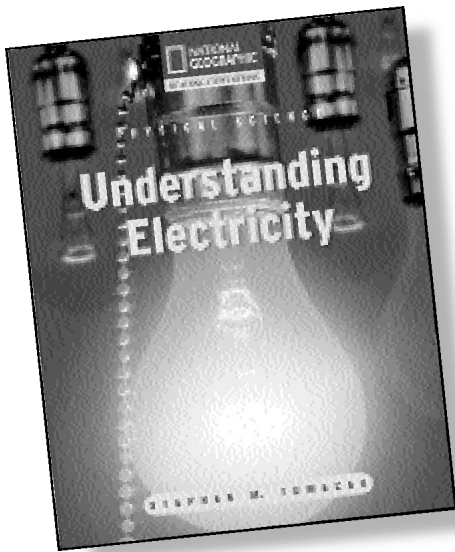


Overview

Summary

Understanding Electricity



By Stephen M. Tomecek

People around the world depend on electricity in their daily lives. Electricity is a form of energy that is generated by the movement of electrons as they move from atom to atom. Static and current electricity are two types of electricity that are determined by how these electrons move.

Many scientists and inventors have contributed to the development of electric power. Their ideas and systems have led to today's modern power pool. The power pool is a large network of power companies that share resources and supply power to areas where demand is greatest.

Today, almost two-thirds of electric power comes from power plants that burn fossil fuels. Burned fossil fuels cause pollution and affect Earth's environment. Alternatives include wind power, solar power, and nuclear power.

Science Background

Since its discovery in the early 1800s, current electricity has revolutionized the way that people live. As our dependency on electricity has grown, so has the demand for electrical power. While we produce huge amounts of electrical power each day, demand often exceeds supply, causing ever more frequent disruptions of power and blackouts. As political leaders and engineers struggle with this dilemma, the future offers hope of new technologies that can help us produce enough electricity without damaging the environment.

Learning Objectives

Science

- Define and give examples of energy
- Describe an electric circuit and its parts
- Recognize that electric circuits can produce light, heat, and magnetic effects
- Define blackouts and explain how people can avoid them
- Recognize that many scientists have contributed to our understanding of electricity
- Identify various resources used for creating electricity

Process Skills

- Skill Focus**
- Making a model
- Supporting Skills**
- Observing
 - Communicating
 - Predicting
 - Inferring
 - Investigating

Reading Skills

- Genre: Expository**
- Skill Focus**
- Make generalizations
 - Use specialized words
- Supporting Skills**
- Identify cause-and-effect relationships
 - Summarize
 - Use graphic organizers

Focus on Reading

Before Reading

Activate Prior Knowledge

Ask students what they know about electricity. You might ask questions such as these:

Where does electricity come from?

How does electricity get into our homes?

Write students' ideas in a K-W-L chart on the board. Explain that in the first column, students will write what they know about electricity, in the second column, they will write what they want to know and, in the third column, they will write what they have learned after reading the book. Have students copy the K-W-L chart into their notebooks and

What I Know	What I Want To Know	What I Learned

complete the first two columns with partners. They can return to the chart after reading to complete the third column.

Preview

Give students time to flip through the book and look at chapter titles, photos, captions, and diagrams. Ask:

What topics do you think will be included in this book?

Look at the diagram on pages 20–21. What is the topic of this diagram? What do the numbers help show?

Set Purpose

Ask students whether this book reminds them of other books they have read. Help them set a purpose for reading. Ask:

What do you want to find out by reading this book?



