

# Lesson 4: Our Earth

## Focus Objectives

Students will be able to:

- use prior knowledge and experience to relate to new information.
- understand the main idea and supporting details of simple expository information.

## TESOL Objective

Students will use appropriate learning strategies to construct and apply academic knowledge.



## Word Work

- **High-Frequency Words:** *made, would, five*
- **Word Study:** Word ending –y
- *It Ends with Y* activity sheet (page 71)

## Academic Vocabulary

- *atmosphere*
- *core*
- *crust*
- *mantle*
- *orbit*
- *oxygen*
- *ozone layer*
- *plates*
- *solar system*

## Comprehension Skills

- Using Prior Knowledge
- Understanding Main Idea and Details
- *Our Earth* activity sheet (page 72)

## Writing

Use high-frequency and vocabulary words to write words, sentences, or paragraphs.

## Cross-curricular Connections

- **Science:** Students know that things near the Earth fall to the ground unless something holds them up.
- **Art:** Students know the differences among visual characteristics and purposes of art.

## Building Fluency

- **Reading the book:** repeated readings with audio support; choral reading
- **Reading the poem:** poetry folder; repeated readings
- “Our Earth” poem (page 70)

# Lesson 4: Our Earth (cont.)

## Word Work

- 1. High-Frequency Words**—Write the words *made*, *would*, and *five* on the board. Read each word aloud.
  - Give students lined paper and a variety of colored pencils. Say and point to the featured high-frequency word. Have students repeat the word and write it on their papers, using a different color for each letter.
  - If you have a classroom word wall, have students add the high-frequency words to it. If time permits, read the word wall together to reinforce mastery of high-frequency words.
- 2. Word Study**—Write the *-y* word ending on a sheet of chart paper, using a red marker. Have students brainstorm words that end with *-y*. Write these words on the chart paper. The list of words may include *by*, *happy*, *cry*, *silly*, and *reply*.
  - Explain that when words end with the letter *y*, the *y* can sound like either a long *e* or a long *i*. Sort the words that students brainstormed into two categories (words that end in *y* but sound like long *i* and words that end in *y* but sound like long *e*).  
**Note:** You may wish to share the phonics tip with students.
  - For additional practice with *-y* word endings, have students complete the *It Ends with Y* activity sheet (page 71).

**Tip:** When a word ends with a stressed consonant *y*, the ending sounds like a long *i*. When a word ends with an unstressed consonant *y*, the ending sounds like a long *e*.

## Academic Vocabulary

1. Display diagrams of Earth's crust, Earth's atmosphere, and the solar system. Write the academic vocabulary on a sheet of chart paper. Teach students the pronunciation of the words, clapping for each syllable.
2. Give pairs of students a copy of the book and a piece of paper for each word they are assigned. Assign one or two words to each pair. Tell students to find the words in the text and write down what they think each word means.
3. Have students check their definitions using the glossary of the book. Students may also draw a picture representing each vocabulary word. Allow students to share with the group. Students' charts may look similar to the chart below.

Word	Student Definition	Picture
core	the middle of Earth, like the middle of an apple core	

## Comprehension

### Before Reading

- 1. Using Prior Knowledge**—Show students the cover of the book. Invite students to describe what they see in the picture. Ask students to share some facts that they know about Earth.
  - Ask students to discuss the things they know about Earth from looking at the photographs.
  - Encourage students to use words from the academic vocabulary section of this lesson while previewing the text.
- 2. Understanding Main Idea and Details**—Display the cover of the book. Read the title aloud. Tell students that the title gives them a clue about the main idea of the book. Read the table of contents. Tell students that the table of contents gives them clues about the details of the book.
  - Ask students why Earth is important. Brainstorm a list of things that humans and other living things get from Earth.
  - Draw a big circle labeled with the main idea of the discussion (*Earth is important*) and smaller circles labeled with the brainstorming ideas. Have different students reiterate the main idea and details. Praise them for understanding that many nonfiction books are organized around a main idea and details.

### English Language Support

Extend the discussion of main idea and details by referring to previous books in the series. For example, say, “If the main idea in *Step into the Desert* is that deserts are unique places, what are the details that support that claim?” Provide sentence frames so that students can answer using complete sentences. Then pair students so they can practice asking each other about main ideas and details.

### During Reading

- 1. Using Prior Knowledge**—Read the book aloud to students, showing them the photographs and tracking the text while you read. Pause at the end of each section and ask students to make connections to the text based on what they already know. For example, after reading *The Big Blue Marble*, you might ask students if they can name any of the other planets that orbit the sun. Likewise, after reading *Water, Water, Everywhere*, you might ask students to use what they know about human needs and water to predict what could happen if there were no more freshwater on Earth.
- 2. Understanding Main Idea and Details**—Using the choral-reading strategy, read the book aloud with students. Pause after each section and ask students to turn and talk with a partner about the most important fact they learned in that section. Allow students to share with the group. Monitor and check for understanding. Then have students read the book independently.



