LESSON OVERVIEW

Lesson 4a Explaining Relationships in Scientific and Technical Texts

Lesson Objectives

Explain the relationships or interactions between two or more . . . events, ideas, or concepts in a . . . scientific or technical text.

Reading

- Identify relationships between two or more events, ideas, or concepts in a scientific or technical text.
- Explain relationships between two or more events, ideas, or concepts in a scientific or technical text.

Writing

- Draw evidence from informational texts to support analysis and reflection.

Speaking and Listening

- Pose and respond to specific questions and contribute to discussions.
- Review the key ideas expressed and draw conclusions.

Language

- Use context as a clue to the meaning of a word or phrase.
- Acquire and use academic and domain-specific words and phrases.

Academic Talk

See **Glossary of Terms**, pp. TR2–TR9

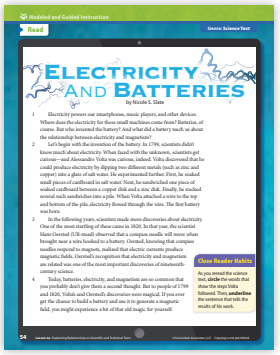
- relationship
- interaction
- scientific text
- technical text

Learning Progression

Grade 4	Grade 5	Grade 6
Students explain events, procedures, ideas, or concepts in a scientific or technical text, including what happened and why, based on specific information in the text.	Building on Grade 4, students draw on specific details to explain the relationships between events, ideas, or concepts in a scientific or technical text. The inclusion of scientific concepts and technical procedures points to the standards' focus on academic and domain-specific knowledge.	Grade 6 increases in complexity by requiring students to analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples).

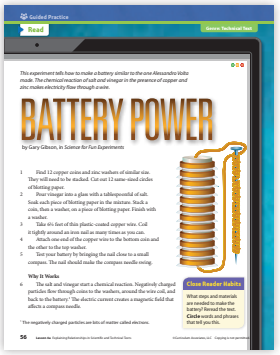
Lesson Text Selections

Modeled and Guided Instruction



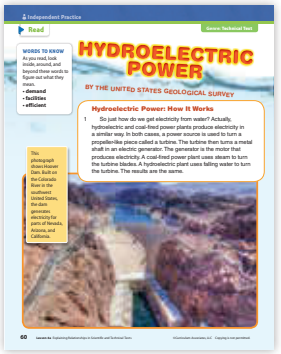
Electricity and Batteries
by Nicole S. Slate
Genre: Science Text

Guided Practice



Battery Power
by Gary Gibson
Genre: Technical Text

Independent Practice



Hydroelectric Power
by the United States Geological Survey
Genre: Technical Text

Lesson Pacing Guide

Whole Class Instruction *30–45 minutes per day*

Day 1

Teacher-Toolbox.com Interactive Tutorial

Check the Teacher Toolbox for Interactive Tutorials to use with this lesson.

Introduction pp. 52–53

- **Read** **Explaining Relationships in Scientific and Technical Texts** *10 min*
- **Think** *10 min*
  Graphic Organizer: Sequence Chart
- **Talk** *5 min*
  Quick Write (TRB) *5 min*

Day 2

Modeled and Guided Instruction pp. 54–55, 58

- **Read** **Electricity and Batteries** *10 min*
- **Think** *10 min*
  Graphic Organizer: Sequence Chart
- **Talk** *5 min*
- **Write** Short Response *10 min*

Day 3

Guided Practice pp. 56–57, 59

- **Read** **Battery Power** *10 min*
- **Think** *10 min*
- **Talk** *5 min*
- **Write** Short Response *10 min*

Day 4

Independent Practice pp. 60–65

- **Read** **Hydroelectric Power** *15 min*
- **Think** *10 min*
- **Write** Short Response *10 min*

Day 5

Independent Practice pp. 60–65

- *Review* Answer Analysis (TRB) *10 min*
- *Review* Response Analysis (TRB) *10 min*
- *Assign and Discuss* Learning Target *10 min*

Language Handbook
Lesson 22 Using a Thesaurus, pp. 480–481
20 min (optional)

Ready Writing Connection

During *Ready Reading* Days 1–5, use:

Lesson 1 Writing an Opinion: Letter to the Editor

- **Steps 6 and 7** **Revise**
- **Step 8** **Edit**
- **Prepare to Publish**
- **Collaborate**
- **Present**

See *Ready Writing TRB*, p. 1a for complete lesson plan.

Small Group Differentiation

Teacher-Toolbox.com

Reteach

Ready Reading Prerequisite Lessons

Grade 4

- Lesson 2 Understanding Historical Texts
- Lesson 3 Understanding Technical Texts
- Lesson 4 Understanding Scientific Texts
- Lesson 14 Text Structures, Part 1: Cause–Effect and Compare–Contrast
- Lesson 15 Text Structures, Part 2: Chronology and Problem–Solution

Teacher-led Activities

Tools for Instruction

- Text Structure

Personalized Learning

i-Ready.com

Independent

i-Ready Close Reading Lesson

- **Grade 5** Explaining Relationships in Scientific and Technical Texts

Get Started

- Explain to students that in this lesson they will read informational texts about electricity. As they read, they will identify and explain relationships between and among ideas and events.
- Ask students to state the meaning of *relationship*. Guide them to define it as "the connection between two or more things." Review:

  You are probably already familiar with cause–effect and compare–contrast relationships. There are other types of relationships, too, like steps in a process or problem–solution. When we think about relationships in a text, we think about how two or more details are connected.
- Work with students to review familiar examples of each type of relationship: a recipe has steps in a process; a "Frequently Asked Questions" (FAQ) guide can describe common problems and offer solutions. Encourage students to offer their own examples.
- Focus students' attention on the Learning Target. Read it aloud to set the purpose for the lesson.
- Display the Academic Talk words and phrases. Tell students to listen for these terms and their meanings as you work through the lesson together. Use the Academic Talk Routine on pp. A48–A49.

