Level U/50

Working with Electricity and Magnetism

NAVIGATORS
TEACHER'S GUIDE

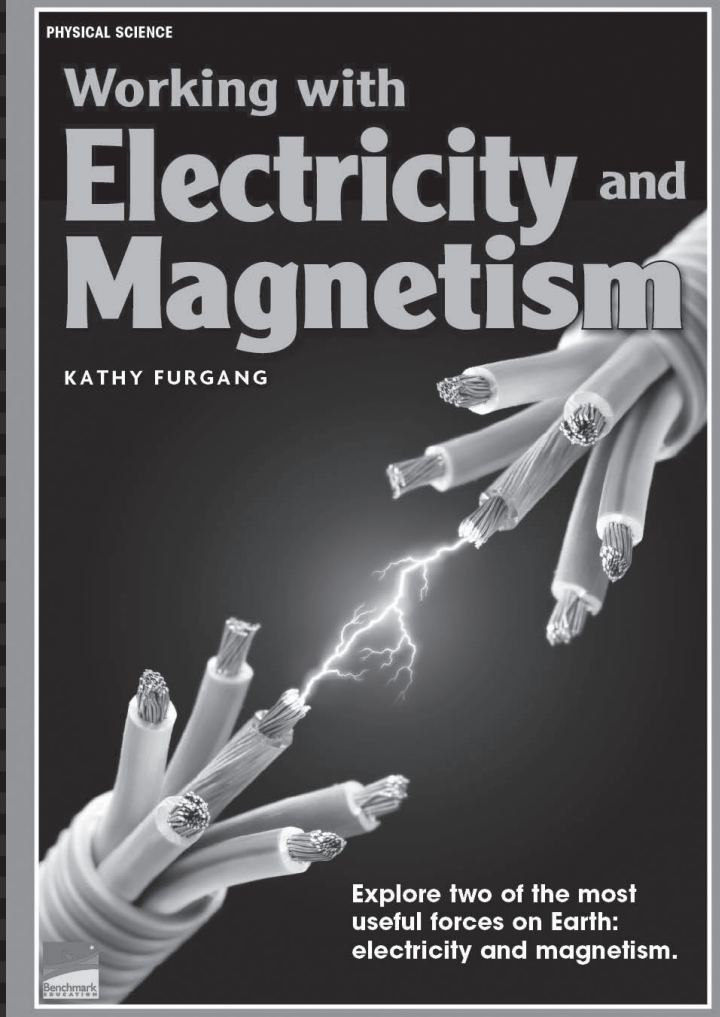
Skills & Strategies

Anchor Comprehension Strategies
- **Identify Cause and Effect**
- **Compare and Contrast**

Comprehension
- Determine text importance
- Draw conclusions
- Use graphic features to interpret information

Vocabulary/Word Study Staregy
- Context clues to determine word meaning

How-To



Themes
- **Sequence**
- **Transfer of Energy**
- **Natural Resources**

ISBN 978-1-4108-1132-5

BENCHMARK EDUCATION COMPANY

Lesson at a Glance

Before Reading (page 3)
- Build Background
- Introduce the Book
- Administer Preassessment

During Reading (pages 4–10)

Chapter 1 (pages 4–6)
- Model Metacognitive Strategy: Determine Text Importance
- Set a Purpose for Reading
- Discuss the Reading
- Model Comprehension Strategy: Cause and Effect
- Use Graphic Features to Interpret Information: Illustrations

Chapter 2 (pages 7–8)
- Apply Metacognitive Strategy: Determine Text Importance
- Set a Purpose for Reading
- Discuss the Reading
- Guide Comprehension Strategy: Cause and Effect
- Use Context Clues to Determine Word Meaning: Definitions

Chapters 3–4 (pages 9–10)
- Apply Metacognitive Strategy: Determine Text Importance
- Set a Purpose for Reading
- Discuss the Reading
- Apply the Comprehension Strategy: Cause and Effect
- Use Context Clues to Determine Word Meaning: Definitions

After Reading (page 11)
- Administer Posttest
- Synthesize Information: Compare and Contrast and Draw Conclusions

Writing Workshop (pages 12–13)
- Model the Writing Process: Write a Cause-and-Effect Paragraph

Identify Cause and Effect (page 14)

Use Context Clues to Determine Word Meaning (page 15)

Cause and Effect (page 16)

Sample Lesson Planning Guide

Navigators Lesson Guides provide flexible options to meet a variety of instructional needs. Here is one way to structure this lesson.

