knowledge. Discuss how the word relates to a familiar topic. Describe a common situation in which the word is used and clarify the meaning of the word as necessary.
  - Ask students to locate one of the words in the text and read aloud the sentence that contains the word. When applicable, discuss the ways in which the context of the sentence helps the student better understand the word.
  - Have students generate examples that relate to the target words. Students can also create sentences or drawings that incorporate the words. You may have students record their thinking on the Word Map copymaster included with this guide.
  - Provide opportunities for students to use new words in speech and writing. For example, structure a small-group discussion in which students incorporate a set of words that you provide on index cards. Or, create a class glossary to use as a reference when writing.
  - Continue to deepen students' understanding of previously learned words by revisiting those words over time. Incorporate vocabulary instruction to support learning in other content areas.

<b>Definition</b> when light bends as it passes from one material to another	<b>Example</b> when a pencil in a glass of water looks broken
<b>Picture</b> 	<b>Sentence</b> You can investigate refraction with a flashlight and a cup of water.

## Teaching Vocabulary with *Cameras, Eyes, and Glasses*

*Cameras, Eyes, and Glasses* introduces the concept of refraction using three common objects that contain lenses. The following steps can be used to introduce this term to students using a word map.

### Getting Ready

1. Make a copy of the Word Map copymaster for each student.
2. On the board or on chart paper, draw an example word map. Write the word “refraction” in the center box. (See the example on this page. You will fill in the green text and draw the illustration with students during class.)

### During Class

1. Introduce *Cameras, Eyes, and Glasses*. Describe how this book explains how light bends as it passes through certain materials. This is called refraction.
2. Ask students to preview the table of contents on page 3. Point out that the “What Is Refraction?” section of the book explains the main idea of the book. Ask students to predict what they think the other sections of the book are about.
3. Read *Cameras, Eyes, and Glasses* in a way that is consistent with your classroom routines, giving students as much independence as possible. Instruct students to focus on how the word *refraction* (as well as *refract*) is used in the book.
4. Direct students’ attention to the word map you prepared before class. Explain that a word map can help them understand an important

concept. Tell them they will use a word map to organize information about refraction.

5. Invite students to reread pages 4–5 of the book to generate a definition for the word *refraction*. Record information students provide from the book in the space labeled “Definition” on your word map. If students provide an incomplete definition, prompt them to add more information. For example, if students say, “Refraction is when light bends” [Page 4.], ask them to identify why light bends. [It passes from one material to another, page 4.]
6. Next, ask students to identify an example of refraction from the book. [When a pencil in a glass of water looks broken, page 4. When a flashlight shines on the wall through a cup of water, page 5.] Write one of these on the word map in the box labeled “Example.”
7. Have students suggest how you can make a simple drawing depicting refraction. Draw it in the box labeled “Picture.” Finally, ask students to use the word *refraction* in a sentence and record this sentence in the last box on the word map.
8. Distribute the Word Map student sheets and ask students to write the word *lens* in the box in the center of the map. Explain that students will now complete a word map for the word *lens* by locating the most important information about the word *lens* in the text.
9. Discuss how to locate the most important information for the word *lens*. Make sure that students mention that the table of contents, headings, bold print, and other text features can help them locate important ideas.
10. Have students reread the text, find information related to the word *lens*, and use this information to complete their word maps.

### Independent Extension

Provide pairs of students with the following words written on index cards: *refract*, *light*, *lens*, *cameras*, *eyes*. Ask students to work together to generate sentences using two or three of the words from the index cards in the same sentence. Challenge students to come up with as many sentences as they can.

Name \_\_\_\_\_

Date \_\_\_\_\_

## Word Map

Title of book: \_\_\_\_\_

<b>Definition</b>	<b>Example</b>
<b>Picture</b>	<b>Sentence</b>

## About Strategy Guides

A six-page strategy guide is available for each *Seeds of Science/Roots of Reading*® student book. These strategies support students in becoming better readers and writers. They help students read science texts with greater understanding, learn and use new vocabulary, and discuss important ideas about the natural world and the nature of science. Many of these strategies can be used with multiple titles in the *Seeds/Roots* series. For more information, as well as for additional instructional resources, visit the *Seeds/Roots* Web site ([www.seedsofscience.org/strategyguides.html](http://www.seedsofscience.org/strategyguides.html)).

## Available Student Books for Grades 3–4

Eighteen engaging student books are now available, each with a corresponding strategy guide. The books are part of the *Seeds of Science/Roots of Reading*® curriculum program described on page 6. Nine *Weather and Water* student books and strategy guides will be available in late 2009.

<i>Digestion and Body Systems</i>	
Strategy	Student Book
Analyzing Part-to-Whole Relationships	<i>Systems</i>
Teaching About the Nature and Practices of Science	<i>Secrets of the Stomach</i>
Teaching Process Description Writing	<i>Voyage of a Cracker</i>
Searching for Information in Science Texts	<i>Handbook of Body Systems</i>
Making Sense of Data in Science Texts	<i>What's the Diagnosis?</i>
<i>Variation and Adaptation</i>	
Strategy	Student Book
Teaching Scientific Comparison Writing	<i>Blue Whales and Buttercups</i>
Using Discourse Circles	<i>The Code</i>
Using Visual Evidence to Make Inferences	<i>Mystery Mouths</i>
Teaching About the Nature and Practices of Science	<i>Evidence from the Past</i>
<i>Light Energy</i>	
Strategy	Student Book
Teaching About Idioms	<i>Can You See in the Dark?</i>
Teaching Summary Writing	<i>The Speed of Light</i>
Teaching About the Nature and Practices of Science	<i>Why Do Scientists Disagree?</i>
Using Discourse Routines with Science Texts	<i>I See What You Mean</i>
Searching for Information in Science Texts	<i>Handbook of Light Interactions</i>
Teaching Scientific Explanation Writing	<i>Light Strikes!</i>
Teaching Vocabulary with Science Texts	<i>Cameras, Eyes, and Glasses</i>
Teaching Concept Mapping	<i>It's All Energy</i>
Interpreting Visual Representations	<i>Sunlight and Showers</i>

## Extend Learning with *Seeds of Science/Roots of Reading*®

The strategy featured in this guide is drawn from the *Seeds of Science / Roots of Reading*® curriculum program. *Seeds/Roots* is an innovative, fully integrated science and literacy program.

The program employs a multimodal instructional model called “Do-it, Talk-it, Read-it, Write-it.” This approach provides rich and varied opportunities for students to learn science as they *investigate* through firsthand inquiry, *talk* with others about their investigations, *read* content-rich books, and *write* to record and reflect on their learning.

**Take advantage of the natural synergies between science and literacy instruction.**

- Improve students’ abilities to read and write in the context of science.
- Excite students with active hands-on investigation.
- Optimize instructional time by addressing goals in two subject areas at the same time.

To learn more about *Seeds of Science / Roots of Reading*® products, pricing, and purchasing information, visit [www.deltaeducation.com](http://www.deltaeducation.com)



### Light Energy Science and Literacy Kit



Developed at Lawrence Hall of Science and the Graduate School of Education at the University of California at Berkeley.

*Seeds of Science/Roots of Reading*® is a collaboration of a science team led by **Jacqueline Barber** and a literacy team led by **P. David Pearson** and **Gina Cervetti**.

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