English Language Learners

- **Genre Focus**

Read

- Read aloud the Read section as students follow along. Restate to reinforce:

  There is an important difference between scientific texts and technical texts. A scientific text teaches you facts and ideas about our natural world. A technical text—like a set of instructions—teaches you how something works, or how to use, make, or do something.
- Have students read the passage. Remind them to underline parts of the text that describe connections between events and ideas.

RI.5.3 Explain the relationships or interactions between two or more . . . events, ideas, or concepts in a . . . scientific or technical text.

Lesson 4a
Explaining Relationships in Scientific and Technical Texts

Learning Target **Explaining the relationships or interactions between events and ideas will help you develop a deeper understanding of scientific or technical texts.**

Read When you read **scientific texts**, you learn about the natural world. If you read about why lightning strikes or how electricity works, you're reading a scientific text. When you read **technical texts**, you are learning to make or do something. If you read the directions for using a cell phone, you are reading a technical text. Both scientific and technical texts describe the **relationships** and **interactions** between events, ideas, or concepts.

Read the passage. Underline any relationships or details that seem important.

ELECTRICITY IN MOTION

You're pretty familiar with what electricity can do. You flip a switch and a light bulb glows. You push a button and a fan whirs to life. Turning on an electric oven makes it heat up. But why do you get these results? What do a glowing light bulb, a spinning fan, and a hot oven have in common?

The answer is current electricity, or the steady flow of bits of matter called electrons. You can't see electrons. They're so small that even the best microscopes won't show one to you. But while electrons aren't visible, you can see the effects of their motion. Light bulbs, fans, ovens—all of these work because you've let the electrons flow.

English Language Learners
Develop Language

- **Academic Vocabulary** Clarify for students that *relationship* is a multiple-meaning word. Invite students to share known meanings of the word. *("the way two people know one another, as in family members"; "two people romantically involved")* Record students' definitions on the board.
- Underline the words or concepts that the definitions have in common. Guide students to see that all relationships have to do with two or more things being connected somehow.
- Connect this meaning to the academic language, reviewing terms such as *cause-and-effect, compare-contrast, sequence, process,* and so forth.

Genre Focus
Technical Text

Explain that in Guided Practice and Independent Practice students will read technical texts. These types of informational texts often deal with subjects such as engineering, electronics, and architecture.

Typically, technical texts tell how things work or how to use, do, or make things. Examples include notes on scientific experiments, how-to manuals, directions, and procedures.

Technical texts often contain specialized vocabulary that is specific to the topic. For example, a recipe uses words like *cup, teaspoon, whip, grill, poach,* and *preheat*.

Think Consider what you know about scientific and technical texts. What process does the passage describe? How does one event lead to another? Complete the organizer, and then write a short explanation of what you learned about electricity.

Event 1	→	Event 2	→	Event 3
You flip a light switch.		Electrons start moving.		A light bulb comes on.

Explanation of the Process

By flipping a switch, you start the electrons moving. When the electrons are flowing, the light bulb shines. The electricity has given you light to see in a dark room.

Talk Share your explanation with a partner.

- What events do you include in your organizer?
- What kind of relationships do you see between one event and another?
- How does understanding one event help you understand another event?

Academic Talk

Use these words and phrases to talk about the text.

- relationship
- interaction
- scientific text
- technical text

Monitor Understanding

If... students struggle to identify relationships,

then... give an example. Tell students that yesterday you filled your teakettle with water, placed the kettle on the stove, and turned on the gas flame.

- **What do you think happened next?** *(The water in the teakettle boiled. The teakettle began to whistle.)*
- **Why did these events happen?** *(Heat causes water to boil and change to steam. When steam forces itself through the tiny hole in the cover over the teakettle's spout, it causes a whistling sound.)*

Ask students to provide their own examples.

Think

- Have students read aloud the Think section. Explain that the organizer will help them capture their thinking.
- Have partners complete the organizer. Remind students to use details from the passage to describe the events that happen as a result of flipping a light switch.
- As students work, circulate and provide assistance as needed.
- Ask volunteers to share what they wrote in their organizers.
- Make certain students understand that Event 1 causes Event 2 to happen, and Event 2 causes Event 3.

Talk

- Read aloud the Talk prompts.
- Have partners discuss and identify the type of relationship that exists between Events 1 and 2 and between Events 2 and 3. (*cause–effect*)
- Ask volunteers to share their ideas.

Quick Write Have students write a response to the following prompt:

Choose a process you go through each day, such as tying your shoes or getting ready for school. Write each step of the process and then explain why you go through the steps in the order you do.

Ask students to share their responses.

Monitor Understanding

Wrap Up

- Invite students to share what they've learned so far. Encourage them to use the Academic Talk words and phrases in their explanations.
- Explain to students that when they read scientific and technical texts, they discover connections, relationships, and interactions among scientific events and ideas.

In the next section, you'll read about how electricity, batteries, and magnetism are related. Explaining these relationships will help you better understand the information in the text.

Modeled and Guided Instruction

Get Started

Today you will read a science text. First, you'll read to understand the events that the author describes. Then you'll read to analyze connections between events and scientific ideas.

Read

- Read aloud the title of the text. Invite students to briefly share prior knowledge about what electricity and batteries are commonly used for.
- Have students read the text independently. Tell them to place a check mark above any confusing words and phrases as they read. Remind students to look inside, around, and beyond each unknown word to help them figure out its meaning. Use the Word Learning Routine on pp. A50–A51.
- When students have finished reading, clarify the meanings of words and phrases they still find confusing. Then use the questions below to check understanding. Encourage students to identify details in the text that support their answers.

  What materials did Volta use to create a battery? *(zinc and copper disks, salt water, cardboard, and wire)*

  What did Oersted discover? *(that electricity and magnetism are connected; that a compass needle reacts to the electrical current in a battery's wire)*

English Language Learners

Word Learning Strategy

Explore

- Read aloud the Explore question at the top of p. 55 to set the purpose for the second read. Tell students they will need to take a closer look at the connections between batteries and magnetism to answer this question.
- Have students read aloud the Close Reader Habit on p. 54.