**Assessment Opportunity**—Monitor students to ensure that they read the high-frequency and vocabulary words accurately.

# Lesson 4: Our Earth (cont.)

## Comprehension (cont.)

### After Reading

- 1. Using Prior Knowledge**—Invite students to review the text while focusing on the photographs. Ask students to connect something that they learned to each photograph. For example, students might look at the photo on page 12 and say, “All living things need water. Earth has enough water to support life here.” For additional practice with comprehension, have students complete the *Our Earth* activity sheet (page 72).
- 2. Building Oral Language**—Put students in pairs. Ask each student to take turns finishing the sentence frame *I found \_\_\_\_\_ the most interesting fact because \_\_\_\_\_*. Have partners take turns sharing and asking each other questions. Next, ask students some *wh* questions (*who, what, when, where, why*) about the text. Explain that when readers can answer *wh* questions, they know they have understood the main idea of the text. Have students work in pairs to ask and respond to questions.

### English Language Support

Read the book aloud to students. Ask students to snap their fingers when the word *Earth* is read. Reread the book aloud to students, but this time, pause when you get to the word *Earth*. Have students fill in the pause by saying “Earth.” Then have students tell you what fact they learned about Earth by asking, “What did you just learn about Earth?”

## Writing

Have students describe Earth, using the high-frequency and vocabulary words from the lesson.

- Give below-grade-level students a word bank to use when writing words or sentences.
- Have on-grade-level students write sentences or a paragraph with descriptive words.
- Encourage above-grade-level students to write a paragraph that includes details about Earth, such as how Earth looks from space, details about its atmosphere, and what is inside Earth.

### Cross-curricular Connections



**Science**—Have students stand in a circle and hold a pencil in front of them. Then tell students to let go of the pencil. Ask students what happened to the pencils when they let them go (*they fell to the ground*). Discuss with students that objects will fall to the ground unless something is holding them up.



**Art**—Have students create their own Earth by wrapping papier-mâché around a circular balloon. Allow students to paint their own models of Earth. When their projects are dry, have students observe the colors and feel the texture it has. Discuss the different textures.

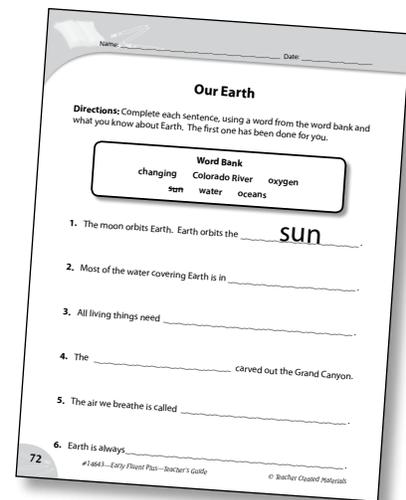
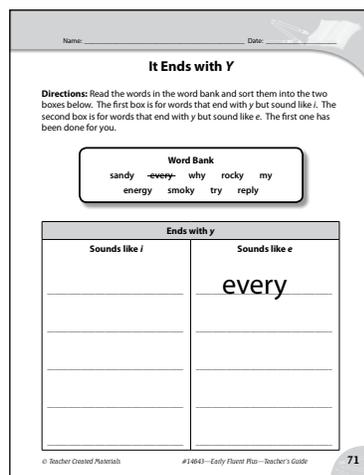
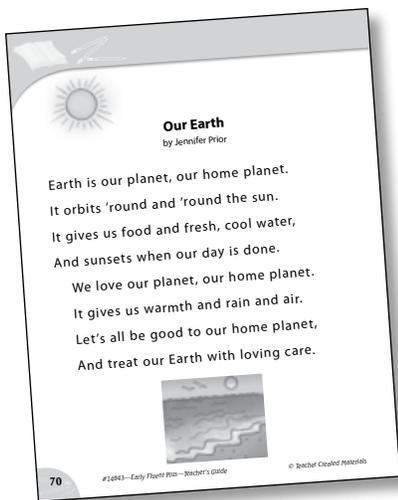
**Note:** For instructions on how to make papier-mâché, you may wish to consult the Internet.

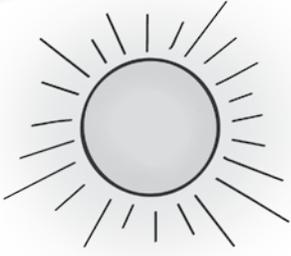
## Building Fluency

- 1. Reading the Book**—Use one or all of the following methods for fluency practice:
  - Use a copy of the book (provided on the Teacher Resource CD) along with the professional audio recording (provided on the Audio CD) so students can practice reading the book to build fluency. Listening to the book being read aloud will give students an idea of how to use proper intonation, expression, and pacing when reading.
  - Use the choral-reading strategy to read the book several times with students, and allow students to practice reading the book silently and in pairs.
- 2. Reading the Poem**—Use one or all of the following methods for fluency practice:
  - Display the “Our Earth” poem (page 70). Ask student to compare and contrast the book and the poem.
  - Provide copies of the poem for students to place in a poetry folder. They can practice reading the poems during free-choice time and independent- or paired-reading time.
  - Write the poem on a sheet of chart paper. Reread it with students throughout the day. Encourage students to create actions, gestures, or a tune to go along with the poem.



**Assessment Opportunities**—Use the oral reading record and the fluency rubric provided in the Assessment Guide to assess students’ ability to read the book and poem fluently and accurately.