Day	Activities		
1	Build background: quick-write about what students know about electricity	Introduce/preview the book: table of contents, skim the chapters, locate boldface words in the glossary	
2	Model metacognitive strategy: determine text importance	Model comprehension strategy: identify cause and effect	Use graphic features to interpret information: illustrations
3	Apply metacognitive strategy: determine text importance	Guide comprehension strategy: identify cause and effect	Use context clues to determine word meaning: definitions
4	Apply metacognitive strategy: determine text importance (several important ideas)	Apply comprehension strategy: identify cause and effect	Use context clues to determine word meaning: definitions
5	Compare and contrast static and current electricity Research and draw conclusions	Draw conclusions	

Additional Related Resources

Notable Trade Books for Read-Aloud
- Adamczyk, Peter. *Electricity and Magnetism* (Usborne Understanding Science). EDC Publications, 1994.
- Angliss, Sarah. *Electricity and Magnets.* Larousse Kingfisher Chambers, 2001.
- Ten, Arnie. *Simple Attractions* (Phantastic Physical Phenomena Series). WH Freeman, 1995.

Web Site for Content Information
- Teach-Nology http://www.bestteachersites.com/themes/science/magnets/

Teach-Nology provides teachers with lesson plans, work sheets, bulletin board ideas, resource materials, downloads, and activities for teaching about electricity and magnetism.

ISBN: 978-1-4108-1132-5

Before Reading

Build Background

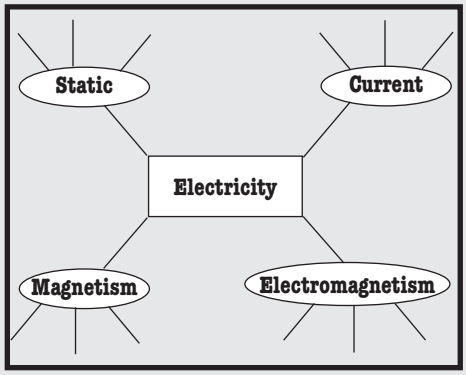
- Say: *For the next two minutes, write down everything you know about electricity.*
- At the end of two minutes, display the graphic organizer shown on the top of this page. Read the labels together with students.
- Let students then share their thoughts about electricity. Ask: *Did anyone write anything that matches one of the topics on the web?*
- List students' ideas in their appropriate places on the web.

Introduce the Book

- Give students a copy of the book. Have them read the title and locate the table of contents.
- Have students work in pairs. Have them turn to the table of contents and choose a chapter that interests them.
- Have pairs skim the chapter to locate a boldface word, then find the word and its definition in the glossary.
- Have students share the words and definitions they found. Ask: *Based on the words you defined, what do you think this book will be about?*
- After students share and respond, explain that *Working with Electricity and Magnetism* not only provides information about electricity and magnetism, but also contains experiments students can do on their own.

Administer Preassessment

- Have students take Pretest #15 on page 66 in the *Comprehension Strategy Assessment Handbook* (Grade 5).
- Score assessments and use the results to determine instruction.
- Keep group assessments in a small-group reading folder. For in-depth analysis, discuss responses with individual students.



Informal Assessment Tips

1. Assess students' ability to use the table of contents and the glossary.
2. Document informal observations in a folder or notebook.
3. Keep the folder or notebook at the small-group reading table for handy reference.
4. Guide struggling students to read the table of contents and identify the page on which the chapter they chose begins. Then have them locate the page on which the glossary begins. Students can jot down both pages, then turn to them to complete the activity.

During Reading: Chapter 1

Content Information

There are some common misconceptions about static electricity. You may wish to share these truths with students:

- Although most people think static electricity is low voltage, the opposite is actually true: Most everyday encounters with static electricity contain thousands of volts. For example, rubbing a balloon on your head generates tens of thousands of volts.
- Static electricity is not caused by friction. All that is required for the transfer of electrons is touching and separation.

