



CONTROL THE FLOW

4-H Electrical Science Lesson

BUILD AND TEST A PAPER CLIP SWITCH

Project Skills:

Understanding open and closed switches

Life Skills:

Problem solving

WI Academic Standards:
Science C.4. Science Inquiry

Time:

20-25 minutes

Supplies:

- Wire strippers
- 6 rolls of transparent tape
- Each youth needs the following materials:
 - 2 brass paper fasteners
 - 1 metal paper clip
 - 3 pieces of 8-10 inch insulated, solid core, 20, 22 or 24 gauge wire
 - 1 - 2" x 2" piece of cardboard
 - 1 D-cell battery
 - 1 battery holder
 - 1 - 1.5 volt light bulbs
 - 1 light bulb holder
 - 1 pencil

Getting Ready:

1. Use the wire strippers to remove 1/2 inch of plastic covering from each end of each wire.
2. Helpers should make their own switch ahead of time to use as a model for youth.

WHAT TO DO

Have youth follow the following directions to make a simple paper clip switch.

1. Wrap the stripped end of one wire around one of the brass paper fasteners. (See Fig. A)
2. Place the brass paper fastener with wire attached through the paper clip. (See Fig. B)
3. Wrap the second wire around the second paper fastener (like in step 1 above). (See Fig. A)
4. Make a hole in the piece of cardboard with a pencil and stick the first fastener with the paper clip through the hole. (See Fig. C)
5. Mark the place where the end of the paper clip falls on the cardboard. (See Fig. C)
6. Make another hole with your pencil at the mark on the cardboard and push the second paper fastener through it. (See Fig. D)
7. Turn the cardboard over and open up the fastener. Put tape over the open fasteners to hold them securely. (See Fig. E)

Have youth follow these directions to connect the battery and light bulb.

1. Wrap the free end of the wire that is attached to the paper clip to the light bulb holder.
2. Wrap the free end of the wire that is not attached to paper clip to the battery holder.
3. Use a new wire to connect the battery holder to the light bulb holder.
4. Insert a light bulb into the light bulb holder.
5. Insert a D-cell battery into the battery holder.

Have youth follow these directions to test the circuit.

1. Check all the wire ends to make sure they are all firmly connected. The light bulb should be off.
2. Rotate the paper clip until it touches the other paper fastener. This will close the circuit and light the light bulb.
3. Make the light bulb turn on and off by moving the paper clip on and off the other paper fastener.

Congratulate the youth for making a simple electrical switch.

TALK IT OVER

Try to get each youth to express his or her feelings and experiences.

Reflect:

- How did you make your paper clip switch?
- What was difficult about making your switch?
- Why does touching the paper clip to the metal fastener make the light bulb light?

Apply:

- What are some home electrical appliances or equipment that also have switches?
- Can you think of something electrical that does not use a switch to turn it on and off? How does it turn on and off?