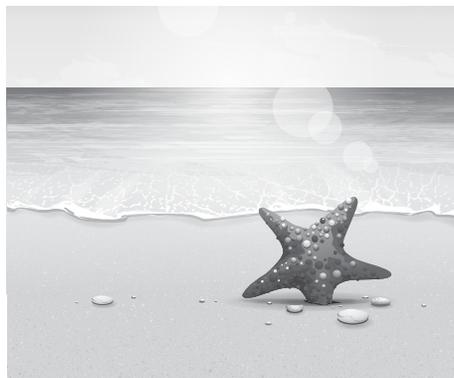


## **Our Earth**

by Jennifer Prior

Earth is our planet, our home planet.  
It orbits 'round and 'round the sun.  
It gives us food and fresh, cool water,  
And sunsets when our day is done.

We love our planet, our home planet.  
It gives us warmth and rain and air.  
Let's all be good to our home planet,  
And treat our Earth with loving care.





## It Ends with Y

**Directions:** Read the words in the word bank and sort them into the two boxes below. The first box is for words that end with *y* but sound like *i*. The second box is for words that end with *y* but sound like *e*. The first one has been done for you.

### Word Bank

sandy   ~~every~~   why   rocky   my  
energy   smoky   try   reply

Ends with y	
Sounds like <i>i</i>	Sounds like <i>e</i>
	every
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

## Our Earth

**Directions:** Complete each sentence, using a word from the word bank and what you know about Earth. The first one has been done for you.

### Word Bank

changing

Colorado River

oxygen

sun

water

oceans

1. The moon orbits Earth. Earth orbits the **sun**.
2. Most of the water covering Earth is in \_\_\_\_\_.
3. All living things need \_\_\_\_\_.
4. The \_\_\_\_\_ carved out the Grand Canyon.
5. The air we breathe is called \_\_\_\_\_.
6. Earth is always \_\_\_\_\_.



## Learning Objectives

### Students will:

- ask and answer questions to comprehend an informational text.
- use sensory words to write a narrative that takes place in or on the ocean.
- create a model to demonstrate how the hydrosphere and atmosphere interact.

## Standards

- **Reading:** By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.
- **Writing:** Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.
- **Content:** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- **Language:** Communicate information, ideas, and concepts necessary for academic success in the content area of Science.

## Lesson Timeline

### Day 1

#### Task

**Introductory and Lab Activities** (page 161)

#### Summary of Student Learning Activities

Observe how water evaporates and condenses to form rain.

### Day 2

#### Task

**Before Reading** (page 162)

#### Summary of Student Learning Activities

Preview the text and create a list of questions to help guide reading.

### Day 3

#### Task

**During Reading** (page 163)

#### Summary of Student Learning Activities

Use the text to answer questions, and write a narrative using sensory words.

### Day 4

#### Task

**After Reading** (page 164)

#### Summary of Student Learning Activities

Ask additional questions about the ocean.

### Day 5

#### Task

**Activity from the Book** (page 164) and **Assessments** (pages 169–170)

#### Summary of Student Learning Activities

Observe water at different stages in the water cycle, and take the assessments.

## Materials

- copies of the *Modeling Two Spheres* activity sheet (page 165)
- large glass bowls
- plastic wrap
- small bowls or cups
- small rocks or weights
- water

### Day 1

Observe how water evaporates and condenses to form rain.

## Introductory Activity

### Engage

1. Tell students that the atmosphere, or the air on Earth, and the hydrosphere, or the water on Earth, interact in a variety of ways. Ask students how they think these two spheres might interact. Record student responses on the board.
2. Discuss how weather events, such as tornadoes and hurricanes, are caused by the hydrosphere interacting with the atmosphere. Tell students that they will learn more about how these two spheres interact.

## Lab Activity

### Explore & Explain

1. Place students in small groups. Distribute a large glass bowl, plastic wrap, a small bowl, a rock, and copies of the *Modeling Two Spheres* activity sheet (page 165) to each group.
2. Have students fill the large bowl with a few centimeters of water. Then, have students place the smaller bowl in the center of the large bowl. **Note:** Be sure the water does not spill into the smaller bowl.
3. Have students cover the large bowl with plastic wrap to create an airtight seal. Have them place a small rock on top of the plastic wrap, centered over the smaller bowl. Have students record their observations on the activity sheet.
4. Place the bowls in a sunny location for a few hours. Then, have students observe the bowls again and record their observations.
5. Ask questions to guide students to the idea that water evaporates from the ocean, condenses, and falls to create rain.
  - *What did you observe? What do you think caused this?*
  - *How did the water get inside the smaller bowl? How do you know?*
  - *What type of weather might this model represent?*
6. Bring the class together for instruction. Clarify misconceptions by having students explain their understandings using logic and evidence to support their ideas.

## Materials

- *The Powerful Ocean* book
- copies of the *Sorting Words* activity sheet (page 166)
- chart paper

### Day 2

Preview the text and create a list of questions to help guide reading.