TIP Tell students that often they will also need to make inferences, or educated guesses, to link events, facts, and ideas.

Read

Genre: Science Text

Electricity and Batteries

by Nicole S. Slate

1 Electricity powers our smartphones, music players, and other devices. Where does the electricity for these small machines come from? Batteries, of course. But who invented the battery? And what did a battery teach us about the relationship between electricity and magnetism?

2 Let's begin with the invention of the battery. In 1799, scientists didn't know much about electricity. When faced with the unknown, scientists get curious—and Alessandro Volta was curious, indeed. Volta discovered that he could produce electricity by dipping two different metals (such as zinc and copper) into a glass of salt water. He experimented further. First, he soaked small pieces of cardboard in salt water. Next, he sandwiched one piece of soaked cardboard between a copper disk and a zinc disk. Finally, he stacked several such sandwiches into a pile. When Volta attached a wire to the top and bottom of the pile, electricity flowed through the wire. The first battery was born.

3 In the following years, scientists made more discoveries about electricity. One of the most startling of these came in 1820. In that year, the scientist Hans Oersted (UR-stead) observed that a compass needle will move when brought near a wire hooked to a battery. Oersted, knowing that compass needles respond to magnets, realized that electric currents produce magnetic fields. Oersted's recognition that electricity and magnetism are related was one of the most important discoveries of nineteenth-century science.

4 Today, batteries, electricity, and magnetism are so common that you probably don't give them a second thought. But to people of 1799 and 1820, Volta's and Oersted's discoveries were magical. If you ever get the chance to build a battery and use it to generate a magnetic field, you might experience a bit of that old magic for yourself.

Close Reader Habits

As you reread the science text, **circle** the words that show the steps Volta followed. Then, **underline** the sentence that tells the results of his work.

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English Language Learners

Build Meaning

Visual Aids To help students understand the words *sandwiched* and *sandwiches* in the article, have them study the illustration on p. 56.

How is this like a sandwich? How is it like Volta's battery? *(A sandwich has stacks of ingredients. Volta's battery had stacks of different metals and soaked cardboard.)*

- Have students form trios and create hand "sandwiches." Student A places one hand flat on a desktop, B places a hand on top of A's hand, and C places a hand on top of B's. They then repeat the process to form an ABCABC "sandwich" of hands.

Word Learning Strategy

Use Context Clues

- Direct students' attention to the word *devices* in the first sentence.

  What do you think *devices* means? What clues help you figure this out?
- Guide students to find the examples *smartphones* and *music players* as well as the synonymous phrase *small machines*. Help them infer that *device* can mean "a small machine." Have students name other battery-powered devices, such as watches and remote controls.
- Remind students that one type of context clue is a synonym, a word or phrase with a similar meaning. Another type is an example.

Explore How does explaining the discoveries of Volta and Oersted add to your understanding of electricity?

Paragraphs 2 and 3 don't just describe two discoveries. They tell you how the second one depended on the first.

Think

1 Complete this organizer for the important events in paragraphs 2 and 3.

Event 1	Event 2	Event 3
Volta put small pieces of cardboard between disks of copper and zinc and stacked several of them together.	Electricity flowed through a wire attached to the top and bottom of the stack, making a battery.	Oersted discovered that a compass needle moves if it is near a wire connected to a battery.

Talk

2 Share your organizers. Discuss the events you describe and how they are related. Revise your organizers as necessary.

Write

3 **Short Response** Explain how Volta's discovery led to Oersted's discovery. Use details from the text to support your answer. Use the space provided on page 58 to write your answer.

HINT Don't just describe what Volta and Oersted discovered. Explain how Oersted's discovery depended on Volta's.

Think Aloud

- Event 1 has already been provided in the organizer. It says that *Volta put small pieces of cardboard between disks of copper and zinc and stacked several of them together.*
- I need to go back to the text to figure out what happened immediately after Event 1.
- What happened as a result of Volta's idea to stack the metals and cardboard? The second-to-last sentence in paragraph 2 tells me the answer: "When Volta attached a wire to the top and bottom of the pile, electricity flowed through the wire." I'll write about electricity flowing in the *Event 2* box.

Think

- Read aloud the Think section. Explain to students that you will model how to find text evidence to fill in part of the organizer. Use the **Think Aloud** below to guide your modeling.
- Revisit the Explore question. Guide students to determine that they need to look for more details, using the Close Reader Habit.
- Encourage students to work with a partner to continue rereading the passage and complete the organizer. Remind them that the Buddy Tip will help them find the information they need.
- Ask volunteers to share their completed organizers.
- Guide students to see that the first two events led to the third. First, Volta invented a battery. As a result, Oersted discovered the connection between electricity and magnetism.

Talk

- Read aloud the Talk prompt.
- Have partners respond to the prompt. Use the Talk Routine on pp. A52–A53.
- Circulate to check that students are using details from their partners' organizers to improve their own.

Write

- Ask a volunteer to read aloud the Write prompt.
- Invite a few students to tell what the prompt is asking them to do.
- Make sure students understand that they need to show how Oersted's discovery was a result of Volta's invention.
- Have students turn to p. 58 to write their responses.
- Use Review Responses on p. 58 to assess students' writing.

Wrap Up

- Ask students to recall the Learning Target. Have them explain how looking closely at relationships between events and interactions among materials (such as zinc, copper, salt water, cardboard, and wire) helped them better understand this scientific text.

Guided Practice

Get Started

Today you will read a technical text. First you will read to understand what the text is about. Then you will reread with a partner to make sure you fully understand the steps of the procedure.

