Energy Education Resources

Introduction to Electricity

Adapted from PBS LearningMedia

Prep Time:

Activity Time: 30-60 minutes per activity

Materials:

- Balloons
- Pieces of wool cloth
- Dry cereal (preferably Cheerios)
- Wire strippers
- Insulated wire
- Flashlight bulbs
- Fresh D-cell batteries
- Tape (masking or electrical)

North Carolina Education Standard:
7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass.

South Carolina Education Standard:
3.P.3A.2 Develop and use models to describe the path of an electric current in a complete simple circuit as it accomplishes a task (such as lighting a bulb or making a sound).

Background

When depend on electricity every day, but what exactly is it? There are generally two types of electricity: static electricity and current electricity.

When electricity is at rest, it is called static electricity. Static electricity is electrons that are transferred or "jump" from one place to another without flowing in a continuous path. Rubbing or brushing objects transfers electrons, creating a charge and, therefore, an electric field. The field affects objects nearby, producing an unlike charge in them, and the unlike charges are drawn together.

Current electricity, on the other hand, is a series of electrons moving in a particular direction, usually through a conductor. Electrons that have been knocked out of the outer shell of an atom are known as free electrons. The movement of free electrons creates an electric current. When an electromotive force is applied, such as that provided by a battery, the free electrons in a conductor, like a wire, are guided in an orderly fashion, atom to atom.

Procedure

<u>Activity 1: Create Static Electricity</u>

1. Have students crush the dry cereal into small crumbs. Make sure students do not crush the cereal into powder.

2. Have students inflate a balloon with air and tie it off. Ask students what do they think they should do to the balloon to create static electricity.

3. Have students vigorously rub the inflated balloon on the wool. Ask students what they think is happening on a molecular level to the balloon as they are rubbing it.

4. Have students place the part of the balloon being rubbed close to the crushed cereal without actually touching it. Have students observe and discuss what happened. Why did the cereal jump onto the balloon?

Activity 2: Make an Electric Circuit

1. Find out what students already know about electricity. Have them draw examples of electricity and electric circuits in their lives Ask:
   - What is electricity?
   - What is electrical current?
   - What is an electric circuit?

2. Tell students that they cannot see electricity because electrons, the charged particles whose movement through a substance creates electricity, are too small to be seen even with a microscope. When electrons flow through certain substances (like copper wire), they form an electrical current. Explain that because electrons share the same negative charge, they repel one another, which keeps them moving along in the same direction. As long as the circle remains intact and the electrons continue to flow, their circuit is closed.

3. Divide the class into teams of two and distribute two lengths of wire (with the ends stripped), a flashlight bulb, a D-cell battery and some tape to each team.

4. Challenge students to use their critical thinking skills and trial and error to get their bulbs to light. Then have them draw a diagram of their circuit, making sure to include all its parts.

   SAFETY NOTE: Exploring electricity is safe as long as it is done with low-voltage batteries (such as D-cell) and under adult supervision. Tell students never to experiment with electricity from a wall outlet.

5. Have students report their findings. Ask:
   - Did you get the bulb to light?
   - In what order did you connect the parts?
   - How did you know that electricity flowed?
   - Can you trace the path of electrons in your circuit?
   - What happened if the circuit was broken, that is, if there was a gap in the circuit?