## Vocabulary Word Bank

- climate
- currents
- hydrologic cycle
- precipitation
- tides

### Before Reading

### Elaborate

1. Write the vocabulary words on the board, and discuss their definitions as a class. Distribute copies of the *Sorting Words* activity sheet (page 166) to students. Ask students to sort the words into categories. Categories may include parts of speech, function, how familiar students are with the words, or others. Then, have students sort the words another way. Have students share their groupings and the rationale behind each with the class. Discuss any types of groupings students may not have mentioned.  
➤ Challenge **above-level learners** to sort the words a third way.
2. Explain to students that asking questions can help a reader monitor his or her comprehension and become a more active reader. Begin a KWL chart on a sheet of chart paper. Ask students what they know about the ocean. Record students' responses in the K column of the chart.
3. Display *The Powerful Ocean* book for students. Point out the chapter headings and a few pictures. Then, ask students what questions they have about the book. Record students' questions in the W column of the KWL chart. Tell students that they will read the book to find the answers to their questions. **Note:** Save this chart for later use.

## Day 3

Use the text to answer questions, and write a narrative using sensory words.

## Materials

- *The Powerful Ocean* books
- copies of the *Sensory Words* activity sheet (page 167)
- KWL chart from the Before Reading activity

## During Reading

## Elaborate

1. Distribute *The Powerful Ocean* books to students. For the first reading, have groups take turns reading sections aloud. For example, have boys read a section, girls read a section, and students wearing green read a third section. Point out a few answers to questions on the KWL chart from the Before Reading activity. Model how to refer explicitly to the text when answering questions.
  - You may choose to display the Interactiv-eBook for a more digitally enhanced reading experience.
2. For the second reading of the text, have students read independently. Have them look for any remaining answers to questions listed on the KWL chart. Record student answers in the L column of the chart. Have students point out the parts of the text that answered their questions.
  - For **below-level learners** and **English language learners**, you may choose to play the audio recording as students follow along to serve as a model of fluent reading. This may be done in small groups or at a listening station. The recordings will help struggling readers practice fluency and aid in comprehension.
  - You may wish to have students digitally annotate the PDF of the text by highlighting sections of the text that answered their questions.
3. Discuss any remaining questions that were not answered in the text and where students might find the answers to these questions, such as the library or the Internet.
4. Tell students they will use what they learned to write a narrative that takes place at the ocean. Explain that narratives are more engaging when the author uses sensory words. Reread the back cover of the book, and discuss sensory words such as *refreshing*, *salty*, *choppy*, and *strong*. Explain that using these words helps the author convey specific images and feelings.
5. Distribute copies of the *Sensory Words* activity sheet (page 167) to students. Have students use the activity sheet to plan a narrative. Then, have them write their narratives on separate sheets of paper.

## Materials

- *The Powerful Ocean* books
- copies of the *Continuing to Question*, *The Powerful Ocean Quiz*, and *Tide Chart* activity sheets (pages 168–170)

**Days 4&5**

Ask additional questions about the ocean. Observe water at different stages in the water cycle, and take the assessments.

## After Reading

## Elaborate & Evaluate

1. Write the vocabulary words on the board and review their definitions. Then, have students write a riddle for each of the words. For example, a riddle for the word *tides* may be, “I make the ocean water rise and fall near the coast every day. What am I?” Have students walk around the room and take turns answering one another’s riddles. Tell students that they must answer four riddles before sitting down.
2. Discuss some of the questions that students answered by reading the text. Explain that sometimes after reading a text, a reader might have more specific questions or wondering questions about a topic.
3. Distribute *The Powerful Ocean* books and copies of the *Continuing to Question* activity sheet (page 168) to students. Have them use the book to complete the activity sheet. Ask students to share their questions with the class. Help students identify where they might find answers to their questions.
  - Support **below-level learners** and **English language learners** by reviewing question words such as *who*, *what*, *where*, *when*, *why*, and *how* before having them begin the activity sheet.

## Activity from the Book

Read the Your Turn! prompt aloud from page 32 of *The Powerful Ocean* book. Have students observe water at different stages of the water cycle and record their observations.

1. A short posttest, *The Powerful Ocean Quiz* (page 169), is provided to assess student learning from the book.
2. A data analysis activity, *Tide Chart* (page 170), is provided to assess students’ understanding of how to analyze scientific data. Explain to students that the chart shows daily high and low tides for a week.
3. The Interactiv-eBook activities may be used as a form of assessment (optional).

**STEM**

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

## Modeling Two Spheres

**Directions:** On the left, draw your model of the hydrosphere and the atmosphere. On the right, draw your model after it has been sitting for a few hours. Then, answer the questions below.

