LESSON 4

What Is Inside a Light Bulb?

Overview and Objectives:

Original STC curriculum materials: This section describes a brief overview of the lesson and lists the objectives for the lesson.

Content Storyline:

In Lesson 4, students expand upon their experiences in previous lessons with complete circuits to develop an understanding of a complete circuit. By observing the difference in brightness with different numbers of batteries, students expand their understanding of the role an electric energy source (e.g. battery) plays in a circuit and how it influences the brightness of a bulb. This activity addresses the following concepts:

- An electric energy source (for example, a battery) is anything that can produce an electric current and provide the electric "push" (voltage) that causes electric current to flow.
- A larger electric "push" (voltage) will cause more current to flow.
- The brighter the light bulb, the greater the amount of electric energy being changed into other kinds of energy.
- A bulb connected to two or more electric energy sources end to end (also known as "series") will be brighter than when it is connected to only one of them.
- In an electric circuit, electric current will flow only if it has a complete loop through which it can pass, beginning and ending with an electric energy source (e.g., battery).

Subsequent lessons refer to these concepts, specifically Lesson 11 when students interact with series and parallel circuits.

Background:

Original STC curriculum materials: This section describes additional science content that the teacher may need for the lesson.

- An **electric energy source** (for example, a battery), is anything that can produce an electric current and provide the electric "push" (voltage) that causes electric current to flow.
- A larger electric "push" (voltage) will cause more electric current to flow.

Figure 4-1

Original STC curriculum materials: This is a labeled diagram of a household light bulb.

Ms. Carter's Use of Predictions with Students

Ms. Carter's students would often make predictions without providing reasons for their thinking. For this reason, she felt the predictions students make about the number of batteries would provide an opportunity for students to draw on their experiences with circuits in Lessons 2 and 3 as reasons supporting their predictions. This would help both her and her students recognize the ideas they held and help them expand on their understanding of complete circuits by collaborating with one another and testing their predictions.

To begin the lesson, Ms. Carter displayed the standard (unlit) household light bulb for her students to see and asked them to write **predictions** in their notebooks as to the number of batteries they thought it would take to light the bulb and why. After sharing their predictions, the class decided to begin their trials with five batteries. They continued to test their predictions in increasing increments of three batteries. They conducted the same test with the stripped household bulb. She then held a discussion with her students about what caused the bulb to light and where the wires were located inside the bulb. Each time students made a statement, she prompted them for evidence to support their ideas. She asked questions like, "What do you see that makes you think that?"

To conclude the lesson, Ms. Carter asked her students to draw the circuit with the stripped household bulb in their science notebooks, making sure to label the diagram. She also had them look back at their initial predictions and write a new prediction about the brightness of the bulb if they used 25 batteries. After class, Ms. Carter looked through their written ideas, checking on students' understanding of the concepts, as well as their use of reasons to support their new predictions. She felt this lesson provided opportunities for her students to engage in making scientific predictions by including reasons to support their ideas.

Materials:

Original STC curriculum materials: This is a list of the materials needed for the lesson.

Preparation:

Original STC curriculum materials: This section describes the steps to prepare for the lesson.

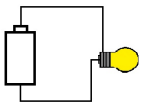
Procedure:

Scientific predictions. *See "Making Scientific Predictions" located at the beginning of Lesson 3.*

Original STC curriculum materials: This section provides step-by-step directions for how to enact the lesson with students.

Figure 4-2
Lighting a Household Bulb

Original STC curriculum materials: This is a picture included in the original materials.



Engaging students in scientific phenomena supports their understanding of a complete circuit. *See the Unit Concept Map in the Unit Overview section.*

Original STC curriculum materials: This section provides step-by-step directions for how to enact the lesson with students.

Important Idea for the Discussion:

- An **electric energy source** (e.g., battery), is anything that can produce an electric current and provide the electric "push" (voltage) that causes electric current to flow.
- The brighter the light bulb, the greater the amount of electrical energy being changed into other forms of energy.

Figure 4-3
Lighting the Bulb

Original STC curriculum materials: This is a picture included in the original materials.

Original STC curriculum materials: This section provides step-by-step directions for how to enact the lesson with students.

Final Activities:

Scientific Representations should correctly and appropriately represent the bulb and complete circuit.
See "Scientific Representations" located at the beginning of Lesson 10.

Useful Tips for This Lesson:

- You may need to turn off the classroom light to see the filament with the least number of batteries.
- When using different batteries and bulbs to light the large circuit, the number of batteries needed to light the circuit will vary.

Extensions:

Original STC curriculum materials: This section describes how a teacher might extend the lesson by making connections to other subjects.