TRB 5:3 - Activity 6: Making a Magnet / Compass

Summary

Students will construct a compass and explain how it works.

Materials

- bar magnet
- string
- straight pins
- one-half inch masking
- sewing thread
- one strong magnet for each group of 3-5 students

Additional Resources:
Books:
Harcourt Science, Grade 4, 2002
Harcourt Science, Grade 5, 2002
Electricity and Magnetism, Glencoe,McGraw-Hill
Electricity and Magnetism, Prentice Hall
The Magnet Book, Shar and Leslie Johnstone, Sterling Publishing Co.
Magnets, Janice VanCleaves, Spectacular Science Projects
Magnet Science, Glen Vecchione, Sterling Publishing Co., Inc.

Background for Teachers

We can make a compass out of a needle. Rub a needle with a magnet. Make sure you always rub it in the same direction. The needle becomes magnetized. By placing the needle on a cork floating on water, one end will point toward the North pole and the other end will point toward the South pole. A compass has been made. The end pointing toward the North pole is called the north end of the compass and the end pointing toward the South pole is called the south end of a compass. The ends are, therefore, named North (N) and South (S) because of the direction each points.
If the north end (N) of a bar magnet is held close to a compass, the south end (S) of the compass will be attracted to it. The same holds true when the south end (S) of a bar magnet is held close to the north end (N) of a compass. When a magnet is brought close to a compass, the magnet 's magnetic field overrides Earth 's effect on the needle. When the magnet is taken away, Earth's magnetic field affects the compass once again.

Intended Learning Outcomes

1-Use science process and thinking skills.
2-Manifest scientific attitudes and interests.
3-Understand science concepts and principles.
4-Communicate effectively using science language and reasoning.
5-Demonstrate awareness of social and historical aspects of science.

Instructional Procedures

Invitation to Learn:

- Tie a piece of thread around the middle of a bar magnet.
- Let the magnet hang in mid-air by holding onto the end of the thread.
- After it stops spinning, ask the class which way the ends are pointing.
- Ask the class how they know one end is pointing north and one end is pointing south.

Ask the class why the ends are pointing in these directions.
Ask the children what it is called when a magnet naturally points north. (Compass)
Tell them they all get to make small hanging compasses.

Instructional Procedures:

Tear off an inch of masking tape and give it to each student. Tell him/her to lay it on a flat surface with sticky side up.
With two pins opposite each other, place them in the middle of the tape making sure the points and heads extend beyond the sides of the tape. (Two pins are used so they won't stick anyone.)
Attach one end of a 12-inch piece of thread at one end of the tape, and run it down the middle of the tape, over the pins, to the other end of the tape. Allow the end of the thread to extend past the tape.
Fold the tape from one end to the other end with the pins in the middle. The thread will be used to suspend the pins in mid-air.
Rub the pins from left to right several times with a permanent magnet.
Let the “compass ” hang to find which end points toward the North Pole.
Mark the north end with an “N ” and south end with an “S” on the tape.
With the new “compass” hanging in mid--air, ask the children what they observed about the compass.
ring the north end (N) of a magnet close to the “compass.” Have the students explain what happened.
Take the magnet away. Have the students explain what happened.
Bring the south end (S) of a magnet close to the “compass.” Have the children explain what happened.
Take the magnet away. Have the children explain what happened.
Ask the class why they think these events happened.
You first noticed that when the magnet was brought near the “compass ” it was attracted to the magnet and not to Earth 's poles. Explain to them that Earth 's magnetic field affects the “compass ” only at great distances. Magnets at close distances affect the “compass ” because the magnetic force of magnets override the Earth 's effect on the “compass.”
You also noticed that the north end (N) of the magnet attracted the south end (S) of the “compass ” and vice--versa. Explain that since the “compass ” is a magnet it acts the same as other magnets, and is attracted to opposite forces. When the north end (N) of a compass points toward the North pole, we call it the north end of the compass. When the south end (S) of a compass points toward the South pole, we call it the south end of the compass. Compasses, used for finding direction will always point to the North pole.

Extensions

Magnetize a needle and tape it on a cork. Put the cork in a bowl of water and let it float. With the bowl in your hand, turn in all directions and see what the needle does.
Glue thread to a magnet ball and suspend in mid-air. When the ball has stopped turning, mark the side "N" that is facing north. Paint that side of the ball white. Suspend the ball in mid-air. Stand in place and turn in a circle. What do you observe? Walk around the room with the ball suspended in mid-air. What do you observe?
Experiment to see what other things might be magnetized to become compasses, (e.g., nail, paperclip, screws, nuts, different types of wire).

Assessment Plan

Response Questions:

What happens when a bar magnet is held in mid-air by a thread?

What causes the bar magnet to do this?
Explain how you can make a compass out of pins?
Explain two things that happen when you put a magnet near a pin that has been magnetized and is hanging in mid-air.
Explain why those two things happened in #4.

Performance Task:
Make a compass with a small nail, magnet, and thread. Show which end is north and which end is south.

Bibliography

This lesson is part of the Fifth Grade Science Teacher Resource Book (TRB3) http://www.usoe.org/curr/science/core/5th/TRB5/. The TRB3 is designed to be your textbook in teaching science curriculum to your students. This book covers all the objectives of each standard and benchmark. If taught efficiently, a student should do well on the End-of-Level (CRT) tests. The TRB3 is designed for teachers who know very little about science, as well as for teachers who have a broad understanding of science.

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