Before	After

**1** Describe the changes in the hydrosphere (water).

---

---

**2** Describe the changes in the atmosphere (air).

---

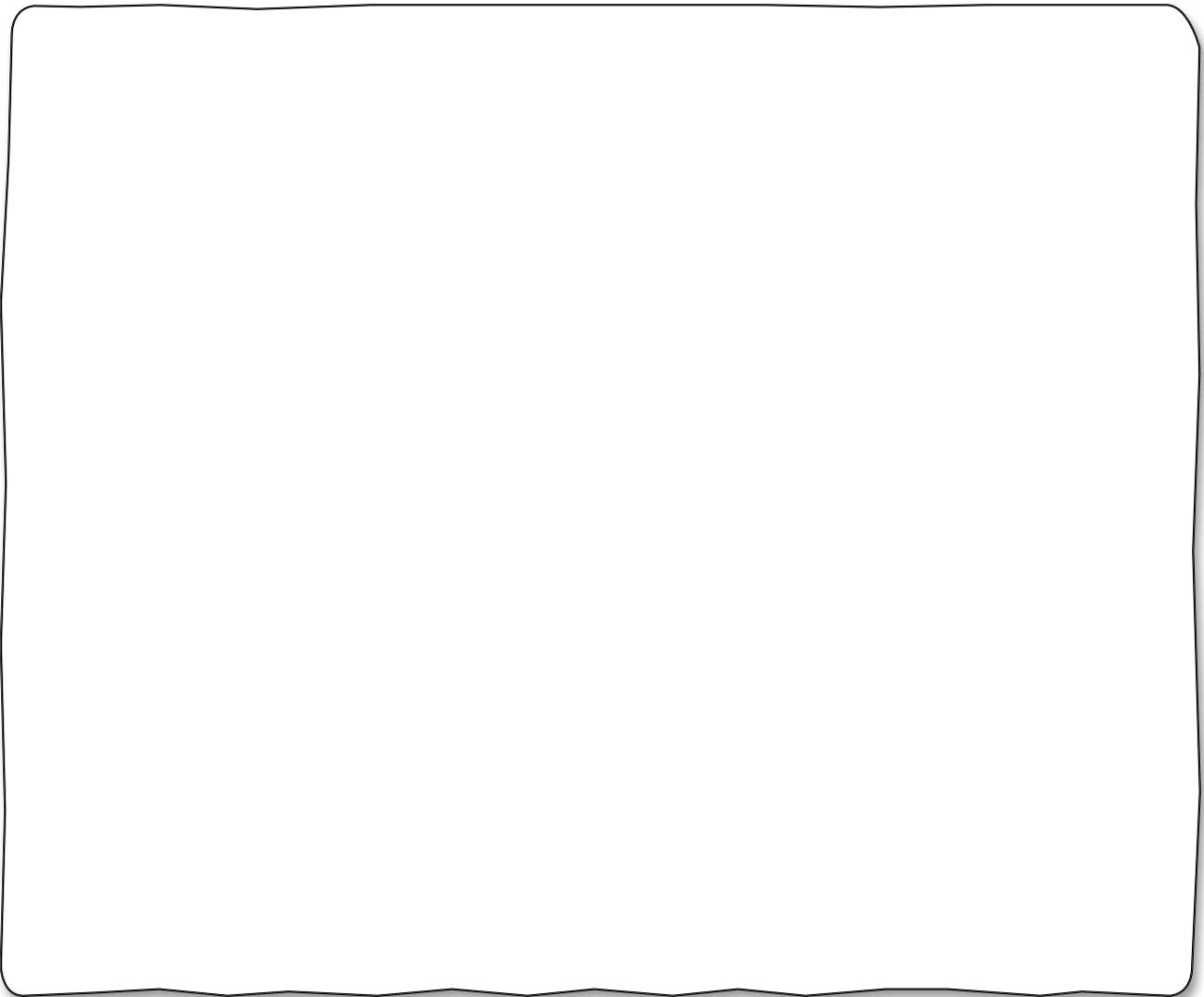
---

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

## Sorting Words

**Directions:** Sort the words below into categories. Then, sort the words a different way. Label how you sorted the words on the lines.

