Lesson 2.2
Energy Past and Present
Lesson Overview

Students read *Energy Past and Present* to understand how electrical devices have so many different output energy forms, even though they are plugged into the same electrical system. The lesson begins with an opportunity for students to apply their new understanding of energy conversion in electrical devices as they use the *Energy Conversions* Sorting Tool to match input and output energy forms to various energy converters. Next, the teacher introduces the student book, which students read in pairs. Students then return to the text to gather information to help answer the Investigation Question. Pairs synthesize ideas to form a new understanding about how energy can change from one form to another. This lesson provides students with an opportunity to come to a deeper understanding of the role of electrical devices within the electrical system.

**Anchor Phenomenon:** Ergstown has frequent blackouts.

**Investigative Phenomenon:** Devices light up, get warm, move, or make sounds.

**Students learn:**

- Energy can change from one form to another form. One way energy can change is through an electrical device.
- In the past, people didn't have electrical devices. They found other ways to do many of the things we use devices for today.
- If an object does not have an output energy form that is different from its input energy form, then the object is not an energy converter.
- Over time, people’s needs and wants change, as do their demands for new and improved technologies.
Introducing Energy Past and Present

The teacher introduces the book and students prepare to read it with their partners.

Instructional Guide

1. **Introduce Energy Past and Present.** Hold up the cover of the book.

   Today we will read *Energy Past and Present* in order to help us answer the question *How do devices have so many different output energy forms when they are plugged into the same electrical system?*

2. **Distribute books.** Distribute one copy of *Energy Past and Present* to each pair.

3. **Have students turn to page 3, Contents.** Ask students to review the text on the page.

   Based on what you read in the table of contents, what do you think the book will be about?

   Call on a few students to share their predictions.

4. **Read aloud pages 4–6 and discuss how devices use energy.**

   We just read that electrical energy can change to motion energy. As you read, think about the ways that energy is converted from one form to another, and how that was different in the past than it is today.

5. **Remind students about synthesizing.** Remind students that they have been learning about synthesizing to come up with new understandings when reading. Suggest that they think about other things they have learned about converting energy from one form to another as they read, to see how it helps them understand more about energy.
Teacher Support

Background

Literacy Note: About the Book
*Energy Past and Present* looks at how people use electrical devices to do various tasks in their everyday lives and how people accomplished these same tasks before electrical devices were invented. Each spread includes a blurb about the present day and a blurb about the past with information about the transfer and conversion of energy. For example, the section about hot baths explains where hot water comes from in a contemporary home and how ancient Romans heated water for communal bathing pools, and it outlines the journey from energy source or source converter to hot water in each case. The pages are full of intriguing details and fascinating information, and the concluding pages encourage students to learn lessons from the past that may help them use less electrical energy. The book delivers important unit content in the context of an engaging and lively exploration of life with and without electrical devices.

Rationale

Pedagogical Goals: Modeling Reading
Teacher modeling is an important component of teaching students to read informational texts effectively. As an expert reader, you already understand how to read these texts effectively and can use your expertise to model and make explicit your thinking processes for students. Think aloud as you read part of the text and consider how text features can be helpful. Invite students to help as you model how to record notes in the Synthesizing Ideas About Converting Energy graphic organizer after reading a section of the text. The goal of modeling is to help engage all students in deep and curious reading, using the same strategies and attitudes you expect when students read *Energy Past and Present*. The more you model how to read science text purposefully, the more successful you will be in motivating students to use the same strategies.

Background

Literacy Note: Visual Representations in Science Text
Adult and student readers alike often ignore visual representations, such as illustrations, as they read informational text. Yet, science text relies heavily on using visual representations to convey information. Drawing explicit attention to the illustrations in *Energy Past and Present* will help students see how much information they contain. As you model using the illustration to make sense of the reading, you will help students see that often the most powerful understanding comes from neither the text nor the illustration alone, but from connecting the two.
Pairs read the book, stopping periodically to synthesize ideas and share their new understandings with one another.

Instructional Guide

1. Have students read the book. Circulate and provide support as needed.

2. Prompt students to synthesize ideas. When students have had a few minutes to read a few pages of the text, ask them to think about a new understanding they have come to so far. Encourage partners to share these new ideas with one another, then continue reading.