Read

- Read aloud the short introduction and the title of the text. Have students predict what the text will be about based on the introduction, the genre, the title, and the illustration.
- **Read to Understand** Have students read the text independently. Tell them to place a check mark above any confusing words and phrases as they read. Remind students to look inside, around, and beyond each unknown word or phrase to help them figure out its meaning. Use the Word Learning Routine on pp. A50–A51.
- When students have finished reading, clarify the meanings of words and phrases they still find confusing. Then use the questions below to check understanding. Encourage students to identify details in the text that support their answers.

  What materials do you need to create this kind of battery? *(12 copper coins, 12 zinc washers, 12 circles of blotting paper, salt, vinegar, wire, and an iron nail)*

  Describe the stack that the instructions and the illustration tell you how to make. *(Stack a coin, then a washer, on a piece of blotting paper 12 times; end with a zinc washer on top.)*

  What should you do after you have created the stack of 36 items? *(Coil a long piece of wire many times around a nail. Attach the ends of the wire to the top washer and the bottom coin.)*

English Language Learners

Word Learning Strategy

- **Read to Analyze** Read aloud the Close Reader Habit on p. 56 to set the purpose for the second read. Then have students reread the text with a partner and discuss any questions they might have.

Guided Practice

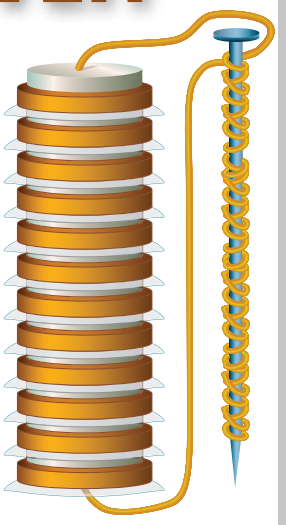
Read

Genre: Technical Text

This experiment tells how to make a battery similar to the one Alessandro Volta made. The chemical reaction of salt and vinegar in the presence of copper and zinc makes electricity flow through a wire.

BATTERY POWER

by Gary Gibson, in *Science for Fun Experiments*



1 Find 12 copper coins and zinc washers of similar size. They will need to be stacked. Cut out 12 same-sized circles of blotting paper.

2 Pour vinegar into a glass with a tablespoonful of salt. Soak each piece of blotting paper in the mixture. Stack a coin, then a washer, on a piece of blotting paper. Finish with a washer.

3 Take 6½ feet of thin plastic-coated copper wire. Coil it tightly around an iron nail as many times as you can.

4 Attach one end of the copper wire to the bottom coin and the other to the top washer.

5 Test your battery by bringing the nail close to a small compass. The nail should make the compass needle swing.

Why It Works

6 The salt and vinegar start a chemical reaction. Negatively charged particles flow through coins to the washers, around the wire coil, and back to the battery.[1] The electric current creates a magnetic field that affects a compass needle.

[1] The negatively charged particles are bits of matter called *electrons*.

Close Reader Habits

What steps and materials are needed to make the battery? Reread the text. **Circle** words and phrases that tell you this.

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English Language Learners

Develop Language

Act It Out Have students demonstrate and describe the meanings of the verbs *blot* and *coil*.

- Dribble some water on a desktop. Ask a volunteer to blot the water with a paper towel or tissue. Say, and have students repeat: **[Student] used a [paper towel] to blot the water. The [paper towel] soaked up the water.**
- Use the illustration on p. 56 and a coiling gesture to have students demonstrate and describe the meaning of *coil*. Encourage them to describe other coiled objects they know, such as a coiled rope or a coiled snake.

Word Learning Strategy

Use Context Clues

- Point out the word *charged* in the last paragraph.

  What does the word *charged* means as it is used in this sentence? *(having an electric charge; containing flowing electrons)*

  What context clues help you figure out its meaning? *("particles flow through coins . . . and back to the battery"; "electric current"; "bits of matter called* electrons*")*
- Remind students that when they encounter multiple-meaning words, they should analyze how the word is used in the text to determine its correct meaning in that instance.

Think

Use what you learned from reading the technical text to respond to the following questions.

Read all the directions to understand what you're making or doing. Then reread and picture what happens at each step.

1 This question has two parts. Answer Part A. Then answer Part B.

Part A

Which statement **best** describes how an electric current affects a compass?

- **A** The electric current goes from the wire into the compass.
- **B** The electric current works only with thin copper wire.
- **C** The electric current makes the compass needle move.
- **D** The electric current causes the nail to swing near the compass.

Part B

Which **two** sentences **best** show the relationship made in Part A?

- **A** "Pour vinegar into a glass with a tablespoonful of salt."
- **B** "Coil it tightly around an iron nail as many times as you can."
- **C** "Attach one end of the copper wire to the bottom coin and the other to the top washer."
- **D** "The nail should make the compass needle swing."
- **E** "The salt and vinegar start a chemical reaction."
- **F** "The electric current creates a magnetic field that affects a compass needle."

Talk

2 Reread the steps to make and test the battery. Why is it important to follow the steps in the order? What would happen if you didn't, or if you used different materials? Write notes from your discussion.

Write

3 **Short Response** Explain why it is important to follow the steps in order and use the proper materials. Use details from the text to support your answer. Use the space provided on page 59 to write your answer.

HINT Don't just describe the steps and materials. Explain why the steps and specific materials are necessary.

● Integrating Standards

Use these questions to further students' understanding of the text.

- **Summarize the purpose of the experiment. Explain how you can tell whether the experiment is a success.** *(The purpose is to create a working battery. It is successful if the battery causes the needle of a compass to move.)* ***DOK 3***
- **How does the author organize information in this text?** *(The author lists the instructions in a sequence, beginning with the first step in the process and ending with the last step.)* ***DOK 3***

● Monitor Understanding

If... students have difficulty answering Part B of item 1,

then... remind them that this answer depends on identifying the correct answer to Part A. To answer Part B, students should pick the two sentences that are most closely related to answer choice C of Part A, which reads "The electric current makes the compass needle move." Guide students to see that in Part B, sentences D and F relate most closely to this description because both mention the compass needle.

Think

- Have students work with a partner to complete item 1. Draw attention to the boldface words in each part.