precipitation      tides      currents      hydrologic cycle      climate



---

---

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

## Sensory Words

**Directions:** Write a narrative that takes place in or on the ocean. Use the chart below to plan your narrative.

Characters	Conflict	Sensory Words
<b>Beginning</b>		
<b>Middle</b>		
<b>End</b>		

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

## Continuing to Question

**Directions:** Write four additional questions you now have about the ocean.

1

---

---

---

---

2

---

---

---

---

3

---

---

---

---

4

---

---

---

---

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

## The Powerful Ocean Quiz

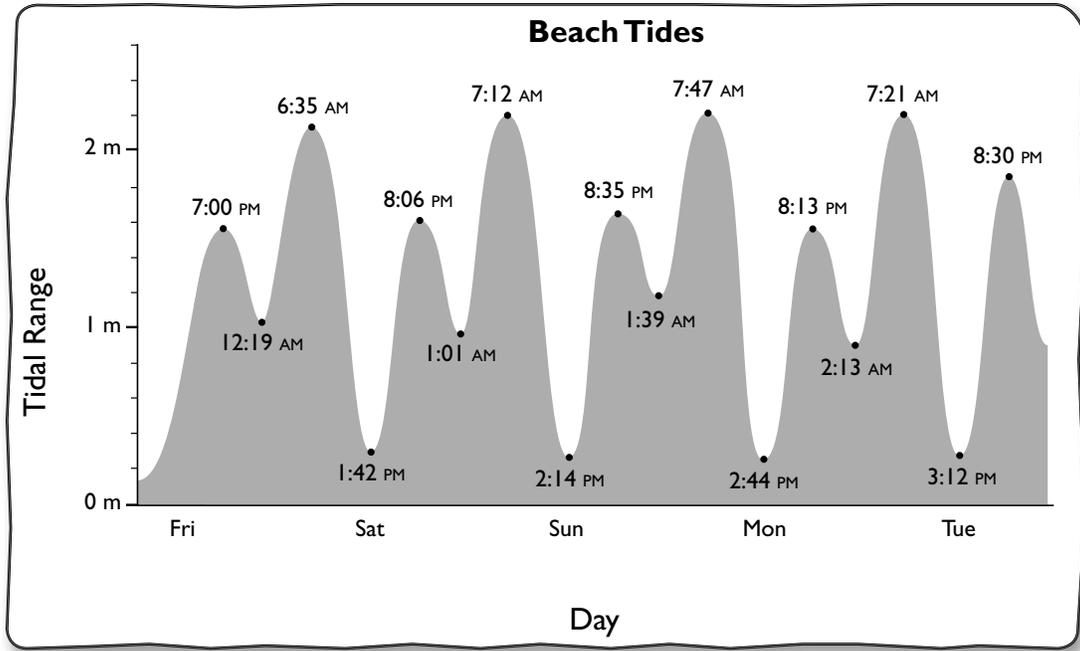
**Directions:** Read each question. Choose the best answer. Fill in the bubble for the answer you have chosen.

- 1** Which statement is true about El Niño?
- (A) It occurs every ten years.
  - (B) It is the abnormal warming of the ocean's surface.
  - (C) It absorbs carbon dioxide in the atmosphere.
  - (D) It causes wet conditions around the world.
- 2** What does NOT help circulate ocean waters?
- (A) tides
  - (B) currents
  - (C) wind
  - (D) animals
- 3** What question might a reader ask after reading the section titled "Down Deep and Dark" on page 19?
- (A) Why is there so much light down there?
  - (B) How do blind fish hunt?
  - (C) Why is it called the *twilight zone*?
  - (D) How can seaweed grow there?
- 4** What creates the different ocean layers?
- (A) water and air
  - (B) light and pressure
  - (C) ice and rock
  - (D) fish and whales
- 5** What would be a good question to ask before reading a book about the ocean?
- (A) What color is the ocean?
  - (B) When was the last ice age?
  - (C) What causes ocean currents?
  - (D) What is the tallest mountain?
- 6** The \_\_\_\_\_ cycle continuously circulates water.
- (A) hydrologic
  - (B) precipitation
  - (C) tectonic
  - (D) climate

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

# Tide Chart STEM

**Directions:** Use the data in the tide chart below to answer the questions.



**1** Around what time do the highest high tides occur? \_\_\_\_\_

\_\_\_\_\_

**2** Describe what the tide will be like on Tuesday at 3:00 Pm.

\_\_\_\_\_

\_\_\_\_\_

**3** What patterns do you notice?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# Weather Scientists Reader

## Learning Objectives

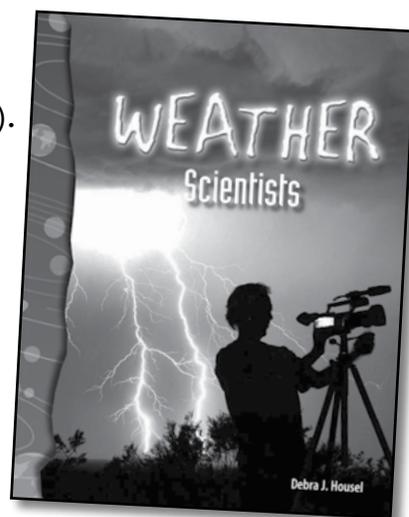
Students set the purpose for reading (Nonfiction Reading Objective).

Students write to reflect knowledge of a topic (Writing Objective).

Students explore concepts related to weather and storms (Science Content Objective).

## Materials

- chalkboard or whiteboard
- chalk or wipe-off markers
- *Caught on Radar* transparency
- *Caught on Radar* activity sheet (page 42)
- *A Stroke of Lightning* activity sheet (page 43)
- *Temperature Scale* activity sheet (page 44)
- paper and pencils
- materials for Lab (page 30)
- *Reader Quiz* (page 45)



## Before Reading

- 1 Complete the Introductory Activity (page 26) with the whole class. Then divide the students into reading groups. The students who read this book should be reading below grade level.
- 2 Explain to students that issues of weather are quite common to us, but long ago weather was mysterious. The science of weather was not widely known to all people. Ask students what they think people long ago wondered about when they thought about weather. Record their thoughts on the board.
- 3 Show the students the cover of the reader *Weather Scientists* and ask them what they think they might learn as they read the text. Explain to the students that it is helpful, especially when reading nonfiction text, to set a **purpose** for reading. In other words, it is important to think about what might be learned or read with the intention of locating certain information.
- 4 Ask students to set purposes for reading *Weather Scientists*. Why would we want to read this text? What might we learn and how might the information be useful to us? What questions do we have that might be answered from a book such as this?

