Lesson 3.3
Making Sense of Full and Partial Transmission
Searching the Reference Book

Partners use the reference book to search for solutions that let different amounts of light pass through different materials.

Instructional Guide

1. Connect students’ learning about full and partial transmission of light to their role as engineers.

Aunque no hayamos diseñado algo nuevo durante los últimos días, aún han estado trabajando como ingenieros de la luz. Los ingenieros de la luz necesitan aprender acerca de cuánta luz pasa a través de diferentes materiales, para que puedan averiguar cómo usar la luz y los materiales para resolver problemas.

Ahora que hemos aprendido acerca de cuánta luz puede pasar a través de diferentes materiales, podemos entender cómo otros ingenieros de la luz han usado la luz y los materiales para diseñar soluciones para problemas.

2. Hold up the Engineering with Light and Sound big book. Flip through several pages and remind students that they already browsed this book to look for light sources.

Hoy miraremos este libro de nuevo para encontrar soluciones que dejarán que toda la luz pase, que algo de luz pase, o que nada de luz pase.


Recuerden, este es un libro de referencia, así que podemos usarlo para buscar cosas específicas en las que estemos interesados. En vez de mirar cada página para encontrar soluciones que dejarán que toda la luz pase, que algo de luz pase, o que nada de luz pase, podemos leer partes específicas del libro para reunir la información que necesitamos.

• Turn to the Contents on page 3.

La página Contenido está al principio del libro y enumera cada sección del libro y los números de página en donde pueden encontrar cada sección.
• Read aloud the sections listed in the Contents. Ask students to signal when they hear a section title that might be useful for finding solutions about letting different amounts of light pass through. [Designing Things That Block Light or Let Light Pass Through.]

• Show students how to use the page number across from the section title to find this section in the book. Turn to the “Designing Things That Block Light or Let Light Pass Through” section on page 13.

4. Model how to use sticky notes to mark solutions. Explain that students will look for one solution that lets no light pass through (or blocks light), one solution that lets some light pass through, and one solution that lets all light pass through. Let students know that they will mark possible solutions by placing sticky notes in the book. Invite a volunteer to be your partner and model how to use the sticky notes to mark solutions.

• Using one sticky note for each word, write “none,” “some,” and “all” on the sticky notes.

• Hold up a copy of the smaller book and demonstrate how to flip through the “Designing Things That Block Light or Let Light Pass Through” section with your partner to find possible solutions. Model thinking aloud and talking to your partner about several possible solutions as you flip through the section.

• Pause and demonstrate how to place a sticky note on a page of the book next to a possible solution, leaving the edge of the note sticking out of the book so you can return to it later.

5. Assign partners and distribute books and sticky notes. Distribute one copy of Engineering with Light and Sound and three sticky notes to each pair. Remind students that they should take turns choosing pages to look at and talking about what the possible solutions they find will do to light. Circulate as students work to observe the possible solutions they find.

6. Gather students in the discussion area. Have students bring their copies of Engineering with Light and Sound to the discussion area and have them sit with their partners.

7. Invite students to share the solutions they found.

• Ask students to share any solutions that let no light pass through.

• Choose one of these solutions and read the corresponding text from the book aloud.

• Ask students to share their thinking about whether or not this solution would allow no light to pass through. It is fine if, during the discussion, students change their ideas about the amount of light the solution would let through.

• Repeat this process for solutions that let some light through and for solutions that let all light pass through.

8. Collect all books and preview the design work in the next lesson.

Acaban de mirar algunas soluciones que otros ingenieros de la luz diseñaron. En la lección siguiente, continuarán trabajando en diseñar sus propias soluciones para ayudar a la compañía de teatro de marionetas.
Lesson Overview

In this lesson, students review the idea that different materials let different amounts of light pass through. Using two diagrams in the Investigation Notebook, students diagram their thinking about how a light source interacts with different materials to make a surface look bright or medium bright. The teacher represents the class’s new understandings about full and partial transmission of light on the What We Know About Light chart. Students revisit the unit’s reference book, *Engineering with Light and Sound*, to search for and discuss solutions that let varying amounts of light pass through. The purpose of this lesson is to provide students with an opportunity to consolidate their understanding of full and partial transmission of light.

**Design Problem:** Design a puppet-show scene, using light.

**Investigative Phenomenon:** A surface can have a medium-bright area.

**Students learn:**

- When all light passes through a material, the surface behind it looks bright.
- When some light passes through a material, the surface behind it looks medium bright.
Searching the Reference Book

Partners use the reference book to search for solutions that let different amounts of light pass through different materials.