TIP If students have trouble answering Part A, explain that the word *affects* means "causes to change in some way."

Answer Analysis

When students have finished, discuss correct and incorrect responses.

1 **Part A**

The correct choice is C. Paragraphs 5 and 6 describe the effect of an electric current on a compass needle.

- **A** and **B** do not tell how a battery's electric current affects a compass. **D** gives incorrect information—the nail does not swing.

Part B

The correct choices are D and F. These sentences are from paragraphs 5 and 6, which describe the effect of an electric current on a compass needle.

- **A, B, C,** and **E** are either unrelated or not closely related to the statement *The electric current makes the compass needle move.*

DOK 3

● Monitor Understanding

● Integrating Standards

Talk

- Have partners discuss the prompt. Emphasize that students should support their ideas with text details and take notes on their discussion.
- Circulate to clarify misunderstandings.

Write

- See p. 59 for instructional guidance.

Wrap Up

- Ask students to recall the Learning Target. Have them discuss the interactions among the battery's materials (the ways that the materials affect one another to produce an electric charge). Discuss how looking closely at these interactions helps them better understand this technical text.

Modeled and Guided Instruction

Write

- Remember to use the Response-Writing Routine on pp. A54–A55.

Review Responses

After students complete the writing activity, help them evaluate their responses.

3 Responses may vary but should show that students realize Oersted could not have observed a compass needle responding to a battery if the battery had not been invented. See the sample response on the student book page. ***DOK 3***

Write **Use the space below to write your answer to the question on page 55.**

Electricity and Batteries

3 **Short Response** Explain how Volta's discovery led to Oersted's discovery. Use details from the text to support your answer.

HINT Don't just describe what Volta and Oersted discovered. Explain how Oersted's discovery depended on Volta's.

Sample response: When Alessandro Volta invented the battery in 1799, he produced an object that could make electricity flow through a wire. Years later, in 1820, Hans Oersted saw that the needle of a magnetic compass will move when brought near a wire hooked up to a battery. This observation suggested that electricity flowing through the wire could produce a magnetic force. This observation led Oersted to discover that the forces of electricity and magnetism are closely related. Without Volta's invention of the battery in 1799, Oersted might not have made his discovery about electricity and magnetism.

Don't forget to check your writing.

Scaffolding Support for Reluctant Writers

If students are having a difficult time getting started, use the strategies below. Work individually with struggling students, or have students work with partners.

- Circle the verbs in the prompt that tell you what to do, such as *describe*, *explain*, or *compare*.
- Underline words and phrases in the prompt that show what information you need to provide in your response, such as *causes*, *reasons*, or *character traits*.
- Talk about the details from the text that you will include in your response.
- Explain aloud how you will respond to the prompt.

Write Use the space below to write your answer to the question on page 57.

BATTERY POWER

3 **Short Response** Explain why it is important to follow the steps in order and use the proper materials. Use details from the text to support your answer.

HINT Don't just describe the steps and materials. Explain why the steps and specific materials are necessary.

Sample response: Following the steps in the order they appear in "Battery Power" produces a working battery. If a step is done out of order, then the experiment might fail. As for why specific materials are needed, the section "Why It Works" explains it. This section says that the salt and vinegar start a chemical reaction with the copper coins and zinc washers. This reaction lets "charged particles" flow, producing an electric current in the wire. If other sorts of materials are used, the chemical reaction might not happen and electricity won't flow. *(DOK 3)*

Check Your Writing

- ☐ Did you read the prompt carefully?
- ☐ Did you put the prompt in your own words?
- ☐ Did you use the best evidence from the text to support your ideas?
- ☐ Are your ideas clearly organized?
- ☐ Did you write in clear and complete sentences?
- ☐ Did you check your spelling and punctuation?

Teacher Notes

Write

- Ask a volunteer to read aloud the Write prompt.
- Invite students to tell what the prompt is asking them to do. Make sure they understand that they need to explain why getting the correct result depends on using the proper materials and following the order of the steps described.
- Call attention to the HINT.
- Remember to use the Response-Writing Routine on pp. A54–A55.

Review Responses

After students complete the writing activity, help them evaluate their responses.

3 Responses may vary but should demonstrate understanding that all the materials must be aligned precisely for the battery to work. See the sample response on the student book page. ***DOK 3***

Independent Practice

Get Started

Today you are going to read another technical text. As you read, look for relationships among steps in the process of using water to create electric power.

- Ask volunteers to state why explaining relationships between steps in a process can help readers understand that process more deeply. Encourage students to use the Academic Talk words and phrases in their responses.

English Language Learners

Read

You are going to read the text independently and use what you have learned to think and write about the text. As you read, remember to look closely at details to identify the steps involved in creating hydroelectric power. Also pay attention to the relationships, or connections, between steps or events.

- Read aloud the title of the passage and then encourage students to preview the text, paying close attention to the photograph and the diagrams. Help students infer that the word part *hydro-* means "water."
- Call attention to the Words to Know in the upper left of p. 60. Remind students to use the Glossary of Words to Know in the back of the Student Book if they struggle to determine meaning from context, or to confirm their understanding of the word.
- If students need support in reading the passage, you may wish to use the Monitor Understanding suggestions.
- When students have finished, have them complete the Think and Write sections.

