

Build Your Own Magnetometer

Lesson found on http://www.windows.ucar.edu/tour/link=/teacher_resources/magnetism/teach_magnetometer.html

Grade Level: 8th grade

Time allotted to unit: 25 minutes

Lesson Plan

Students will build an instrument capable of detecting a magnetic field and magnetic polarity.

Goals and Objectives

- Students will learn about ferrofluids.
- Students will be able to describe the polarity of magnets (that they have north and south poles).
- Students will be able to demonstrate how magnetism can be induced in certain materials.
- Students will build an instrument that can detect the direction of a magnetic field.

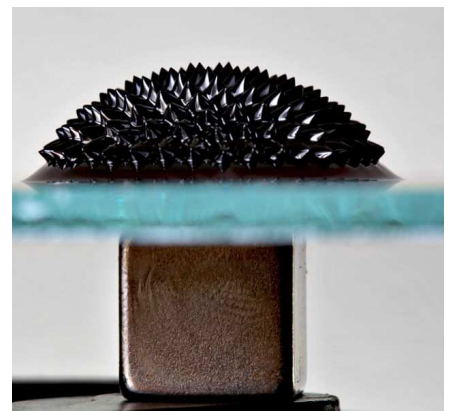
Materials

- 10 cm (4-inch) long piece of plastic straw
- 2 steel straight pins
- masking tape
- sewing thread
- magnet

NJCCCS: 5.7.8 in Science,
4.5.8.C.3, 4.5.8.C.4 in Mathematics

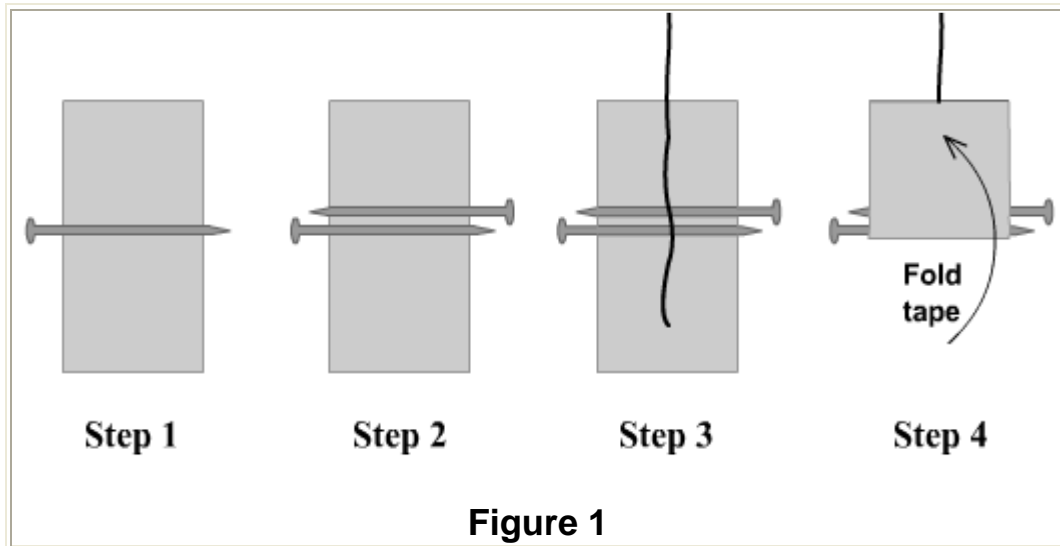
Activities and Procedures:

1. Remain students about my research in liquid crystals and ferrofluids. Mention that ferrofluids are “magnetic liquids”. A **ferrofluid** (from the Latin *ferrum*, meaning iron) is a liquid which becomes strongly polarised in the presence of a magnetic field.
2. Lead discussion about magnetism.
3. Let students build their own magnetometer.