Minds-On/ Hands-On Activity

1. Have partners discuss personal experiences they have had involving static electricity.
2. Have them work together on a picture or diagram showing one common experience, such as rubbing a balloon on their hair or rubbing their feet on a carpet and touching a doorknob. Do not have them label the picture.
3. Have partners then show their pictures to the group and describe what they think the picture shows.
4. After sharing and discussing experiences, students complete their pictures by labeling them. Display pictures in the small-group area.

Model Metacognitive Strategy: Determine Text Importance

Good readers decide and remember what is important and what is not important while they read. To do this well, readers must be able to identify the author's purpose for using particular nonfiction text features, notice and select new information on familiar and unfamiliar topics, understand that a piece of text may have many themes and/or ideas, and distinguish between key topics and supporting details. Good readers keep track of their thinking by using a journal or self-stick notes.

- Use a real-life example of determining text importance. Say: *Good readers are able to distinguish between the key topics and supporting details of a selection. Key topics are the most important ideas. They are broad ideas that are covered in several pages rather than only one or two paragraphs. The supporting details are the finer points that tell about the main topic. When I read a book, I write key topics and supporting details on self-stick notes or in my journal. I can then use this information to help me remember important information that I read.*
- Read pages 2–3 aloud while students follow along. *Say: The most important information on these pages focuses on the forces of electricity and magnetism. So this is the key topic for these pages. I can write this topic and any supporting details about the forces on self-stick notes or in a journal.*
- Demonstrate how to write the key topic and details:
  Key Topic: Two forces in nature: electricity and magnetism

  Details: static electricity
  current electricity
  magnetism
  electromagnetism

Set a Purpose for Reading

- Ask students to read pages 4–11 silently to see what they can find out about static electricity. Say: *In this chapter you will read information about static electricity as well as experiments you can do to observe static electricity. As you read, write key topics for both parts of the chapter.* Students can write the key topics on self-stick notes or in their journals. Ask them to also write the details that support each topic. Tell them they will share their key topics and details after reading the chapter. Remind them to use the headings to help them determine the key topics.

Discuss the Reading

- Ask students to share their key topics. Encourage them to explain how they identified their key topics.
- Have students then share the details that support the key topics they identified.
- You may wish to list key topics and details on the board in a T-chart with the headings Information and Experiments. For example:

Information	Experiments
Key topic: atoms Supporting details: protons, neutrons, electrons, nucleus	Key topic: Bending water with static electricity Supporting details: transferring electrons from wool to a pen can cause the pen to bend a flow of water.

Model Comprehension Strategy: Cause and Effect

- Explain what a cause-and-effect relationship is. Say: *One way authors explain information is to tell why certain events happen. When you read about an event and why it occurs, you are reading about a cause-and-effect relationship. As I read this chapter, I paid attention to what happened. I noticed if the author gave a reason for what happened. That's how I identified cause-and-effect relationships in the chapter. The event is the effect; the reason it happened is the cause.*
- Pass out the graphic organizer **Identify Cause and Effect** (blackline master, page 14 of this guide).
- Explain that as students read, they will complete the first six rows of causes and effects together. They will complete the last three rows independently.
- Have students look at the book and follow along while you show them how to find and identify cause-and-effect relationships from the Introduction and chapter 1. Write the information on the graphic organizer as you find it. (You may want to make a chart-size copy of the graphic organizer or use a transparency.)
- Read page 2 aloud and say: *Often authors provide clue words to help you find cause-and-effect relationships. Some of these words are* ***because of, as a result, affects, makes,*** *and* ***since****. I see that the last paragraph on this page has a cause-and-effect relationship. The author says that current electricity makes lights in school and home work. This means current electricity is the cause for these events. I'll write "current electricity" as the cause and "lights in school and home work" as the effect. To check if I'm correct, I can ask myself, "What happened?" If the answer is the effect, I'm correct. Then I ask, "Why did it happen?" The answer to this question should be in the cause column.*

Informal Assessment Tips

1. Watch carefully for students who struggle with this metacognitive strategy after reading pages 4–5.
2. In a folder or notebook, jot down what you see each student doing.
3. Students should be able to determine text importance by determining a key topic and supporting details as they read. Document students who are and are not using this metacognitive strategy.
4. If students do not do well, model the strategy for them as you read aloud pages 4–5. Demonstrate how to identify the key topic and supporting details and write them on self-stick notes.