Instructional Guide

1. Connect students’ learning about full and partial transmission of light to their role as engineers.

- Even though we have not designed something new for the past few days, you have still been working as light engineers. Light engineers need to learn about how much light passes through different materials so they can figure out how to use light and materials to solve problems.

- Now that we have learned about how much light can pass through different materials, we can understand how other light engineers have used light and materials to design solutions to problems.

2. Hold up the Engineering with Light and Sound big book. Flip through several pages and remind students that they already browsed this book to look for light sources.

- Today, we will look at this book again for solutions that will let all light pass through, some light pass through, or no light pass through.


- Remember, this is a reference book, so we can use it to look up specific things we are interested in. Instead of looking at every page to find solutions that will let all light pass through, some light pass through, or no light pass through, we can read specific parts of the book to gather the information we need.

• Turn to the Contents on page 3.

- The Contents page is at the beginning of the book and lists each section of the book and the page numbers where you can find each section.
- Read aloud the sections listed in the Contents. Ask students to signal when they hear a section title that might be useful for finding solutions about letting different amounts of light pass through. [Designing Things That Block Light or Let Light Pass Through.]
- Show students how to use the page number across from the section title to find this section in the book. Turn to the “Designing Things That Block Light or Let Light Pass Through” section on page 13.

4. **Model how to use sticky notes to mark solutions.** Explain that students will look for one solution that lets no light pass through (or blocks light), one solution that lets some light pass through, and one solution that lets all light pass through. Let students know that they will mark possible solutions by placing sticky notes in the book. Invite a volunteer to be your partner and model how to use the sticky notes to mark solutions.

- Using one sticky note for each word, write “none,” “some,” and “all” on the sticky notes.
- Hold up a copy of the smaller book and demonstrate how to flip through the “Designing Things That Block Light or Let Light Pass Through” section with your partner to find possible solutions. Model thinking aloud and talking to your partner about several possible solutions as you flip through the section.
- Pause and demonstrate how to place a sticky note on a page of the book next to a possible solution, leaving the edge of the note sticking out of the book so you can return to it later.

5. **Assign partners and distribute books and sticky notes.** Distribute one copy of *Engineering with Light and Sound* and three sticky notes to each pair. Remind students that they should take turns choosing pages to look at and talking about what the possible solutions they find will do to light. Circulate as students work to observe the possible solutions they find.

6. **Gather students in the discussion area.** Have students bring their copies of *Engineering with Light and Sound* to the discussion area and have them sit with their partners.

7. **Invite students to share the solutions they found.**

- Ask students to share any solutions that let no light pass through.
- Choose one of these solutions and read the corresponding text from the book aloud.
- Ask students to share their thinking about whether or not this solution would allow no light to pass through. It is fine if, during the discussion, students change their ideas about the amount of light the solution would let through.
- Repeat this process for solutions that let some light through and for solutions that let all light pass through.

8. **Collect all books and preview the design work in the next lesson.**

You just looked at some solutions that other light engineers designed. In the next lesson, you will continue to work on designing your own solutions to help the puppet-theater company.
Teacher Support

Background

**Literacy Note: Using the Reference Book**
Students have now been officially introduced to how different materials block different amounts of light. The reference book for this unit, *Engineering with Light and Sound*, includes information about engineered designs that block light or let various amounts of light through a material. Activity 3 was designed to allow all students to feel successful as they search for and find information in the text and photographs. When appropriate, you may wish to invite students to read specific sections of this book to increase comprehension of key concepts and to provide opportunities to practice reading and hearing scientific language in an authentic context.

**Instructional Suggestion**

**Providing More Experience: None, Some, All**
It may be helpful to provide a few examples to distinguish the meanings of *none*, *some*, and *all* before students search the reference book. Ask students to write *none*, *some*, and *all* on sticky notes. Then, using a group of small items such as blocks or marbles, demonstrate placing all the items in a container. Ask students to hold up the correct sticky note and say the word. Next, repeat placing some or none of the items in the container. After students have practiced these words using physical materials, you may wish to practice within the context of light. Using the Materials chart, point to each material and ask students to hold up and name the corresponding sticky note to indicate how much light passed through that material.

**Instructional Suggestion**

**Providing More Experience: Home Investigation**
This optional activity invites students to use various materials in their homes (inside and/or outside) to explore how the amount of light passing through a material creates a particular effect on a surface. 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 Optional: Chapter 3 Home Investigation: Light Passing Through Materials copymaster (in Digital Resources). Make one copy for each student and review the instructions with students.