Monitor Understanding

Read

Genre: Technical Text

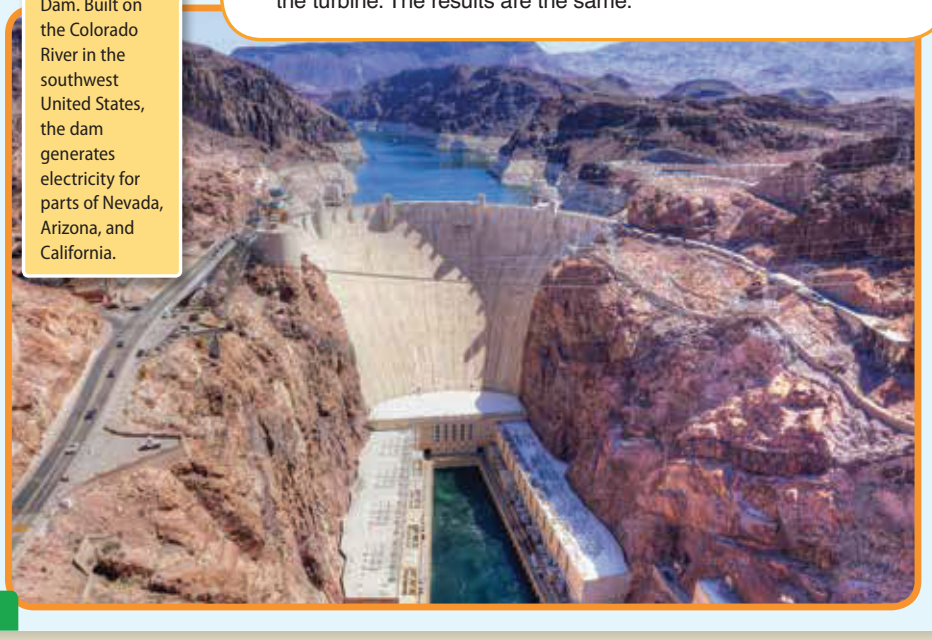
WORDS TO KNOW
As you read, look inside, around, and beyond these words to figure out what they mean.
- **demand**
- **facilities**
- **efficient**

HYDROELECTRIC POWER

BY THE UNITED STATES GEOLOGICAL SURVEY

Hydroelectric Power: How It Works

1 So just how do we get electricity from water? Actually, hydroelectric and coal-fired power plants produce electricity in a similar way. In both cases, a power source is used to turn a propeller-like piece called a turbine. The turbine then turns a metal shaft in an electric generator. The generator is the motor that produces electricity. A coal-fired power plant uses steam to turn the turbine blades. A hydroelectric plant uses falling water to turn the turbine. The results are the same.



This photograph shows Hoover Dam. Built on the Colorado River in the southwest United States, the dam generates electricity for parts of Nevada, Arizona, and California.

English Language Learners

Build Meaning

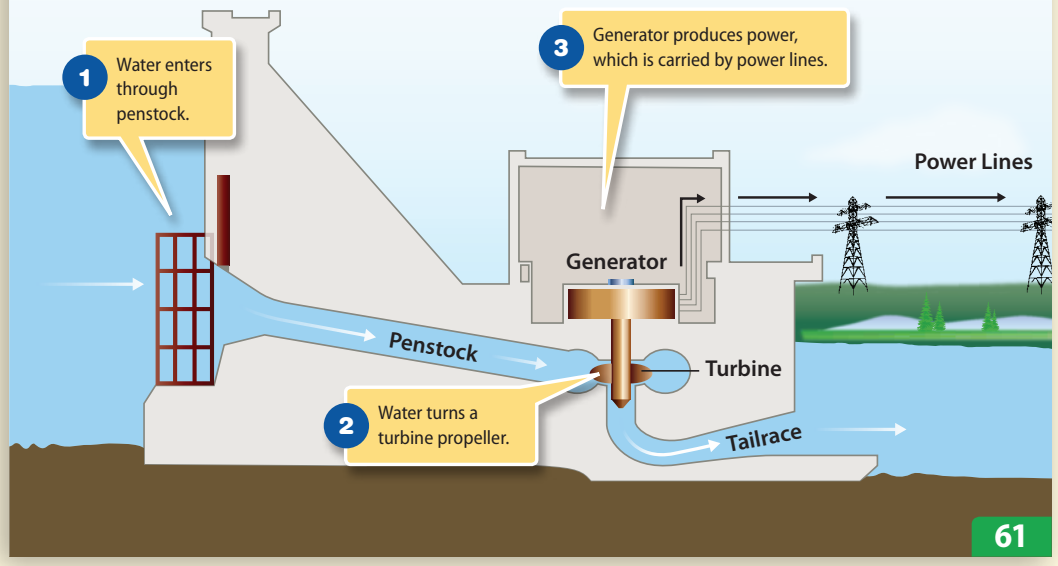
Preview Illustrations Have students preview the visuals that accompany the text in "Hydroelectric Power." Begin by having them describe what they see in the photograph on p. 60. Then guide discussion with the following questions:

- **Where can you see water in the photograph?**
- **What structure is in front of the higher body of water in the photograph?**
- **Where do you see the same structure in the diagram on p. 61?**
- **What questions do you have about this structure?**

List students' questions. Then read aloud the first two sentences on p. 61 to make certain students have a firm understanding of the words *dam* and *reservoir.*

2 A typical hydroelectric dam is built on a large river with a large drop in elevation. The dam stores lots of water behind it in the reservoir. Near the bottom of the dam wall there is the water intake called a penstock. Gravity causes the water to fall through the penstock inside the dam. At the end of the penstock, there is a turbine propeller, which is turned by the moving water. The shaft from the turbine goes up into the generator, which produces the power.[1] Power lines connected to the generator carry electricity to your home and mine. The water continues past the propeller through the tailrace. The water then flows into the river, past the dam. By the way, it is not a good idea to be playing in the water right below a dam when water is released!

[1] For the generator to produce electricity, loops of wire must spin rapidly through force fields made by magnets.



Monitor Understanding

If… students struggle to read and understand the passage,

then… use these scaffolding suggestions:

Question the Text Preview the text by asking the following questions:

- **Based on the title and text features, what do you predict this text will be about?**
- **What questions do you have about the text?**

Vocabulary Support Define specialized terms that may interfere with comprehension, such as *coal-fired, power source, propeller, turbine, shaft,* and *generator.*

Read Aloud Read aloud the text with students. You could also have students chorally read the text in a small group.

Check Understanding Use the questions below to check understanding. Encourage students to cite details in the text and illustrations that support their answers.