Identify Cause and Effect		
Page Number	Cause	Effect
2	Current electricity	Lights in home and school work.
7		
8		
12		
13		
17		
20		
22		
26		

Identify Cause and Effect		
Page Number	Cause	Effect
2	Current electricity	Lights in home and school work.
7	The negatively charged pen is moved closer to the stream of water.	The stream of water bends.
8	An electric discharge	A charged object looses its static electricity.
12		
13		
17		
20		
22		
26		

- Read the experiment on page 7. Say: *The result of an experiment is the effect. I first ask myself, "What happened in this experiment?" The stream of water bent. The answer to my question is the effect. I'll write that in the Effect box.*
- Say: *To identify the cause, I ask myself, "Why did the stream of water bend?" I write this answer in the Cause box. The water bent because the negatively charged pen was moved closer to the stream of water.* Fill in the Cause box for page 7 on the graphic organizer as shown.
- Read page 8 aloud. Say: *There are several cause-and-effect relationships on this page.* Discuss these with students. Choose one cause and effect to list on the chart for page 8. Some causes and effects you can discuss are:

  Cause: rub your shoes across a carpet and touch a metal doorknob
  Effect: you get an electric shock

  Cause: an electric discharge
  Effect: charged object loses its static electricity

  Cause: extra electrons discharge to a doorknob
  Effect: you see a spark

Use Graphic Features to Interpret Information: Illustrations

- Reread the first paragraph on page 6 with students. Say: *This paragraph explains a complex scientific idea. An illustration can help you better understand this idea.*
- Have students look at the illustration on page 6. Ask: *What idea does the illustration show? How does it show it?* (It shows that opposite electrically charged objects attract. The minus signs stand for negative charges. The plus signs stand for positive charges.

Chapter 2

Apply Metacognitive Strategy: Determine Text Importance

- Have students review the key topics and supporting details they wrote yesterday. Ask them how determining text importance helped them understand the chapter. Remind students that identifying key topics and supporting details is what good readers do to keep track of their thinking and remember important information.
- Say: *Yesterday we learned how to identify key topics and their supporting details. Today we are going to learn how to identify new information about both familiar and unfamiliar topics. Good readers identify new information and think about how that affects what they know about a topic.* Read pages 12–13 aloud while students follow along.
- Say: *I am familiar with light bulbs, but I didn't know that the light from a light bulb is actually the heat from the wire inside the bulb. I'm going to write that information on a self-stick note and place it on page 12 where I read it.*
- Have students practice identifying new information on page 13 and writing it on self-stick notes. Remind students to include any new information they learn in the illustrations.
- Ask volunteers to share and compare their notes.

Set a Purpose for Reading

- Have students finish reading chapter 2 to identify and learn interesting facts about how electricity works. Remind them to note the new information they read on self-stick notes. Have students also write important key topics contained in this chapter.

Discuss the Reading

- Have students tell about the new information they identified. You may wish to list the information on the board, then have students suggest supporting details for each. For example, list the key topic: circuits. Then list supporting details such as: closed path, conducting wires, device that uses electricity.
- Ask students to share their notes about new information and encourage other students to compare their ideas with their classmates'. Ask students to explain how they chose which information to write about.
- Have students explain if the new information they identified was about familiar or unfamiliar topics. Ask: *How does identifying and writing new information help you better understand what you read?* (Possible answer: It helps me think about information I didn't know before, remember it better, and gives me a way to review it quickly.)

Content Information

You may wish to share the following information about the history of the battery with students:

- The first experiment leading to more investigations was work carried out by Luigi Galvani from 1780 to 1786. He observed that a frog's legs would twitch when connected pieces of iron and brass were applied to them. Although he believed it was the leg tissue that caused this response, his work led to other experiments.
- Alessandro Volta experimented with zinc and silver plates by stacking them to form a "pile," which was the first "dry" battery. He did this work from 1796 to 1799 at the University of Pavia.
- Following Volta, other methods for producing electricity were invented in which liquid electrodes were used. Two of these systems were developed by Grove in 1839 and Bunsen in 1842.
- It was George Leclanche's invention in 1866 of a "wet" cell that was the forerunner to today's battery. It consisted of a positive electrode made of manganese dioxide and carbon and a negative electrode made of zinc.