Vocabulary Strategy: Use Specialized Words

Activity Master, Page 22

Explain to students that some words are used to describe a specific or “special” topic, and these words are called specialized words. Specialized words can be grouped together because their meanings are related. Have students use *Understanding Electricity* and the glossary to help them define each word and then write how each word relates to electricity. Students will use these words:

volt	circuit
switch	conductor
static	

Correlation to National Standards

Writing Skills

Writing Focus

- Write a speech (persuasive)
- Use the writing process

Supporting Skills

- Write for a specific audience
- Conduct research

Speaking and Listening

- Give an oral presentation

Science

- Light, heat, electricity, and magnetism (K–4)
- Transfer of energy (5–8)
- Science and technology (K–4, 5–8)
- Science as a human endeavor (K–4, 5–8)
- Scientific inquiry (K–4, 5–8)
- Nature of science (K–4, 5–8)
- Types of resources (K–4, 5–8)

Reading/Language Arts

- Apply a wide range of strategies to comprehend and interpret texts
- Apply language structure/conventions
- Use the writing process
- Conduct research
- Use language for persuasion
- Participate in literacy communities
- Use a variety of informational resources

During Reading

Read Strategically: Make Generalizations

Activity Master, Page 23

Assign each chapter of the book as independent reading. As students read, they can write examples that support the generalizations provided on the Activity Master on page 23.

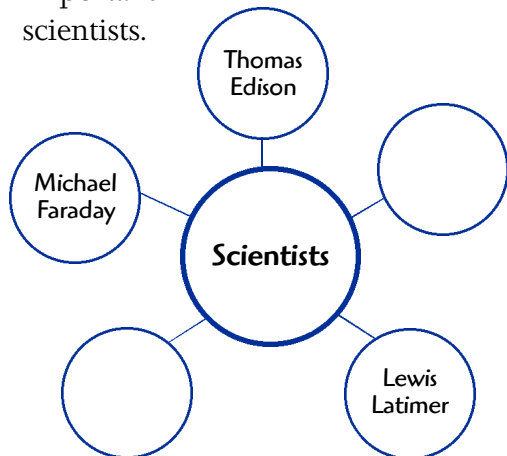
Students then write their own generalization about electricity and provide examples to support it.

Remind students that a *generalization* is a kind of conclusion or rule that applies to many examples.

Generalizations use words such as *all*, *most*, *many*, *some*, *generally*, and *never*.

Strategy Tip: Use graphic organizers

To help students remember the new information in the book, encourage them to create webs to organize details related to main topics, for example, static electricity, currents, and important scientists.



Meeting Individual Needs

For specific strategies on meeting individual needs, see pages 50–55.

After Reading

Responding

Initiate a class discussion to assess reading comprehension.

Ask:

What causes blackouts? (See pages 5 and 15 in the student book.) **(cause and effect)**

What are important parts of a circuit, and how does a circuit work? (See pages 12–13.) **(summarize)**

Electric circuits can generate heat. What else can electric circuits produce? (See pages 7, 11, and 16.) **(cause and effect)**

What is the difference between static electricity and current electricity? (See pages 8–10.) **(compare and contrast)**

What are magnets? (See pages 10–11.) **(summarize)**

What are some ways to make electricity? What the benefits and drawbacks for each? (See pages 23–24.) **(cause and effect)**

Why do people create models? (See pages 26–27.) **(draw conclusions)**



Writing and Research: Write a Speech

Activity Master, Page 24

Scientists often share their ideas at conferences where they can give and listen to speeches. Students can imagine they are scientists and write a short speech about the best way to make electricity.

Students should

- identify what they think is the best method to make electricity
- explain why this method is better than other methods
- suggest ways people can use these methods in their everyday lives

Suggest that students use *Understanding Electricity* and other resources to research their topic. Students can use the Activity Master on page 24 to help them choose a topic and generate ideas for their speech.

Communicating: Speaking/Listening

Give an oral presentation

Students can present their speeches in small groups.

Students giving speeches should

- ✓ speak clearly
- ✓ make eye contact with listeners
- ✓ adapt speech patterns, such as speak with emphasis on certain points

Listeners should

- ✓ determine main ideas
- ✓ ask questions to clarify ideas
- ✓ listen politely

Focus on Science

Thinking Like a Scientist

Process Skill: Making a Model

Answers for page 27: Answers will vary, but students might suggest that the wire be wrapped around the nail more than ten times before completing step 3. Students should recognize that only one part of the model should be changed at a time to help them identify causes for changes in results.



Making a Model

Activity Master, Page 25

Students use the Activity Master to choose a topic and decide how they would build a model of that topic. While students will only plan the building of the model for this activity, you might want them to actually build it if time permits and materials are available. If necessary, refer students to pages 26–27 in the student book for additional guidance in making a model.