**Before Reading** (cont.)

- 5 Review new vocabulary words with the students. Select words from the list below you think will be difficult for your students. Spend time reviewing each word or term and work as a group to use each in a sentence. See the glossary in the back of the reader for definitions, if needed.

air pressure	global warming
astronomy	Gulf Stream
barometer	lightning rod
centigrade scale	mercury
Coriolis force	meteorologist
Doppler radar	observatory
Fahrenheit temperature scale	radar
	weather satellite

**During Reading**

- 6 Allow students time to read. If necessary, pair struggling readers or second language learners with stronger readers. You might like to have all students read the entire text or you may want to assign sections of the books for students to read.
- 7 After students have the chance to read the assigned text for the first time, ask them to share with the group the information they read. Ask students to reflect on their **purposes for reading**. Did the text meet their expectations and present the anticipated information?
- 8 Discuss how weather forecasters share weather predictions and the role radar images play in their summaries. Have the students share what they know about these radar images. Reread pages 18 through 21 about radar and its history. Discuss how this tool has changed over time. Display the transparency for students to review. Discuss what the radar image shows. Pull down a United States map, if necessary, for students to identify states on the radar map. Distribute *Caught on Radar* (page 42) to each student. Read the information and directions as a class, and allow time for students to complete the activity sheet. Following, discuss the students' responses to question #8.
- 9 Where do the students go when they know a thunderstorm is near? Discuss ways to stay safe in a thunderstorm. Reread pages 14 through 17 about lightning. Discuss facts and information the students found interesting. Distribute *A Stroke of Lightning* (page 43) to students. Review the information and data charts. Provide calculators, if needed, for students to make the calculations. Discuss the patterns they see in the charts. Review the last two questions as a class. Help students follow the two-step process to solve the problem. ( $86,400 \text{ seconds/day} \times 100 \text{ lightning strikes per second} \times 95\% = 8,208,000$ ;  $86,400 \text{ seconds/day} \times 100 \text{ lightning strikes per second} \times 5\% = 432,000$ )

**During Reading** *(cont.)*

- 10 Have a large thermometer outside or inside the classroom. Ask someone to read the temperature, including the scale (Fahrenheit or Celsius). Ask if anyone knows of a second scale used to measure temperature. Reread pages 6 through 9 about measuring temperature. Discuss the differences between the two scales. How are they alike? How are they different? Distribute *Temperature Scale* (page 44) to students. Read the information and sample problems together, and allow time for students to convert the temperatures. Students will need calculators that allow them to enter negative integers. (A prerequisite math skill is rounding decimals to the nearest whole number. Students may need a review of this skill prior to completing the page.)

**After Reading**

- 11 Have students work in pairs to list the new information they learned. Ask the pairs to think about how this new information would be useful for others to know about.
- 12 Remind the students of the statement at the beginning of *Weather Scientists* that “weather was a mystery” to people long ago. Have each student use the information from the text and the brainstormed list to write a few paragraphs in answer to the following question: What did you learn from the text that would have been useful information to people living in ancient times? As students write, remind them these people had almost no background knowledge about the science of weather, so they should be sure to define complex concepts when necessary.
- 13 Allow students to share their written work with the group. Encourage students to offer compliments and constructive suggestions.
- 14 Use the *Reader Quiz* (page 45) to further assess student learning. For ELL students, it might be necessary to read the test questions aloud to them to assess their comprehension.
- 15 Gather students together as a whole group to complete the lab activity (pages 29–30).
- 16 Gather the students together as a whole group and have them complete the Concluding Activity (page 27).

## Caught on Radar

Doppler radar images can show rain or snow on a weather map. The amount of rain or snow is shown by different colors. Look at the radar image of the United States. This image was taken on September 5, 1996. You can see Hurricane Fran between North and South Carolina. Most of the country saw some rain that day, too. The scale to the left shows the level of rain or snow. Light rain is in light blue. Heavy rain is in red. Snow is in white.

**Directions:** Use the information from the radar image and what you read in *Weather Scientists* to answer the questions.

Circle light, moderate, or heavy to describe the rainfall in these states on September 5, 1996.

- |                   |       |          |       |
|-------------------|-------|----------|-------|
| 1. Oklahoma       | light | moderate | heavy |
| 2. North Carolina | light | moderate | heavy |
| 3. Oregon         | light | moderate | heavy |
| 4. Texas          | light | moderate | heavy |
| 5. Colorado       | light | moderate | heavy |

6. Name one state that does not show rain or snow.

7. About what percent of the country saw rain that day?    25%    50%    75%    100%

8. Do you believe any states may have seen tornadoes that day? Explain your answer.

## A Stroke of Lightning

According to *Weather Scientists*, there are two kinds of lightning. The most common is negative lightning. One of its bolts could light a 100-watt bulb for two months. Positive lightning has enough energy to light a 100-watt bulb for 95 years.