- **What happens after moving water turns the propeller?** *(The moving propeller spins the turbine shaft in a generator.)*
- **Where does the electric power go after the generator creates it?** *(It travels over power lines to homes and businesses.)*
- **What is the text mainly about?** *(how people use huge dams to create hydroelectric power)*

Independent Practice

Integrating Standards

After students have read the text, use these questions to discuss the text with them.

- **Compare the photograph on p. 60 to the diagram on p. 61. Where in the photograph do you think the penstock and the tailrace are located?**

  (The penstock is probably located near the bottom of the water in the reservoir behind the dam; its entrance is probably near the bottom on the side of the dam that we cannot see in the photograph. The tailrace is probably located at the dam end of the rectangular pool shown at the bottom of the photograph.)
  DOK 3

- **Reread the footnote on p. 61. What do you think causes the loops of wire to "spin rapidly through force fields"? Explain why you think your answer is correct.**
  (The force produced by the turbine's moving propeller and shaft probably causes the loops to spin. I think so because the text says, "The shaft from the turbine goes up into the generator, which produces the power." Then the footnote gives more details about how *the generator creates power. I think the shaft spins inside the generator and causes the wire loops to spin.)*
  DOK 3

- **What reasons does the author use to show why pumped storage makes hydroelectric plants efficient?**

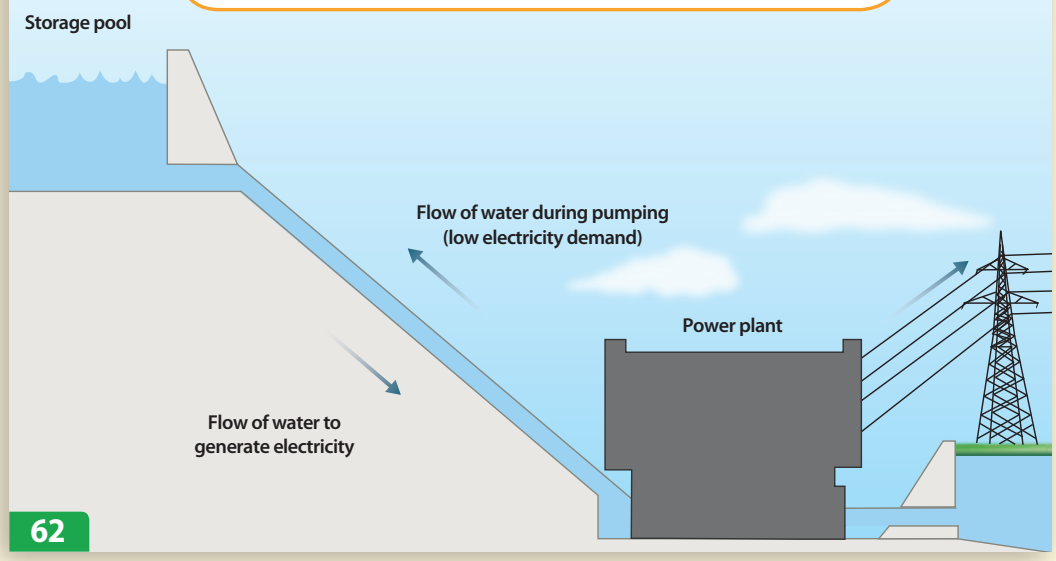
  (The author tells how hydroelectric plants are able to produce power differently at different times of the day. The plants store water in reserve pools when demand is low; they reuse this water to produce more power when demand is high.)
  DOK 3

Theme Connection

Pumped Storage: Reusing Water for Peak Electricity Demand

3 Demand for electricity is not "flat" and constant. Demand goes up and down during the day. Overnight there is less need for electricity in homes, businesses, and other facilities. For example, at 5:00 PM on a hot August weekend day, there may be a huge demand for electricity to run millions of air conditioners! But, 12 hours later at 5:00 AM . . . not so much. Hydroelectric plants are more efficient at providing for peak power demands during short periods than are fossil fuel and nuclear power plants. One way of doing that is by using "pumped storage," which uses the same water more than once.

4 Pumped storage is a method of keeping water in reserve for peak periods of power demand. Pumps move water that had already flowed through the turbines back up to a storage pool above the power plant. That happens when customer demand for energy is low, such as during the middle of the night. The water is then allowed to flow back through the turbine-generators at times when electricity demand is high.



Theme Connection

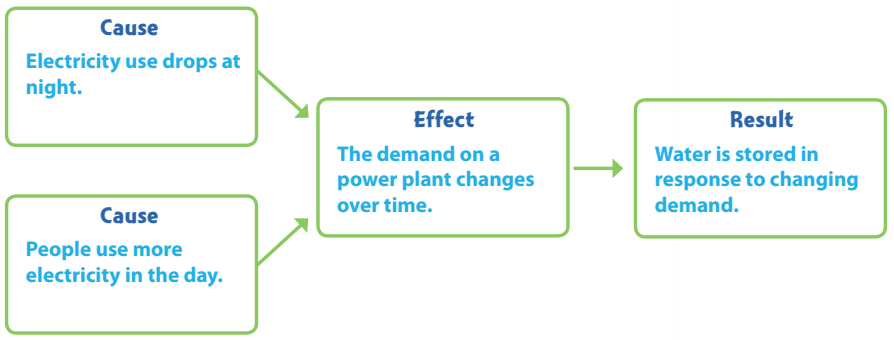
- Remind students that the theme of this lesson is It's Electric.
- Display a four-column chart on a whiteboard. Label each column with the passage titles, including "Introduction" for the short passage on p. 52.
- Ask students to recall facts and ideas they learned from each passage. List their responses in the appropriate column.
- Ask students to explain how all of the passages relate to the theme of electricity.

Think Use what you learned from reading the technical text to respond to the following questions.

1 The boxes below describe four events from "Hydroelectric Power." Two events are causes, one event is an effect, and one event results from that effect. The events are in no particular order.

Water is stored in response to changing demand.	People use more electricity in the day.	The demand on a power plant changes over time.	Electricity use drops at night.