Teacher Support

Background

Literacy Note: More About Synthesizing
Synthesizing promotes comprehension monitoring and is particularly useful for reading informational texts. In science, people often read for the authentic purpose of informing investigations about a particular topic, as students do in this lesson. Reading in science therefore provides opportunities for setting meaningful goals. Instruction on synthesizing in this unit capitalizes on this relationship and helps students begin to connect information from a variety of sources in order to further their understanding. In this lesson, students have the opportunity to practice synthesizing more independently as they read the book. After reading, they engage in a more guided activity in which they use a graphic organizer to help them put together several ideas from the text to answer a question.
Synthesizing Ideas from the Book

Students return to the text to synthesize ideas about energy conversions past and present. The class answers the Investigation Question.

Instructional Guide

1. Briefly discuss the text. Ask students to share some new understandings they came to while reading. You might also ask students to point out an energy conversion from the past that they found surprising or interesting.

2. Project notebook page. Have students turn to page 28, Synthesizing Ideas About Converting Energy, in the notebook. Point out that this graphic organizer is similar to one they have used before to help them synthesize information. This time, they will just be focusing on putting together information from different parts of the book. Read the directions with students.

3. Read aloud pages 4–6 and model recording ideas on page 28 in the notebook.

The text on page 6 states, “The fan converts electrical energy into the motion energy of the spinning blades.”

Remember that our Investigation Question is about devices that are plugged into the electrical system, and this idea is about a fan converting electrical energy to another form of energy. I think this example will help answer the question, so I will record a note about this idea.

4. Read aloud page 7.

The text states, “Motion energy was transferred from the servant’s arms to the fan, and from the fan to the air.” This example tells me that the servant’s body converted the energy from one form to another.

Does this example relate to our question about devices plugged into the electrical system?

[No.]
Because this example doesn’t say anything about an electrical device plugged into the electrical grid, I’m not going to record it in the table. Although it’s interesting and helps us understand more about how people use energy, it won’t help us answer the question.

5. **Have students reread the text and collect ideas.** Prompt students to provide the page number on which they found the information as needed.

6. **Guide students to synthesize.** When students have finished gathering ideas, point the class to the Investigation Question: *How do devices have so many different output energy forms when they are plugged into the same electrical system?*

   What do we now know about forms of energy?

   [There are many forms of energy; forms of energy can change.]

   What do we now know about electrical devices?

   [They convert, or change, energy from one form to another; they convert, or change, electrical energy to other forms of energy.]

7. **On-the-Fly Assessment: Synthesizing Information from a Text.** Inform students that you would like them to work with a partner to synthesize the information they gathered in order to answer the Investigation Question.

   Remember, when scientists and engineers synthesize, they put together different ideas they have gathered to form a new understanding.

   • Circulate around the room, listening to partners share. Check to see if students connect ideas from the text to come to a new understanding that answers the Investigation Question. Listen to how students are using new science vocabulary in their responses, as well.

   • After partners have taken turns synthesizing, call on a few students to share their new understandings with the class.

8. **Have students record their new understanding on notebook page 28.** Let students know that they can write their own idea or one of the ideas that was shared.

9. **Introduce the key concept.** Refer back to the Investigation Question and point out that the class can now answer it. Post the key concept and read it aloud.

   Energy can change from one form to another form. One way energy can change is through an electrical device.

10. **Discuss changes from the past to the present.**
The electrical devices we have now help us to do things more easily than people could in the past. These devices weren’t just developed out of nowhere—they were developed to solve problems and fulfill people’s wants and needs. Over time, people’s wants and needs change, giving engineers new challenges.

Ask students to think of technologies that were developed in between the time when their parents or grandparents were children and now. Discuss what wants or needs these new technologies fulfilled. Examples include cell phones that make it easier to be in touch with people from anywhere or electric cars that pollute the environment less.

11. Conclude the lesson. Let students know that they will get to do lots of exploration of energy converters such as electrical devices in the next few days.

Embedded Formative Assessment

On-the-Fly Assessment 8: Synthesizing Information from a Text

Look for: At this point in the unit, students have had a few opportunities to synthesize ideas from their reading with other information they have gathered. In this activity, students will be discussing the new understanding that they reached by connecting different ideas from the book. As you circulate, make note of whether students are connecting the different ideas in order to come to a reasonable understanding that serves to answer the Investigation Question. Also, listen to make sure students are beginning to use new science vocabulary when they present their new understandings.

