Electricity Lab
Lesson Plan

Duration:
1 hour.

Description:
In the Electricity Lab students will be presented with materials that explain the flow of electricity through circuits and the interactions of a switch therein. A presentation will be given of the historical context of how this technology was used in the 19th century for communication. They will then be provided the materials with which to make a simple circuit with a buzzer and a switch (telegraph key). This will culminate in a visit to the museum's working Fire Alarm Office to emphasize how this technology was practically applied by the Baltimore City Fire Department as early as 1859.

Inquiry Question:
What do we use electricity for today?

Desired Results:
After this lab students will understand the following:

- How electricity is used all around us to create light and sound.
- That electricity requires a closed circuit to flow.
- How a switch can control the opening and closing of a circuit.
- That electricity can be transformed into sound for the purposes of communication.
- How telegraphs were the first form of communication to use the science of electric circuits.

Activities:
Students will participate in the following activities during this program:

- Act out the flow of electrons through conductive materials.
- Make a working circuit with a telegraph key (switch) to close a circuit.
- Use telegraph key to demonstrate Baltimore Fire Department codes. (i.e. OK = 2-3, Repeat = 3-2, Company in Service = 2-2-9, Chief in Service = 2-2-3, Recall (fire under control) = 2-9.)
- See practical application of electrical circuit and telegraph in Fire Alarm Office demonstration.

Assessment:
Students respond successfully to follow up question prompts during the tour:

- When can electricity flow through a circuit?
- How does a switch allow you to control the flow of electricity through a circuit?
- How did people communicate fire alarms before Fire Alarm Telegraphs?
- How did telegraphs change the way people communicated in emergency situations?
- How did telegraphs keep a record of the information transmitted?

Electricity Lab Next Generation Science Standards Connections:

- **3-PS2-3.** Ask questions to determine cause and affect relationships of electric or magnetic interactions between two objects not in contact with each other.
- **4-PS3-2.** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- **4-PS3-4.** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- **5-PS1-3.** Make observations and measurements to identify materials based on their properties.
- **MS-PS2-3.** Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- **MS-PS2-5.** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Maryland State Curriculum - Science Connections:

Subject: Physics
Grade: 2
Topic: C. Electricity and Magnetism
Indicator: 1. Identify and describe the sources and uses of electricity in daily life.
Objectives: a. Identify sources of electricity.

- Electrical outlets
- Batteries

b. Identify the devices that use electricity to produce light, heat, and sound. (Students should be cautioned not to experiment with sources of electricity without adult supervision.)

Subject: Physics
Grade: 4
Topic: C. Electricity and Magnetism
Indicator: 2. Investigate and provide evidence that electricity requires a closed loop in order to produce measurable effects.
Objectives: a. Identify the source of electricity needed to produce various effects:

- Light - flashlight (battery)
- Heat - hot plate, hairdryer (outlet, battery)
- Sound - Ipod (battery) , doorbell(electrical wiring)
- Movement - mechanical toys (battery, outlet)

b. Investigate and describe (orally or with diagrams) how to light a light bulb or sound a buzzer given a battery, wires, and light bulb or buzzer.
c. Describe and compare the path of electricity (circuit) within this system that caused the light to light or the buzzer to sound to those that do not affect the light or buzzer.
d. Observe, describe and compare materials that readily conduct electricity and those that do not conduct electricity.
e. Provide evidence from observations and investigations that electrical circuits require a complete loop through which electricity can pass.

Subject: Physics
Grade: 6
Topic: C. Electricity and Magnetism
Indicator: 2. Cite evidence supporting that electrical energy can be produced from a variety of energy sources and can itself be transformed into almost any other form of energy.

Objectives: a. Research and identify various energy sources and the energy transforming devices used to produce electrical energy

- Wind (generators, wind mills)
- Sun (solar cells)
- Water (turbines)
- Fossil fuels (engines)

b. Cite examples that demonstrate the transformation of electrical energy into other forms of energy.
c. Investigate and describe that some materials allow the quick, convenient, and safe transfer of electricity (conductors), while others prevent the transfer of electricity (insulators).
d. Identify and describe the energy transformations in simple electric circuits.