**Directions:** Use the information to calculate how long negative and positive lightning could light a 100-watt bulb.

### 1. Negative Lightning

Number of Bolts	Life of 100-watt Bulb
1	2 months
2	4 months
3	_____
4	_____
5	_____
10	_____
50	_____

### 2. Positive Lightning

Number of Bolts	Life of 100-watt Bulb
1	95 years
2	190 years
3	_____
4	_____
5	_____
10	_____
50	_____

- Lightning, on average, strikes the Earth 100 times per second. Calculate the life of a 100-watt bulb if it were powered by 100 negative lightning strikes.
- Calculate the life of a 100-watt bulb if it were powered by 100 strikes of positive lightning.
- There are 86,400 seconds in a day. 95% of lightning strikes are negative. On average, how many strikes per day are negative?
- 5% of lightning strikes are positive. On average, how many strikes per day are positive?
- How is this information important to scientists?

## Temperature Scale

Early thermometers did not all use the same units. Today people usually use two scales: Fahrenheit and Celsius. Both these scales were named after the men who created them. The United States is one of the only countries to continue using the Fahrenheit scale. Most scientific studies use the Celsius scale. If you know the temperature in one scale, you can figure out or convert the temperature to the other scale. Here's how.

To convert a Fahrenheit temperature to Celsius:  $(^{\circ}\text{F} - 32) \div 1.8 = ^{\circ}\text{C}$

Example:

The temperature is  $50^{\circ}\text{F}$ . Subtract:  $50 - 32 = 18$ . Divide:  $18 \div 1.8 = 10$ .  $50^{\circ}\text{F} = 10^{\circ}\text{C}$ .

To convert a Celsius temperature to Fahrenheit:  $(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$

Example:

The temperature is  $20^{\circ}\text{C}$ . Multiply:  $20 \times 1.8 = 36$ . Add:  $36 + 32 = 68$ .  $20^{\circ}\text{C} = 68^{\circ}\text{F}$ .

**Directions:** Use the formula above to convert these Fahrenheit temperatures to Celsius. Round the temperature to the nearest whole degree.

1.  $90^{\circ}\text{F}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{C}$

2.  $45^{\circ}\text{F}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{C}$

3.  $0^{\circ}\text{F}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{C}$

4.  $60^{\circ}\text{F}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{C}$

5.  $72^{\circ}\text{F}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{C}$

**Directions:** Use the formula above to convert these Celsius temperatures to Fahrenheit. Round the temperature to the nearest whole degree.

6.  $12^{\circ}\text{C}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{F}$

7.  $22^{\circ}\text{C}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{F}$

8.  $30^{\circ}\text{C}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{F}$

9.  $5^{\circ}\text{C}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{F}$

10.  $-5^{\circ}\text{C}$  \_\_\_\_\_ = \_\_\_\_\_  $^{\circ}\text{F}$

11. Which of the above measures are below freezing?

12. Why is it important to be able to convert from Fahrenheit to Celsius and from Celsius to Fahrenheit?

## Reader Quiz

**Directions:** Circle the best answer.

- Which of the following is NOT an instrument used to record the weather?  
a. thermometer      b. barometer      c. satellite      d. observatory
- What is used as the zero of both Fahrenheit and Celsius scales?  
a. They both use freezing points of water, fresh and salty.  
b. They both use a set level of mercury, one inch and one centimeter.  
c. They both use air pressure to decide the scale.  
d. They both set their scale by guessing.
- What did Ben Franklin study?  
a. the Gulf Stream      b. lightning      c. electricity      d. all of these
- What have scientists learned about lightning?  
a. It never strikes the same place twice.  
b. Lightning can be positive or negative.  
c. Lightning rods repel lightning.  
d. No one who is struck by lightning survives.
- According to the book, which is NOT a use for radar?  
a. tracking enemy planes during WWII  
b. measuring the temperature of the Earth  
c. detecting rain and snow  
d. finding and tracking cloud cover
- How did the work of Tetsuya Theodore Fujita help weather scientists?  
a. He discovered that several tornadoes can form from one cloud.  
b. He showed how satellites can be used to report the weather.  
c. He set a scale to measure the strength of a tornado.  
d. All of these.
- How does the work of past weather scientists help today's weather scientists? Use details and examples from the book to explain your answer.

## Weather Scientists Answer Key

### Caught on Radar

1. light
2. heavy
3. moderate
4. heavy
5. light and/or moderate
6. Any one: MN, IA, WI, MI, ME, VT, NH, MA, DE, CT (HI and AK unknown)
7. 50%
8. Accept all reasonable answers. Students may explain that twisters could have formed in the heavy rain in TX or NC.

### A Stroke of Lightning

1. Negative Bolts: 6 months; 8 months; 10 months; 20 months; 100 months
2. Positive Bolts: 285 years; 380 years; 475 years; 950 years; 4,750 years
3. 200 strikes
4. 9,500 years
5. 8,208,000 strikes
6. 432,000 strikes
7. Accept all reasonable answers. Example: They can predict where the most dangerous storms will be and warn people to stay safe.

### Temperature Scale

1. 32
2. 7
3. -18
4. 16
5. 22
6. 54
7. 72
8. 86
9. 41
10. 23
11. Questions 3 and 10
12. Accept all reasonable responses. Example: Scientists need one scale to compare experiment results.

### Reader Quiz

1. d
2. a
3. d
4. b
5. b
6. d
7. Accept all reasonable answers. Example: Today's weather scientists can use information from experiments to better predict the weather. For example, Tetsuya Theodore Fujita showed how studying data could help us know more about the weather.