Hands-on Science

Summary Students create a model of an electrical system. Batteries, insulated wire, and flashlight bulbs help model the process of electricity traveling from a power plant to a home.

Tips If students have trouble lighting the bulbs, have them check their taping to be sure their circuit is properly connected. Also, you might want to draw the model on the

board for students' additional reference.

Safety Notes Make sure students use new batteries. Old batteries could leak or open.

Answers to Think *Students should understand that parallel circuits are a good idea because if one circuit is broken, the rest of the system will still work.*

Assessment Options

Use the following assessment options to assess students' understanding of the book.

Questions

Use the following questions during individual conferences, or ask students to write the answers in their notebooks:

- 1 What is a circuit and how can it be broken?
- 2 What is one way static electricity is different from current electricity?
- 3 What are fossil fuels? How are they used to create electricity?
- 4 What are two other ways to create electricity? What are the advantages of each?
- 5 How does electricity get from a power plant to your home?
- 6 What is a model and why do people use models?

Assessment Activity

Students can use magazines and newspapers or create drawings to represent these three concepts from *Understanding Electricity*:

- People depend on electricity.
- Electric circuits can produce light, heat, and magnetic effects.

- There are many ways to produce electricity.

Pictures should

- ✓ clearly address all three concepts
- ✓ be well organized and carefully prepared

Multiple-Choice Test

See the multiple-choice test on page 66.

Cross-Curricular Connection

Literature

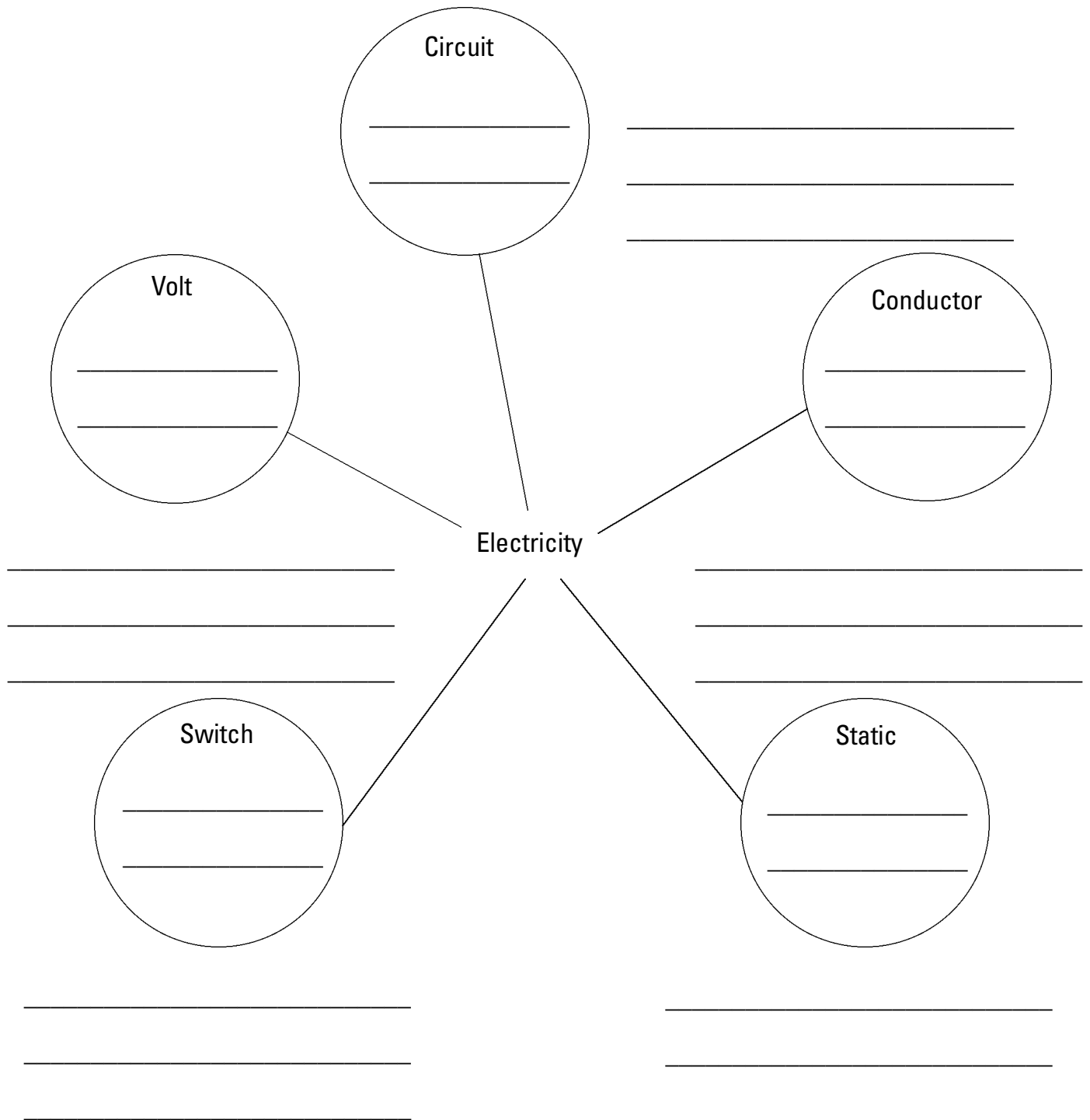
Ask students to investigate the life of one of the scientists mentioned in *Understanding Electricity*. Students can read age-appropriate biographies or nonfiction books about a scientist and then share some aspect of that person's life and work.

