It's Electric!

Hands-on Activity for Understanding Compasses and Electricity

Time

30 minutes: Set-up
5 – 10 minutes: Observations
15 minutes: Concluding activity

Materials and Preparation

- 3 small, 1 ½" X ¼" (approx.) compass
- 3 - 2" square pieces of cardboard
- 3 - 30" thin, enameled, copper wires
- Electrical Tape
- 1- AA battery
- 1- D-Cell

Teacher Preparation
1. With the compass needle pointing North/South, fold a small piece of cardboard ¼ inch on two sides and tape the two sides of the cardboard to the East/West sides of the compass. (The cardboard makes it easier to wrap the thin wire around the compasses.)
2. Strip ½ inch of enamel from both ends of each wire to permit easy contact with poles of AA and D cell batteries.
3. Wrap a wire once in an E/W direction around the first compass. Wrap the second compass with two turns of wire and the third with three turns.

Key Question

How can a compass be used as a galvanometer?

Background

A compass responds to magnetic fields. Depending on the strength of the magnetic field, the cardinal direction of the compass can be mislead. An example of this could be if a compass is reading true North. When the same compass is introduced to a strong magnetic field, it now reads North West.

The Earth has a magnetic field. A magnetic field can also be created when an electrical current passes through a wire. The greater the current, the greater the magnetic field. The stronger the magnetic filed in relationship to the Earth's magnetic field, the greater the effect on the compass.

A device called a galvanometer can measure electrical current that passes through a wire. A compass wrapped with a thin wire can also measure an electrical current, therefore acting as a galvanometer. Very small differences in electrical current can have a significant effect on a magnetic field produced by an electrical current.

Part One – Current Events

PROCEDURE FOR PART ONE

1. Touch the leads from the compasses wrapped once with the wire and touch them to the positive and negative poles of the AA battery.
2. Now take the leads and touch them to the poles of the D cell battery.
3. Record your observations. Repeat steps 1 and 2 using the other two compasses.

CLOSURE QUESTIONS FOR PART ONE

1. What can you conclude from each compass and each battery?
2. Determine which combination of compass and battery had the strongest magnetic field as measured by the movement of the compass needle. Why did this happen?