Electromagnetic Fishing Pole

Adapted from "Electromagnetic Fishing Derby." Science Explorer: Electricity and Magnetism. Needham: Prentice Hall, 2002. 13.

Q**uestion:** How can I build the best electromagnetic fishing pole?

Kentucky Core Content:

SC-H-1.2.6 In conducting materials, electrons flow easily; whereas, in insulating materials, they can hardly flow at all. Semi conducting materials have intermediate behavior. At low temperatures, some materials become superconductors and offer no resistance to the flow of electrons.

SC-H-1.4.3 The electric force is a universal force that exists between any two charged objects. Opposite charges attract while like charges repel.

SC-H-1.4.4 Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. This idea underlies the operation of electric motors and generators.

SC-H-1.5.2 All energy can be considered to be either kinetic energy, potential energy, or energy contained by a field (e.g., electric, magnetic, gravitational).

Objectives:

Students will be able to:

1. Design and construct an electromagnetic fishing pole.
2. Identify and manipulate variables that affect the strength of the electromagnet.
3. Operate a functioning electromagnet.

Materials:

Thin insulated wire
Batteries (varying sizes or 1.5 volt D cells)
Meter sticks or rulers (any object to act as a pole)
Paper clips
Tape
Nails (any object to act as metal core of electromagnet)
Containers (one to act as the water and one to act as the catch basin)

Procedure/Time:

This activity can be performed over two class periods.

Day One

1. Students should already have a working knowledge of electromagnets and be familiar with what affects an electromagnet's strength. Teachers may want to take some time to review major topics concerning electricity and magnetism.
2. Students should begin designing their fishing poles and switch. It is important that the poles are able to release the paper clips after they are attracted by the electromagnet, and this requires a functioning switch or a break in the circuit.

Day Two

1. The students will next begin assembling their electromagnet fishing poles using the materials available or anything that they have brought from home.

2. Once the poles are built, the students should start testing their work and experiment with different variables (battery size, length of wire, number of turns, etc.) to create the best functioning electromagnet possible.
3. When all students or groups are finished, allow students to compete by collecting as many paper clips as possible from one container and moving them to another over a particular period of time.
4. After each group finishes their trial, allow them to present their pole and explain the design, testing, and construction phases of their work.
5. When wrapping up the activity, spend time with the class discussing the different variables and what effects they have on the strength of the electromagnet. Ask the students what materials they would use to make the strongest electromagnet possible and what experiments could be conducted to test this work.

Assessment:

Students will be assessed on the following components:

1. Designing the fishing pole
2. Testing and modifying the pole
3. Fishing pole performance
4. Presentation of results
5. Students' use all appropriate concepts relating to electricity and magnetism when developing and operating the electromagnetic fishing pole.