Home-School Connection

Students can discuss with family members how electricity is made and why it's important to conserve energy. Then students and family members can review a household electric bill together. They can identify the amount of electricity the family used in that one month and then together they can identify ways to reduce the amount of electricity they use. Students can then review future bills to see how much energy they are conserving.

Vocabulary: Use Specialized Words

The words below are from *Understanding Electricity*. Each word has something to do with electricity. In each circle, write a meaning for the word. On the lines, write a sentence that shows how the word is related to electricity.



Reading: Make Generalizations

In *Understanding Electricity*, you'll read about how electricity is made and how it is used. Below you will find four generalizations about electricity. Under each generalization, write two or three examples that support it. Then, at the bottom of the page, write your own generalization about electricity and provide three examples to support it.

Remember that a generalization is a kind of conclusion or rule that applies to many examples. Generalizations use words such as *all*, *most*, *many*, *some*, *generally*, and *never*.

All electrical circuits operate in a similar way.

Most of the time, power blackouts don't happen.

Thomas Edison influenced the use of electricity more than any other inventor.

There are many different ways to create electricity.

Generalization:

Examples:

Writing: Use the Writing Process

Write a Speech

You are a scientist who specializes in improving how electricity is made. You will be giving a speech at a conference to share your ideas and suggestions. Choose a topic from the list below or a topic of your own. Keep in mind that you are trying to inform your listeners about your topic and convince them to use your ideas.

You will need to use facts and details in your speech, so you might want to conduct research to learn more about your topic. Use the space below to organize your ideas for writing.

List of Topics: Choose One		Other Ideas:
Wind power	Nuclear power	_____
Solar power	Water and fuel cell power	_____
Power plants		_____

My topic will be _____

This is how my topic works:

Here are facts that explain why topic should be used:

My topic is better than other options because

This is what I think people should do to improve how electricity is made:

Thinking Like a Scientist: Making a Model

Scientists create models to test ideas and to learn how things work. Choose a topic from the list below and decide how you can make a model of that topic. You will plan how you might build the model, but you will not actually build it.

List of Topics: Choose One	Other Ideas:
What an atom looks like	_____
What a circuit looks like	_____
How a power pool works	_____
What a power grid system looks like	_____
How electricity gets from the power plant to your home	_____
How fossil fuels are used to make electricity	_____

My topic will be _____

List of parts I will need to show:

Materials I will need and what parts they will represent:

How I will put the parts together (write it out or draw a sketch):

Why this model is useful:
