How Many? How Far? How Thick?

Summary

Students will conduct three related investigation concerning magnetic attraction and the relative strength of magnets.

Materials

Various magnets (domino, disk, horseshoe, donut)
Paper clips
Centimeter ruler
Paper
Cardboard
Plastic
Wood
- *How Many? How Far? How Thick?*
Observation Sheet

Additional Resources

Books

- *Electricity & Magnetism*
, by Dr. John B. Beaver & Don Powers, Ph.D; ISBN 1-58037-222-8
- *Magnets & Electricity*
, by Karen Lee Siepak; Carson-Dellosa Publishing Co.

Background for Teachers

Students will conduct three related investigations concerning magnetic attraction and the relative strength of magnets in this activity. They will determine how many objects a magnet can hold and then determine if additional magnets will affect the overall magnetic force. Students will work with different kinds of magnets and find that magnetic force varies greatly among the varying types and is not necessarily related to the size of the magnet. Magnets are made of many different materials including iron and iron alloys. The force that a magnet exerts depends on many variables, including the condition of the magnet, the alignment of the magnetic domains that exist within it, its material make-up, etc. When magnets are combined, the magnets act as one magnet and will have an increase in force.

Students will also measure the distance a paper clip will move toward a magnet and then add magnets to see if the distance is affected. The distance that is observed represents the extent of the magnetic force; however, the magnetic force may extend beyond what is observed. Factors such as friction may affect the observations.

Students will finally investigate the effectiveness of magnetic force through materials of varying thicknesses. A magnet's force acts through space, and certain materials appear to be relatively transparent to a magnetic field.

Intended Learning Outcomes

3. Understand Science Concepts and Principles.

Instructional Procedures

Invitation to Learn

Begin this activity by demonstrating the "flying" paper clip (Attach a paper clip to a 12-18 inch piece of fishing line and tape one end to the desk. Pass a high powered magnet near it and pull it upward); or

the "floating" magnet (Place several disk magnets on a dowel or pencil so that each is repelled from the one next to it); or allow the students to play with an Etch-A-Sketch™ or a Magna Doodle™ or any other magnet-type game.

Instructional Procedures

This is a three-part discovery activity. The activities do not need to be completed in sequential order. The activity works better when completed with partners or in small groups of three to four; each person will record on their own paper.

Part I:

Have the students form a hook from a paper clip and then place it on the magnet. The magnetic force will hold the paper clip in place.

Using the *How Many? How Far? How Thick?* Observation Sheet, have students make predictions on how many paper clips the hook will hold before it falls from the magnet.

The students are now ready to follow directions from and make observations on their *How Many? How Far? How Thick?M* Observation Sheet.

Part II:

Have the students place a paper clip at one end of a 20-centimeter line drawn on paper. Put a magnet at the other end.

5. *Using the How Many? How Far? How Thick?*

Observation Sheet, have students make predictions on the distance at which a paper clip will be attracted to a magnet.

The students are now ready to follow directions from and make observations on the *How Many? How Far? How Thick?* Observation Sheet.

Part III:

Using the *How Many? How Far? How Thick?* Observation Sheet, have the students make predictions on the thickness through which magnetic force is observable using several different materials.

The students are now ready to follow directions from and make observations on the *How Many? How Far? How Thick?* Observation Sheet.

In all of the above activities, make sure sufficient time is given to allow the students to experiment with more than one magnet.

Time should also be given for students to record observations, thoughts and conclusions in their science journals.

Extensions

Family Connections

Have the students create a game of some kind using magnets. Bring the game back to school and have a magnet game sharing opportunity.

Assessment Plan

- *The How Many? How Far? How Thick?*

Observation Sheet may serve as the best assessment tool. The correctness of the students' observations will help evaluate student performance.

Teacher observations during student investigations will also serve as an assessment tool.

Bibliography

Jacobs, Struan,. (2001). *Limits to problem solving in science*. EBSCO Publishing. Retrieved November 22, 2005.

Lee, Kam-Wah, & Chin, Christine. (2000). *Science teachers and problem solving in elementary schools in singapore*. EBSCO Publishing. Retrieved December 12, 2005.

Classroom environments that provide opportunities for small groups of children to work together to solve problems tend to foster the development of problem-solving skills. Students should be given problems to consider and through the process of problem solving, thinking skills can be developed. Even though research shows that students should have these opportunities, these strategies are not being used in the majority of elementary and secondary classrooms.

Authors

Utah LessonPlans