

Circuit City

Science Standard

IV

Objective

2

Connections

Standard IV:

Students will understand features of static and current electricity.

Objective 2:

Analyze the behavior of current electricity.

Intended Learning Outcomes:

3. Understand Science Concepts and Principles.

Background Information

The lives of most children are affected more directly by electricity and its applications than by just about anything else they learn about and investigate in elementary science. Simple circuits are the basic tools for investigating electricity at the primary level, and their basic properties need to be understood before attempting to use them to explore further. Students should have investigated making circuits, adding components to a circuit (such as switches, batteries and additional bulbs) and conductors and insulators. This activity would be best used as a culminating activity after these investigations have been conducted.

Research Basis

Jorgenson, Olaf, (2005). What k-8 principals should know about hands-on science...it can be messy and noisy, but students learn science best when they do it themselves. *Principal-effective intervention-special edition*, Volume 85 (Number 2), Pages 49-52.

Haury, David L, & Rillero, Peter. (1997). Perspectives of hands-on science teaching. *Eric clearinghouse for science*. Retrieved January 14, 2006, from <http://www.ncrel.org/sdrs/areas/issues/content/ntareas/science/erideric2.htm>

The importance of providing children with direct experience with materials, objects, and phenomena is widely supported. While information can be remembered if taught through books and lectures, true understanding and the ability to use knowledge comes when students are given hands-on learning opportunities.

Invitation to Learn

Give the students an Emergency Flashlight Kit: a brown bag with the following items: three Hershey Kisses™ (or a candy bar wrapped in foil...beware, some are now wrapped in paper treated with silver, but are not foil), a pencil, a piece of woolen cloth, a D-cell battery, a toothpick, and a small bulb. Tell the students they must make an emergency flashlight using only the items in the bag.

Instructional Procedures

This activity is meant to be a culminating activity or even a performance assessment. DO NOT use this activity until the students understand and can make a simple circuit with a switch.

Working in groups of four to six, the students are going to design a subdivision, with each student making their own property with a house containing one light source and another outside light source. The neighborhood will also include one commercial-type building of their choice with two light sources.

1. Have the students meet together to decide on the placement of their properties and what commercial building they are going to make. Then have each student draw up the circuit diagram for their individual property.
2. Give each student a piece of foam board or cardboard to use as his or her property. This works best if each of the individual pieces has been cut from a larger piece so that they fit back together nicely. Make sure that one extra piece is reserved for the commercial building.
3. Have the students each save two milk cartons from the cafeteria. One will be used for the house and the other as a cover for the power source. The group will also need a small cardboard box for their commercial building.
4. Give each student two bulbs and two D-size batteries for their power source.
5. Have lots of insulated wire, wire cutter/strippers, and electrical tape available for making circuits. They will also need to make a switch using two brads and a paper clip attached to a small piece of oak tag or cardboard.
6. Have art supplies available for making their properties attractive (construction paper to cover the milk carton, craft sticks for fences, Spanish moss for buses, etc.).
7. The students will then proceed to put a light through the bottom of their milk carton house, place the house of the board and run the wires underneath the board to complete the simple circuit. The power source should be placed near the switch and then covered with the other milk carton (cut the top part off and turn it over). The outside light source can be a lamppost (flexible drinking straws work well for this) or any other creative use of outside lighting (a porch light, light inside a hot tub, on a sport court, etc.)

Materials

- Emergency Flashlight Kit (three Hershey Kisses, a pencil, a piece of woolen cloth, a D battery, a small bulb and a toothpick)
- Foam board or cardboard
- Insulated wire
- Wire cutters/strippers
- Electrical tape
- Small bulbs (Christmas lights cut up)
- D-cell batteries
- Milk cartons
- Electrical switches (two brads, paper clip on a small square of oak tag)
- Art supplies

8. Once the students have completed their own properties, they make the commercial property and run the circuitry for two light sources
9. Once everyone has their subdivisions complete and put together, turn off the lights in your classroom and have the official "lighting" ceremony.

Assessment Suggestions

- The best assessment for this activity is to see that each student has successfully made the simple circuit for two light sources on their property.
- The circuit drawing made by the student can also serve as an assessment tool.

Curriculum Extensions/Adaptations/ Integration

- An alternative activity that uses students making simple circuits is a quiz board. The students can make simple quiz boards by punching equal numbers of holes down both sides of oak tag. The students then make up matching questions, such as states and capitals, amendments and their numbers, and presidents and fun facts. Write the information in two columns. The next step is to run a thin strip of aluminum foil on the back side of the oak tag from one side to the other making sure that they match up to correct information. The aluminum foil strip is completely covered using adhesive tape. Make sure there is no aluminum foil left uncovered so that it will not short circuit with another strip. Also, make sure that the aluminum foil completely covers the small holes. Repeat this process as many times as necessary to complete the quiz board. The students then make the "tester" by connecting materials in this order: wire to battery, battery to second wire, second wire to bulb, and then bulb to third wire. Strip the ends of the outside wires and use them to touch the small aluminum circles on the front side of the quiz board. If the information is correct, the circuit will be complete and the light will go on. Have the students check their board by testing all the answers themselves. If everything has been done correctly, they then staple a second sheet of oak tag to the back of their boards so no one can see the "answers." They can exchange boards with other classmates. This is a great