Complete the diagram below by copying each event in the correct box.



2 Which sentence describes a way hydroelectric plants are better than other power plants?

- **A** "Actually, hydroelectric and coal-fired power plants produce electricity in a similar way."
- **B** "A typical hydroelectric dam is built on a large river with a large drop in elevation."
- **C** "Overnight there is less need for electricity in homes, businesses, and other facilities."
- **D** "Hydroelectric plants are more efficient at providing for peak power demands during short periods than are fossil fuel and nuclear power plants."

Monitor Understanding

If... students struggle to complete the items,

then... you may wish to use the following suggestions:

Read Aloud Activities

- As you read, have students note any unfamiliar words or phrases. Clarify any misunderstandings.
- Discuss each item with students to make certain they understand the expectation.

Reread the Text

- Have students complete a *What Happens? and Why?* chart as they reread. For example: What Happens? *Water flows from the reservoir at the top of the dam into the penstock.* Why? *The penstock slants downhill, so gravity causes water to flow into the penstock and down, like a child sliding down a slide.*
- Have partners ask each other questions to clarify parts of the process that they do not understand.

Think

- Use the Monitor Understanding suggestions to support students in completing items 1–4.

Monitor Understanding

Answer Analysis

When students have finished, discuss correct and incorrect responses.

1 **See the answers on the student book page.** Discuss students' answers to make sure they understand which events lead to other events. Remind students that this item simulates drag-and-drop items they may see on a computer-based assessment.
DOK 3

2 **The correct choice is D.** This is the only choice that clearly describes an advantage that hydroelectric plants have over other types of power plants.

- **A** only mentions a similarity between hydroelectric and coal-fired power plants.
- **B** describes a characteristic of a hydroelectric plant, but it does not say whether that characteristic makes it better than other power plants.
- **C** does not describe power plants, just the facilities that rely on them to produce electricity.

DOK 1

Independent Practice

3 Part A

The correct choice is C. This sentence provides the best summary of the process.

- **A** and **D** each describe only one aspect of the process.
- **B** is factual, but it describes a coal-fired electric plant, not a hydroelectric one.

Part B

The correct choices are C and D. These sentences are most closely related to answer choice C in Part A.

- **A**, **B, E,** and **F** are either unrelated or not very closely related to the statement in answer choice C in Part A.

DOK 3

4 The correct choice is C. The quotation implies that a turbine "turns like a wheel."

- **A** is incorrect—a turbine is not a natural force; it is man-made.
- **B** is incorrect—a turbine is not an intake valve or a gate.
- **D** is incorrect—a turbine is part of a machine, but it does not carry things to different places.

DOK 2

3 This question has two parts. First, answer Part A. Then answer Part B.

Part A

Select the statement that **best** describes how water produces electricity.

- **A** Water is stored during periods when electricity is not needed.
- **B** A coal-fired power plant turns steam into electricity.
- **C** Moving water turns a turbine within a generator.
- **D** A penstock is needed to create electricity from water.

Part B

Which **two** sentences from the text **best** show the relationship described in Part A?

- **A** "Actually, hydroelectric and coal-fired power plants produce electricity in a similar way."
- **B** "The generator is the motor that produces electricity."
- **C** "A hydroelectric plant uses falling water to turn the turbine."
- **D** "A typical hydroelectric dam is built on a big river with a large drop in elevation."
- **E** "Power lines connected to the generator carry electricity to your home and mine."
- **F** "Pumps move water that had already flowed through the turbines back up to a storage pool above the power plant."

4 Read the sentence from the text.

The turbine then turns a metal shaft in an electric generator.

Which dictionary entry **best** defines turbine?

- **A** a natural force that causes things to fall
- **B** a gate for regulating the flow of water
- **C** an engine with a part that turns like a wheel
- **D** a machine for carrying things to different levels in a building

Monitor Understanding

If… students don't understand the writing task,

then… read aloud the writing prompt. Use the following questions to help students get started.

- **What is the prompt asking you to write about?**
- **Do you need to reread the text to find more information?**
- **How will you identify the information you need to include?**

- Have partners talk about how they will organize their responses.
- Provide a graphic organizer to assist students, if needed.

Write

5 **Short Response** Explain the role that gravity plays in a hydroelectric dam's ability to produce electricity. Use details from the text to support your answer.

Sample response: Gravity begins the whole process of creating electricity in a hydroelectric dam. Gravity causes water to move downward. Paragraph 2 explains, "gravity causes the water to fall through the penstock." Then the moving water turns the "turbine propeller." The turbine moves inside the generator, which produces electricity.

Learning Target

In this lesson, you practiced explaining the relationships and interactions between events and ideas in scientific and technical texts. Explain how your work has prepared you to read other scientific or technical texts.

Responses will vary, but students should identify that looking for and explaining the relationships or interactions of events and ideas helps them understand what scientific and technical texts are trying to tell them.

5 2-Point Writing Rubric

Points	Focus	Evidence	Organization
2	My answer does exactly what the prompt asked me to do.	My answer is supported with plenty of details from the text.	My ideas are clear and in a logical order.
1	Some of my answer does not relate to the prompt.	My answer is missing some important details from the text.	Some of my ideas are unclear and out of order.
0	My answer does not make sense.	My answer does not have any details from the text.	My ideas are unclear and not in any order.

Write

- Tell students that using what they read, they will compose a short response to the writing prompt.

Monitor Understanding

Review Responses

After students have completed the writing activity, help them evaluate their responses.

5 Display or pass out copies of the **2-Point Writing Rubric** on p. TR10. Have students use the rubric to individually assess their writing and revise as needed.

When students have finished their revisions, evaluate their responses. Answers will vary but should use details from the text to explain gravity's role. See the sample response.
DOK 3

Wrap Up

Learning Target

- Have each student respond in writing to the Learning Target prompt.
- When students have finished, have them share their responses. This may be done with a partner, in small groups, or as a whole class.