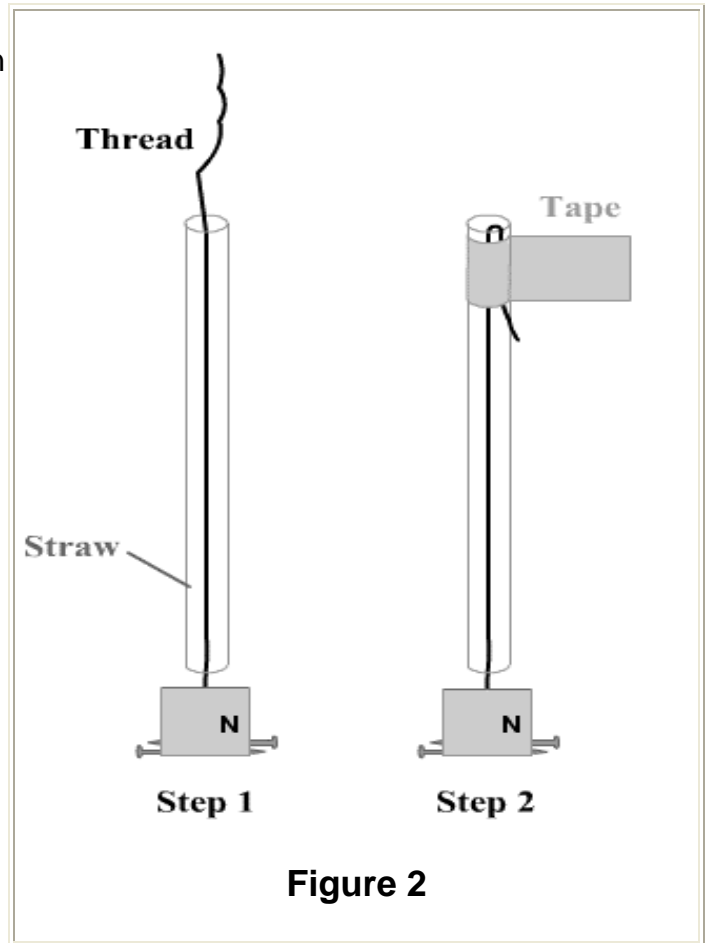
DIRECTIONS:

1. Place a small piece (about 4 cm [1.5 inches] long) of masking tape on your desk with the sticky side up.
2. Lay one pin across the tape (see Step 1 in Figure 1).



3. Lay the second pin right next to the first, but with the point in the opposite direction (Figure 1, Step 2). The idea is to have the heads of the pins protrude a bit on each side to make it harder to stab oneself with the points.
4. Lay one end of the thread across the pins and tape, running perpendicular to the pins (Figure 1, Step 3).
5. Fold the tape over the pins and end of the thread, with the crease in the tape at the pins (Figure 1, Step 4).
6. Push the thread through the straw. Hold the straw upright (its length should be vertical) with the taped pins dangling just below the bottom of the straw. The top of the tape holding the pins should be just below (about 2-3 mm or 1/4 inch) the bottom of the straw without touching it. The taped pins should be able to spin freely on the thread (see Step 1 in Figure 2).

7. Fold the top of the thread over onto the outside of the top of the straw, and then tape it into place there (Figure 2 Step 2). Leave a little tab of tape sticking out - this can be used for students to write their names or group names on.
8. Stroke the pins (lengthwise along the pins) from left to right several times with one pole of a permanent magnet. This will magnetize the pins.
9. Hold the straw upright with the pins dangling beneath. Move the north pole of the magnet near the pins. One end of the pins will point towards the north end of the magnet (just like a compass does). This is the north-seeking end of your magnetometer. Label this north-seeking end by writing a small "N" on north-seeking end of the tape holding the pins.



10. Use your magnetometer to find things in the classroom that are magnetic.

11. Hang all magnetometers in the ceiling. After some time, observe what happened.

Accommodations:

For SLD explain each activity step by step. Arrange heterogeneous group assignments. For ELL give some vocabulary the day before so they can prepare with another student or look up in dictionary, or specifically translate some words for them.

Assessment:

Walk around the room; classroom discussion, collect magnetometers.