Lesson 4.1
Blackout!
Lesson Overview

Students are introduced to the question that will guide their investigations for Chapter 4: *How does energy get to the devices all over Ergstown?* To start investigating this question, students consider the effect that the failure of one part can have on the system as a whole. First, student groups build a simple electrical system and cause it to fail. Then they identify the part that caused the failure of another group’s system. Next, student pairs read *Blackout!* a book about different electrical system failures, and then return to one article to look for evidence about the cause of that particular electrical system failure. The purpose of this lesson is to build students’ understanding of the effect that system parts have on the overall function of the electrical system. This will prepare them to investigate the possible cause of Ergstown’s nighttime blackouts in the following lesson.

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

**Investigative Phenomenon:** A simple electrical system of a solar panel, wires, and a motor attached to a fan can function or fail.

**Students learn:**

- There are many possible reasons that a system might fail.
- It is unlikely that too many devices or not enough energy in the electrical system could be a reason for a nighttime blackout.
The teacher introduces *Blackout!* and pairs of students read the book to learn about various causes of system failure.

**Instructional Guide**

1. **Refer back to the Investigation Question.** Remind students that they are trying to answer the question *Why might a system fail?* Explain that the book they are about to read will give them ideas about many different possible causes of blackouts.

2. **Hold up Blackout!** Inform students that they are going to read a book that includes six different news articles about real blackouts that have happened all over the world. Reading the book will help them understand what can cause an electrical system to fail.

3. **Distribute books.** Provide one copy of *Blackout!* to each pair of students.

4. **Set the purpose for reading.**

   As you read about the different blackouts, look for information that may help you answer the question *Why might a system fail?*

   - Remind students that paying attention to text features such as titles, photos, and captions will help them understand what system failure occurred to cause each blackout.

5. **Partners read.** Students read the book with their partners. Circulate to monitor progress and provide support.

6. **Share ideas.** Regain attention when students have finished reading. Ask volunteers to share what they read that relates to the question *Why might a system fail?* Accept all responses, encouraging students to refer to specific pages in the text as they share their ideas.

7. **On-the-Fly Assessment: Students practice synthesizing.** Ask students to reflect on what they read. Ask students to think about the following question, then talk about it with their partners:

   What new understanding have you come to about how systems can fail?
8. Conclude the lesson. Let students know that they will discuss the book further in the following lesson.

Embedded Formative Assessment

On-the-Fly Assessment 17: Synthesizing Information from a Text

Look for: At this point in the unit, students have had several opportunities to synthesize ideas from their reading with other information. In this activity, students will discuss their understanding of the reasons that systems can fail, based on connecting different ideas from the book. As students discuss, circulate and make note of whether students are able to connect different ideas to draw conclusions that can answer the Investigation Question about the different ways that a system can fail.

Now what? If students are having difficulty describing these connections between ideas, return to page 42 of the Investigation Notebook. Have students use these sentence frames to help them construct descriptions of their understanding. Call on students to share the ideas they construct and point out to the class when a student has connected together different pieces of information from the book (and/or other sources) to come to a broader understanding of how systems can fail. If many students in the class still need support with this practice, model the practice yourself, thinking aloud about why each idea is important and having students help you connect the ideas together.

Teacher Support

Background

About the Book: Blackout!

Blackout! is formatted like a series of news articles about real-life blackouts that have occurred around the world. Each blackout has a different cause, from a runaway truck crashing into utility poles to an overburdened electrical grid failing in a heat wave. The articles encourage students to think about energy sources, energy transfer, and what happens when one part of a system fails. The readings reinforce the role of the electrical grid and plant the idea that grid failure is not the only reason for electrical blackouts to occur. Different parts of the system, including sources and converters, are vulnerable to failure. These ideas support students’ thinking and provide secondhand evidence as they investigate the causes and remedies for the blackouts occurring in Ergstown.

Background

Literacy Note: Text Features

Text features guide students to navigate and comprehend informational text. While reviewing the text features you may want to call out the headings, captions and images. Invite a few students to find and read a heading, caption, and describe an image, and then explain how they are helpful when looking for information. Another option is to have students find and discuss these text features with a partner.
Reading: Blackout!

The teacher introduces *Blackout!* and pairs of students read the book to learn about various causes of system failure.

### Instructional Guide

1. **Refer back to the Investigation Question.** Remind students that they are trying to answer the question *Why might a system fail?* Explain that the book they are about to read will give them ideas about many different possible causes of blackouts.

2. **Hold up *Blackout!*** Inform students that they are going to read a book that includes six different news articles about real blackouts that have happened all over the world. Reading the book will help them understand what can cause an electrical system to fail.

3. **Distribute books.** Provide one copy of *Blackout!* to each pair of students.

4. **Set the purpose for reading.**

   - **Mientras leen sobre los diferentes apagones, busquen información que podría ayudarles a responder la pregunta ¿Por qué podría fallar un sistema?**

   - Remind students that paying attention to text features such as titles, photos, and captions will help them understand what system failure occurred to cause each blackout.

5. **Partners read.** Students read the book with their partners. Circulate to monitor progress and provide support.

6. **Share ideas.** Regain attention when students have finished reading. Ask volunteers to share what they read that relates to the question *Why might a system fail?* Accept all responses, encouraging students to refer to specific pages in the text as they share their ideas.

7. **On-the-Fly Assessment: Students practice synthesizing.** Ask students to reflect on what they read. Ask students to think about the following question, then talk about it with their partners:

   - ¿A qué nueva comprensión han llegado sobre cómo pueden fallar los sistemas?
8. **Conclude the lesson.** Let students know that they will discuss the book further in the following lesson.

## Embedded Formative Assessment

**On-the-Fly Assessment 17: Synthesizing Information from a Text**

**Look for:** At this point in the unit, students have had several opportunities to synthesize ideas from their reading with other information. In this activity, students will discuss their understanding of the reasons that systems can fail, based on connecting different ideas from the book. As students discuss, circulate and make note of whether students are able to connect different ideas to draw conclusions that can answer the Investigation Question about the different ways that a system can fail.

**Now what?** If students are having difficulty describing these connections between ideas, return to page 42 of the Investigation Notebook. Have students use these sentence frames to help them construct descriptions of their understanding. Call on students to share the ideas they construct and point out to the class when a student has connected together different pieces of information from the book (and/or other sources) to come to a broader understanding of how systems can fail. If many students in the class still need support with this practice, model the practice yourself, thinking aloud about why each idea is important and having students help you connect the ideas together.

## Teacher Support

### Background

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