Minds-On/ Hands-On Activity

1. Discuss with students the difference between battery-operated machines and those that are plugged into outlets. Ask: *What are the advantages of battery-operated products? What are the disadvantages?* (Possible answers: advantages: portable; disadvantages: run out of power)
2. Have pairs of students make a T-chart with the following headings: Battery and Outlet.
3. Give students five to ten minutes to fill in the chart with machines that belong in each column.
4. Have students share and compare their lists.

Identify Cause and Effect		
Page Number	Cause	Effect
2	Current electricity	Lights in home and school work.
7	The negatively charged pen is moved closer to the stream of water.	The stream of water bends.
8	An electric discharge	A charged object loses its static electricity.
12	Electricity produces heat as it flows through the wire inside the light bulb.	The heated wire gives off light.
13	The switch is off.	The circuit is broken.
17	Circuits can be overloaded.	A fire
20		
22		
26		

Informal Assessment Tips

1. Watch students as they complete the Cause and Effect organizer.
2. In your folder, jot down what you see the students doing as they complete the activity with you.
3. Ask yourself: *Are students having problems with this strategy? If so, what are the problems? Are students mastering this strategy? If so, how do I know?*
4. For struggling students, review the strategy.

Guide Comprehension Strategy: Cause and Effect

- Review cause-and-effect relationships by reviewing the graphic organizer and clue words. Remind students that not all cause-and-effect relationships contain clue words. Explain that as a group you are going to revisit chapter 2 to find and identify cause-and-effect relationships.
- Ask students to reread page 12 to find a cause-and-effect relationship. Then have them identify the cause and the effect. Ask: *What happens with the wire in the light bulb?* (It gives off light.) *Does that event go in the Cause or Effect column in the organizer?* (Effect) *Why does this event happen? Where will you write this information?* (Electricity produces heat as it flows through the wire; in the Cause box)
- Work together with students in this way to locate and identify cause-and-effect relationships on pages 13 and 17. Use the completed graphic organizer on this page for suggested answers.

Use Context Clues to Determine Word Meaning: Definitions

- Remind students that sometimes they can figure out the meaning of unfamiliar terms by reading other words or sentences nearby. Have students find the term ***current electricity*** in the second paragraph on page 12. Say: *I'm not sure what this scientific term means. I will try to use context clues to understand it. I will first read the whole sentence containing the term.* Read the sentence aloud. Say: *This sentence gives me a definition for the term.* Point out the word ***is*** in the sentence as a clue to connect the term to its definition. Say: *Some other signals used to show definitions are* **such as, or,** *and* **called**. *Authors also use synonyms or parentheses to define unfamiliar or technical terms.* Ask: *What is current electricity?* (the flow of electrons through a wire or other conductor) *How can you tell?* (Possible answer: The sentence says "Current electricity is")
- Ask students to find the word ***circuit*** on page 12. Ask: *What is the first thing I can do to figure out the meaning of* **circuit***?* (Read the whole sentence it is in). Read the sentence aloud. Ask: *What does the word* **circuit** *mean?* (a closed path) *How do you know?* (The word ***is*** signals a definition.)
- Repeat this procedure to guide students to define ***battery*** on page 12. Point out the words ***such as*** that signal the definition. Ask: *What can I do to help me define the word* **battery***?* (Use context clues) *What is a* **battery***?* (a source of electricity) *How can you tell?* (The sentence says, "You will need a source of electricity, such as a battery."