Now what? If students are struggling to express their ideas, consider providing additional modeling and practice. Talk students through connecting the different ideas on page 28 of the Investigation Notebook. Model gathering information from different points in the text and think aloud as you record ideas, giving the reasons why you think the idea is important. Have students help you connect the ideas together by asking questions such as “How do those ideas fit together to answer the question?” You can also provide students with sentence frames such as the following to help them write their synthesized ideas:

- On page ___________ of the book, I read ____________.
- I also read that ____________.
- These ideas mean ____________.
- Based of ___________. I can conclude that ____________.
- Because of ___________. I now think that ____________.

Call on students to help you construct a new understanding, and model recording one or two of those understandings on page 28 in the Investigation Notebook. Depending on how many students need this support, you could provide it to students individually, in a small group, or to the whole class.
Teacher Support

Instructional Suggestion

Supporting English Learners: Sentence Frames
If you think students would benefit from additional structure when gathering evidence from the book, you may wish to introduce the following sentence frame to a group of students: The __________(device) converts electrical energy to __________. Providing this sentence frame allows students to focus more on gathering information from reading and less on constructing appropriate ways to record their ideas.

Background

Science Note: Synthesizing Information
Synthesizing information is one way scientists and engineers arrive at new ideas or refine their understanding of phenomena. Connecting information from a variety of sources helps scientists and engineers formulate a stronger argument about the way in which the natural world works. A scientist may use evidence from previous findings, computer simulations, and observations, and synthesize them to come to a new understanding of the natural world.

Instructional Suggestion

Providing More Experience: Home Investigation
This optional activity invites students to think about the form of energy output of some of the energy converters in their homes. Home Investigations can encourage interaction and discussion between students and their families around science concepts, which has been found to be beneficial for student learning. See the Optional: Chapter 2 Home Investigation: Converters and Forms of Energy copymaster (in Digital Resources). Make one copy for each student and review the instructions with the class. On the board, write the different energy forms (thermal energy, sound energy, motion energy, and light energy), and invite students to record them for reference.

Possible Responses

Investigation Notebook
Synthesizing Ideas About Converting Energy (page 28)

Idea: fans convert electrical energy to motion energy
Page: 6

Idea: electric lamps convert electrical energy to light energy
Page: 8

Idea: energy in fuel is converted into light
Page: 9
Idea: an alarm converts electrical energy into sound energy
Page: 14

New understanding: Devices convert electrical energy into other forms of energy we can use.
**Synthesizing Ideas About Converting Energy**

1. Read the question below. As you read *Energy Past and Present*, look for ideas in the text that will help you answer the question.

2. Record ideas from the text in the boxes below. Include page numbers.

3. Then, with your class, connect the ideas together to answer the question. Write your new understanding in the box below the arrow.

**Question:** How do devices have so many different output energy forms when they are plugged into the same electrical system?

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New understanding:
Introducing Energy Past and Present

The teacher introduces the book and students prepare to read it with their partners.

Instructional Guide

1. Introduce *Energy Past and Present*. Hold up the cover of the book.

   - Hoy leeremos Energía en el pasado y en el presente para ayudarnos a responder la pregunta ¿Cómo es posible que los aparatos tengan tantas formas diferentes de salida de energía cuando todos se conectan al mismo sistema eléctrico?

2. Distribute books. Distribute one copy of *Energy Past and Present* to each pair.

3. Have students turn to page 3, Contents. Ask students to review the text on the page.

   - Basándose en lo que leyeron en la tabla de contenidos, ¿de qué piensan que tratará el libro?

   Call on a few students to share their predictions.

   - Mientras leemos, aprenderemos mucha información sobre el uso de energía desde la antigüedad hasta hoy.

4. Read aloud pages 4–6 and discuss how devices use energy.

   - Acabamos de leer que la energía eléctrica se puede convertir en energía del movimiento. Mientras leen, piensen en las maneras en que la energía es convertida de una forma a otra, y cómo esto era diferente en el pasado que hoy en día.

5. Remind students about synthesizing. Remind students that they have been learning about synthesizing to come up with new understandings when reading. Suggest that they think about other things they have learned about converting energy from one form to another as they read, to see how it helps them understand more about energy.
Teacher Support

Background

Literacy Note: About the Book

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Rationale

Pedagogical Goals: Modeling Reading

Teacher modeling is an important component of teaching students to read informational texts effectively. As an expert reader, you already understand how to read these texts effectively and can use your expertise to model and make explicit your thinking processes for students. Think aloud as you read part of the text and consider how text features can be helpful. Invite students to help as you model how to record notes in the Synthesizing Ideas About Converting Energy graphic organizer after reading a section of the text. The goal of modeling is to help engage all students in deep and curious reading, using the same strategies and attitudes you expect when students read Energy Past and Present. The more you model how to read science text purposefully, the more successful you will be in motivating students to use the same strategies.

