Switches

Electricity All Around Us
Activity
Grade Level: 5-8

Main Objectives

The construction of switches will help learners understand the differences between open and closed circuits and different types of switches to control circuits. Using the design and inquiry process, learners will make predictions, experiment, implement and interpret results. Learners will share results and discuss their findings.

Learning Outcomes

By the end of this activity, learners will:

- Test a manufactured switch
- Describe the difference between an open and closed circuit
- Describe several different types of switches
- Choose appropriate materials to construct a switch
- Apply knowledge about switch design to construct a switch

Length of Activity

2.5 hours

Materials List

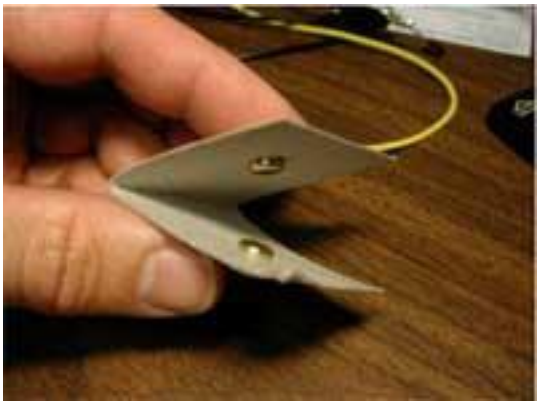
Switches Learner Activity Instructions
Switches Learner Worksheet

<u>For each learner group:</u>
3-Volt battery
Battery holder
Light
Light holder
Wire strippers and cutters
3 Paper clips
2-4 Paper fasteners
Small pieces of cardboard
Metal thumb tacks
Clothespin
Pieces of string
Glue or glue gun
Tape
3 Insulated copper wires (each piece 10 to 20 cm long, ends stripped OR insulated copper wires with alligator clips on the ends, these can be purchased at Radio Shack in packs and are reasonably priced)

Background

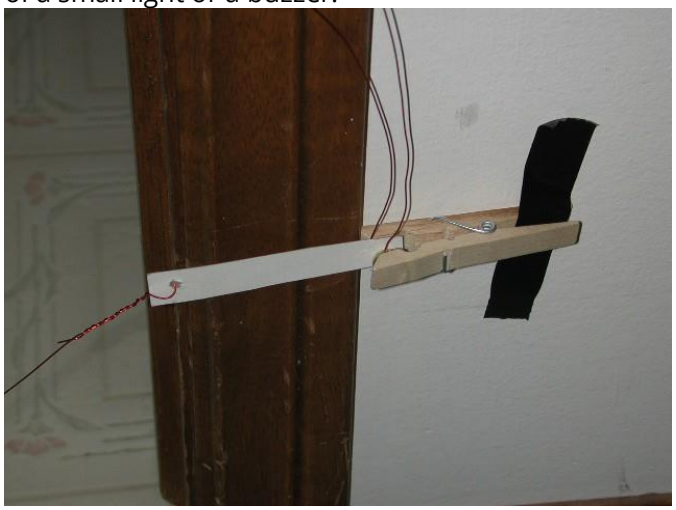
Switches are generally designed to do one thing, which is to open and close circuits. To do this, they need to have contacts, some kind of button or lever to operate and connectors that allow wires to be attached. The contacts can be opened or closed. When closed, they permit electricity to flow. When open, the gap between the contacts prevents the flow of electricity. Switches are used in almost all circuits in our homes or schools. Switches can be very simple or quite complex, depending on what the switch is needed for. Switches can also be manual (e.g. something needs to touch the switch to make it operate) or automatic (e.g. sensors). There are many different types of switches. Listed below are samples of various switches with examples of their uses in everyday life.

Momentary Switch
A momentary switch closes a circuit for as long as someone pushes or holds the button down. A spring inside the switch causes the switch to open as soon as the pressure is released. An example most people are familiar with is a doorbell switch. In this activity, learners will build a model doorbell switch using cardboard, brass paper fasteners, insulated copper wire, a battery, a battery holder and a light or a buzzer.



Sliding Switch
A sliding switch closes a circuit when someone slides the slider to touch the contact button. The switch will remain closed until someone moves the slider so it no longer is touching the contact button. You can often find examples of sliding switches on small appliances such as flashlights, electric shavers and battery-powered children's toys. The learners will build a sliding switch using cardboard, brass paper fasteners a paper clip, insulated copper wire, a battery, a battery holder and a light or a buzzer. The illustration provides an example of the sliding switch learners will be building.

Clothespin Switch
Your learners will build a switch using a clothespin, which once it is turned on, stays on until it is turned off manually. This type of switch is often used in various types of alarms, such as the alarms in elevators, burglar alarms, and fire alarms. The principle behind this switch is simple: thumbtacks will be used as contacts between the two main pieces of a wooden clothespin. A small piece of boxboard (cardboard) will be used to keep the switch open. Anything that pulls the paper out from between the contacts will cause the circuit to close, and the alarm to be activated. In this case, the alarm could consist of a small light or a buzzer.



Procedure

1. Print and distribute the worksheet. Have learners review the background information.
2. Discuss the purpose of switches. Ask learners why switches are needed? Ask the learners to locate examples of switches in the classroom.
3. Explain to the learners that they will be making their own switches. Learners will have to use the materials and background information to design a number of switches.
4. In small groups, have the learners do the activity and record their observations on a worksheet.
5. Ask learners to use the materials given and test two types of switches. Then ask them to record their observations on their worksheet.
6. Learners may require a part of an additional class period to complete the building of their switches.

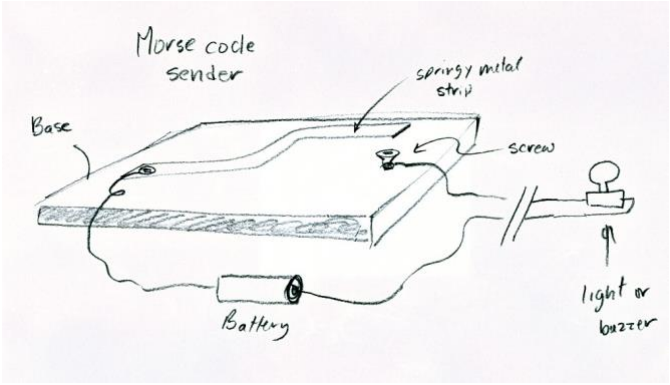
7. At the end of class ask learners to share their observations.

Tips and Extensions

Explore the school to develop a list of items that use switches. The custodian would be a good resource. The school buzzer would be a good example to illustrate. Learners could also develop a list of switches in their own households.

Investigate infrared motion sensor switches. How do they work? What can they be used for besides turning lights on and off?

Make a momentary (push button) switch that can be used to send Morse code.



Comprehension

You may wish to test learners' comprehension of the basics of switches using the following questions:

- Ask learners to identify the importance of switches.
- Ask learners how they can identify when a circuit is closed or opened?
- Discuss the different designs of switches.
- How would learners improve their switch design?
- How could you design a switch that did the opposite of the clothespin switch? In this case, we want a switch that turns the circuit off when it is tripped. Where would this switch be used, and what value would it have?