Chapters 3–4

Apply Metacognitive Strategy: Determine Text Importance

- Have students review the new information they wrote yesterday. Ask them how the new information affected what they knew about the topic. Remind students that writing new information on self-stick notes or in their journal is a good way to help them remember the information.
- Say: *Often in a book or chapter there are several important ideas rather than one single idea. Today we are going to read to determine the important ideas contained in chapters 3 and 4. Good readers identify the important ideas to help them recognize the author's purpose in writing.*
- Read page 18 aloud while students follow along.
- Say: *The title of this chapter is "Magnetism." As I read, I can jot down important ideas about magnetism. The first important idea is that the first magnet was magnetite, a rock discovered by the Greeks. As I read about magnetism, I learn another important idea: Travelers to China used lodestone like we use compasses today. From these ideas I see that the author's purpose for page 18 is to give readers information about the history of magnets. I'll write these ideas on self-stick notes to help me remember them.*
- Have students practice identifying important ideas on page 19 and writing them on self-stick notes.
- Ask volunteers to share and compare their notes. (Possible ideas: Magnets come in a variety of shapes and sizes; magnets are made of iron, cobalt, nickel, or alnico.)

Set a Purpose for Reading

- Have students read the rest of the book silently. Ask them to write at least one important idea for each page they read. Have them also write important ideas they discover as they complete each experiment. Remind them to use context clues that give definitions to help them figure out the meaning of scientific terms.

Discuss the Reading

- Have students share the important ideas they identified in these chapters. You may wish to list the ideas on the board, then have students suggest supporting details for each. For example, list the idea from page 20: Magnetism is a force. Then list supporting details such as: It can attract or repel. Like poles attract. Unlike poles repel.
- Provide time for students to discuss the experiments they did. Ask them to explain why the ideas they discovered are important to understanding magnetism and electromagnetism.

Content Information

Share additional information about Earth's magnetic poles:

- Scientists believe that Earth's magnetic field is actually produced by electric currents caused by moving molten metal in the outer core of Earth.
- The North Magnetic Pole and the South Magnetic Pole are not exactly opposite each other.
- The poles are constantly changing. At present, the North Magnetic Pole is near Ellef Ringnes Island in the Canadian arctic islands. The South Magnetic Pole is near the coast of Antarctica, about 3,000 kilometers south of Tasmania.
- The North Magnetic Pole is currently moving at a rate of about 15 kilometers per year.

Minds-On/ Hands-On Activity

1. Provide a variety of magnets and metal and nonmetal objects for pairs to explore.
2. Have groups brainstorm a list of questions they can answer using the materials. For example: Are pencils magnetic? Which magnet is stronger? Which parts of different magnets attract each other? Which repel?
3. Have students experiment and explore the materials using the magnets, then write the answers to their questions based on their experiments and explorations.
4. Have pairs share and compare their questions and answers with the class.

Identify Cause and Effect		
Page Number	Cause	Effect
2	Current electricity	Lights in home and school work.
7	The negatively charged pen is moved closer to the stream of water.	The stream of water bends.
8	An electric discharge	A charged object loses its static electricity.
12	Electricity produces heat as it flows through the wire inside the light bulb.	The heated wire gives off light.
13	The switch is off.	The circuit is broken.
17	Circuits can be overloaded.	A fire
20	Dropping a magnet	A magnet gets weaker.
22	Earth is surrounded by a magnetic field.	If you hang a bar magnet from a string, the ends will face north and south.
26	Wrap more coils around the iron.	The electromagnet is stronger.

Informal Assessment Tips

1. Watch students as they identify important ideas. Ask yourself: *How have the students progressed with determining text importance? What problems are they still having? What questions pop into my mind about what I see them doing?*
2. Watch students as they complete the graphic organizer independently. Ask yourself: *Who is still struggling with this strategy? What are they doing or not doing that makes me think they are struggling? How can I help them?*
3. Jot down your thoughts in your folder or notebook.

Apply Comprehension Strategy: Cause and Effect

- Review the graphic organizer with students and explain that you want them to find and identify cause-and-effect relationships they read about on pages 20, 22, and 26 independently.
- Ask if they have any questions about cause and effect before they begin.
- Monitor their work and intervene if they are having difficulty completing the graphic organizer.
- Discuss student responses together.
- For more practice, have students complete the blackline master **Cause and Effect** on page 16 of this guide.

	Cause	Effect
Paragraph 1	Cause: Our teacher wanted us to understand Lenz's law.	Effect: She had us complete a science experiment.
Paragraph 2	Cause: I needed a material that was a conductor, but not magnetic.	Effect: I used copper in the experiment.
Paragraph 3	Cause: The current's magnetic field opposes the magnetic field of the magnet.	Effect: The swing of the magnet is slowed down.

Use Context Clues to Determine Word Meaning: Definitions

- Have students locate the following terms: ***magnetic field*** and ***poles*** on page 20; ***electromagnet*** on page 26. Remind them that authors often include a definition for technical terms by using clues such as the words ***is, called, or,*** and using synonyms or parentheses. Have students then define each term using context clues and clue words. (magnetic field: The area around a magnet in which magnetic forces attract or repel; poles: the ends of a magnet; electromagnet: a piece of iron with a coil of wire wrapped around it.)
- For more practice, have students complete the blackline master **Use Context Clues to Determine Word Meaning** on page 15 of this guide. Students can complete this activity in small groups or at their desks.

1. conductor (page 12) a conductor (is) a material that allows electrons to move through it easily.
2. switch (page 13) the switch in a circuit opens and closes the circuit.
3. complete circuit (page 13) the circuit is complete, (or) closed.
4. incomplete circuit (page 13) It is incomplete, (or) open.
5. negative symbol (page 14) marked with a negative (–) symbol

After Reading

Administer Posttest

- Have students take Ongoing Assessment #16 on page 68 in the *Comprehension Strategy Assessment Handbook* (Grade 5).

Synthesize Information: Compare and Contrast and Draw Conclusions

- Remind students that when they compare and contrast information they find similarities and differences. Explain that they can synthesize what they learned in this book by comparing and contrasting static and current electricity.
- Have students skim chapters 1 and 2. As they look back at the information, have them list facts in a chart.
- Have students then complete the chart by noting which facts apply to static electricity and which apply to current electricity. For example:

Facts	Static Electricity	Current Electricity
Electrons build up on an object.	X	
Electrons flow through an insulated conductor.		X
Conductors allow electric charges to move easily through them.	X	X
Electricity moves through a closed circuit.		X
Extra electrons escape into the air and cause an electric discharge.	X	
A switch can stop or start the flow of electricity.		X

- Have students use the information in the chart to compare and contrast the two kinds of electricty and draw conclusions. Say: *You can use this chart to help you draw conclusions about the characteristics of static and current electricity.*
- Have students draw conclusions and support them with evidence from the chart. Ask questions such as: *What conclusions can you draw about controlling electricity? What evidence supports your conclusion?* (Possible answer: It is easier to control current electricity than static electricity. With current electricity, electrons move through an insulated conductor and a switch can stop them. With static electricity, the electrons escape into the air, so they are not as easily controlled.)

Informal Assessment Tips

1. Score assessments and determine if more instruction is needed for this strategy.
2. Keep group assessments in a small-group reading folder.
3. Look closely at students' responses. Ask yourself: *Why might this student have answered the question in this manner?* For in-depth analysis, discuss responses with individual students.
4. Use posttests to document growth over time, for parent/teacher conferences, or for your own records.

Writing Workshop

Teaching Tips: Process Writing Steps

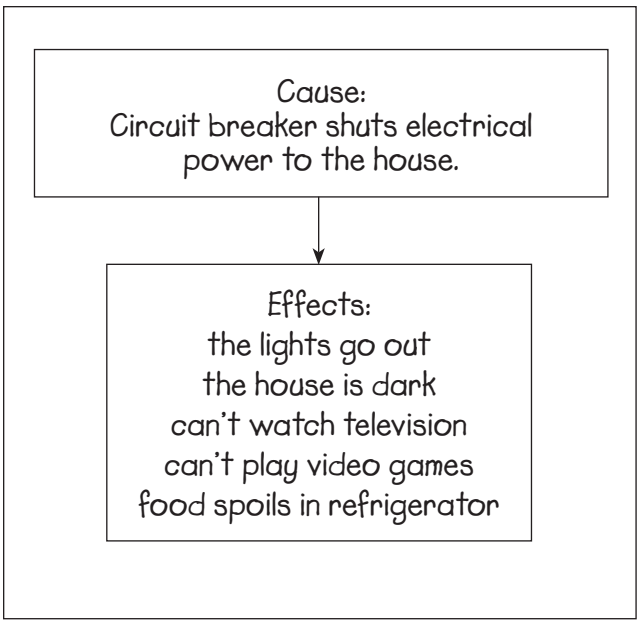
1. Have students independently write a first draft using the cause-and-effect structure.
2. After students complete their paragraphs, have them revise and edit with the help of a classroom buddy.
3. Conference with each student following the first revision and editing.
4. Have students make any additional changes and create a final copy of their paragraphs.
5. Finally, invite students to share their paragraphs with a group of other students.

Informal Assessment Tips

1. Observe students as they participate in the group writing project. Identify those who might need additional assistance during the various stages of the writing process. Jot down notes in your journal.
2. During conferences, keep notes on each student's writing behaviors. Ask yourself: *What evidence do I have to support the conclusion that this student is writing well or poorly? What can I do about it?*
3. Have struggling students complete cause-and-effect sentence frames: Because I was hungry, I ate a chicken sandwich. Since it was so cold outside, I wore a heavy coat. Then have students identify the cause and effect in each sentence.

Model the Writing Process: Write a Cause and Effect Paragraph

- Remind students that throughout the book *Working with Electricity and Magnetism,* they read about causes and effects of electricity and magnetism.
- On chart paper or the chalkboard, display a visual map like the one below, showing the effects of a power outage.
- Use the writing model to show how to use the information in the map to write a paragraph that describes cause-and-effect relationships. Remind students that they can use certain signal words to help them describe the cause-and-effect relationships. List these words on the board or chart paper for students to refer to: ***because, caused, resulting in, since, if, so, leading to, therefore, consequently, as a result***.
- With students, brainstorm a list of devices we use that depend on magnetism. Students can revisit pages 18, 19, and 27 for help.
- Have students then use the list to create a chart similar to the one shown, listing the effects the absence of magnetism would have on their lives.
- While students are writing, remind them to use the signal words to help them write about the cause-and-effect relationships.



Writing Model

When the Electricity Is Off

Electricity is important to almost everything we do in our house. If a house circuit breaker is switched off, it shuts off the electrical power to the house. This causes the lights to go out. As a result, the entire house becomes dark. Also, because the electrical power is shut off, we cannot watch television or play video games. The lack of power for refrigeration can cause bacteria to grow and spoil food. Obviously, electricity is an essential part of our lives.

Name _____ Date _____

Identify Cause and Effect

Page Number	Cause	Effect
2		
7		
8		
12		
13		
17		
20		
22		
26		

Name _____ Date _____

Use Context Clues to Determine Word Meaning

Directions: Find the word on the page indicated. Write the sentence that gives the definition of each word. Circle any signal words in the definition.

1. conductor (page 12) _____

_____

_____

2. switch (page 13) _____

_____

_____

3. complete circuit (page 13) _____

_____

_____

4. incomplete circuit (page 13) _____

_____

_____

5. negative symbol (page 14) _____

_____

_____

6. positive symbol (page 15) _____

_____

_____

Name _____ Date _____

Cause and Effect

Directions: Find the cause-and-effect relationship in each paragraph. Complete the graphic organizer at the bottom of the page by identifying the cause and effect in each relationship.

My Experiment

In science class we learned about Heinrich Lenz. He was a physicist from Russia. In 1834 he discovered how electric currents are related to magnetic fields. His discovery is called Lenz's law. Our teacher wanted us to understand this law. So she had us do a simple science experiment. Here is what I did.

First I attached a magnet to a string. I swung the magnet. Then I hung the magnet over a sheet of copper. I used copper because I needed a material that was a conductor, but was not magnetic. I swung the magnet closely above the copper sheet. I noticed that the swing of the magnet was slower than without the copper. I know the copper is not magnetic, so why did it affect the swing of the magnet?

It turns out that the magnet's magnetic field cuts through the copper and creates an electrical current. This current has its own magnetic field. According to Lenz's Law, the current's magnetic field opposes the magnetic field of the magnet. It is the opposing magnetic field from the current that slows the swing of the magnet.