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Pairs read the book, stopping periodically to synthesize ideas and share their new understandings with one another.

### Instructional Guide

1. **Have students read the book.** Circulate and provide support as needed.

2. **Prompt students to synthesize ideas.** When students have had a few minutes to read a few pages of the text, ask them to think about a new understanding they have come to so far. Encourage partners to share these new ideas with one another, then continue reading.

### Teacher Support

**Background**

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Synthesizing promotes comprehension monitoring and is particularly useful for reading informational texts. In science, people often read for the authentic purpose of informing investigations about a particular topic, as students do in this lesson. Reading in science therefore provides opportunities for setting meaningful goals. Instruction on synthesizing in this unit capitalizes on this relationship and helps students begin to connect information from a variety of sources in order to further their understanding. In this lesson, students have the opportunity to practice synthesizing more independently as they read the book. After reading, they engage in a more guided activity in which they use a graphic organizer to help them put together several ideas from the text to answer a question.
Students return to the text to synthesize ideas about energy conversions past and present. The class answers the Investigation Question.

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1. **Briefly discuss the text.** Ask students to share some new understandings they came to while reading. You might also ask students to point out an energy conversion from the past that they found surprising or interesting.

2. **Project notebook page.** Have students turn to page 28, Synthesizing Ideas About Converting Energy, in the notebook. Point out that this graphic organizer is similar to one they have used before to help them synthesize information. This time, they will just be focusing on putting together information from different parts of the book. Read the directions with students.

3. **Read aloud pages 4–6 and model recording ideas on page 28 in the notebook.**

   - El texto en la página 6 afirma: "El ventilador convierte la energía eléctrica en la energía del movimiento de las aspas giratorias".

   - Recuerden que nuestra pregunta de investigación trata sobre aparatos que están conectados en el sistema eléctrico, y esta idea es sobre un ventilador que convierte la energía eléctrica en otra forma de energía. Pienso que este ejemplo ayudará a responder la pregunta, así que apuntaré una nota sobre esta idea.

4. **Read aloud page 7.**

   - El texto afirma: "La energía del movimiento se transfería de los brazos del sirviente al abanico y del abanico al aire". Este ejemplo me dice que el cuerpo del sirviente convertía la energía de una forma a otra.

   - ¿Este ejemplo se relaciona con nuestra pregunta sobre aparatos conectados en el sistema eléctrico?

     [No].
5. Have students reread the text and collect ideas. Prompt students to provide the page number on which they found the information as needed.

6. Guide students to synthesize. When students have finished gathering ideas, point the class to the Investigation Question: How do devices have so many different output energy forms when they are plugged into the same electrical system?

7. On-the-Fly Assessment: Synthesizing Information from a Text. Inform students that you would like them to work with a partner to synthesize the information they gathered in order to answer the Investigation Question.

8. Have students record their new understanding on notebook page 28. Let students know that they can write their own idea or one of the ideas that was shared.

9. Introduce the key concept. Refer back to the Investigation Question and point out that the class can now answer it. Post the key concept and read it aloud.

10. Discuss changes from the past to the present.
Ask students to think of technologies that were developed in between the time when their parents or grandparents were children and now. Discuss what wants or needs these new technologies fulfilled. Examples include cell phones that make it easier to be in touch with people from anywhere or electric cars that pollute the environment less.

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New understanding: Devices convert electrical energy into other forms of energy we can use.
Sintetizar ideas acerca de la conversión de energía

1. Lee la pregunta siguiente. A medida que leas Energía en el pasado y en el presente, busca ideas en el texto que te ayuden a responder la pregunta.


3. Luego, con tu clase, conecta las ideas para responder la pregunta.
   En el cuadro debajo de la flecha, escribe algo nuevo que comprendes.

**Pregunta:** ¿Cómo es posible que los aparatos tengan tantas formas diferentes de salida de energía cuando todos se conectan al mismo sistema eléctrico?

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Algo nuevo que comprendo: