Investigation One – Experimenting with Magnets

Standard III

Students will understand that magnetism can be observed when there is an interaction between the magnetic fields of magnets or between a magnet and material made of iron.

Objective 1

Investigate and compare the behavior of magnetism using magnets.

Intended Learning Outcomes

1. Use science process and thinking skills

Standard III

Objective 1

Background Information

We know that magnets have forces that will draw iron and steel objects toward them. We also know that when two magnets are brought close to each other, they will repel each other if the north ends or south ends are facing each other. They will attract each other if the north end of one magnet faces the south end of another magnet. If they are close enough they will collide.

Pre- Assessment/Invitation to Learn

Show the simple demonstration of attraction and repulsion using two bar magnets. Place one magnet on the table and then slide the other magnet towards it. The magnet will either be attracted or repelled. Ask questions like: Why are the magnets pulled together or pushed apart? What will happen if I turn the magnet around? Have the students explain what they already know about poles and the principles of attraction and repulsion.

Materials
- 2 bar magnets

Instructional Procedure

Any or all of the following four experiments may be done as class demonstrations, or set up into "stations", where the students rotate from one to the other.

Materials
- Pencil (dowel)
- 4 donut magnets

Experiment 1:

1. Using a pencil or wooden dowel, insert two donut magnets over the end of the pencil or dowel and see what happens to them. Do they stick together or are they forced apart?
2. Repeat the experiment by adding two more donut magnets to the pencil or dowel. Have the students explain why some attract and some repel each other.
3. Have the students see if they can make each of the magnets appear to "float" above each other.
4. You can try variations of the experiment by adding metal washers between the donut magnets. Do the washers change what is happening to the donut magnets?

Materials
- String
- 2 bar magnets
- Tape

Experiment 2:
1. Tie a 12-inch piece of string from the middle of a bar magnet and suspend it from the side of a wooden table using a piece of tape.
2. Hold the other bar magnet close to the end of the first magnet and see what happens. Are the two magnets attracted to each other or are they repelled? Now turn around the magnet in your hand and try the experiment again.
3. Have the students record observations in their journals.

Materials
- Tape
- Thread
- Magnetic craft tape

Experiment 3:
1. Tape the ends of a 12-inch piece of thread to opposite sides of a small piece of magnetic craft tape.
2. Tape the loop formed by the thread to a wooden table so that the magnet strip is suspended over the edge.
3. Do the same with a second piece of magnetic craft tape of equal size. As you hang the magnetic tape, make sure it is as close as possible to the first piece, but not touching.
4. Spin one of the magnets a few times to wind the thread and then release it.
5. Using your knowledge of poles and attraction and repulsion, explain the motion of the two magnets.
6. Have the students record their observations in their journals.

Materials
- Ring stand
- Clamp
- String
- 7 donut magnets

Experiment 4:
1. Using a ring stand and clamp, or an improvised stand made from Tinkertoys,
   suspend one donut magnet from a string or fishing line so that it is a free-swing pendulum. You can hang the magnet in any orientation.
2. Arrange three piles of two donut magnets stacked together in an equilateral triangle, measuring a couple of inches per side, on the ring base stand.
3. Adjust the length of the pendulum so that the free-swinging magnet will come as close as possible to the magnets on the base without hitting them or the base itself.
4. Give the pendulum magnet a push and watch what happens.
5. Have the students record the results in their journals.
6. Vary the locations and poles of the magnets to develop other patterns. You can arrange the magnets so they all have the same pole up, or you can mix them up. Notice that a tiny change in the location of one of the fixed magnets or in the starting position of the pendulum may cause the pendulum to develop a whole new pattern of swinging.
7. This experiment shows the force of gravity and the simple pushes and pulls of the magnets as they act together. It is difficult to predict where the pendulum is going to go next, even though you know which magnets are attracting it and which are repelling it.

Curriculum Extensions

Language Arts –

- Write 5 "fact" sentences and 5 "opinion" sentences about magnets and their abilities to attract and repel other magnets. (Standard 8, Objective 6)

Science –

- Put the students in groups of 3-5. Have them design their own experiments with magnets. Each group needs to have a variety of magnets and materials to do this. Have them follow the scientific method to do this. (ILOs 1, 3, 4, 6)
- Have the students crate machines or toys that push objects using magnetic repulsion. Have the students explain how the machines or toys work and how they are used. (ILOs 1, 2)

Assessment Suggestion

- Check student journals for accuracy and completeness of the experiments 1-4.
- Ask questions about each experiment for understanding.

Reference to Assessment Section:

	Multiple Choice	Constructed Response	Performance Test
Unit Test	5	2, 4	Using Magnets

Resources

Books:

- Madgwick, Wendy. Magnets and Sparks
- Adler, David. Amazing Magnets.
- VanCleve, Janice. Magnets
- Levine, Shar, and Leslie Johnson. The Magnet Book

Websites:

- www.askjeevesfor kids.com (search magnets)
- www.sciencemadesimple.com/magnets
- www.exploratorium.edu/snacks/strangeattractor
- www.hotstuffworks.com/magnets

Videos:

- Magnetism. Schlessinger, 2000
- Learning About Magnetism. Encyclopedia Britannica, 1975
- Magnetism (Bill Nye). Disney Educational, 1995
- Magnets Lucerne, 1994
- What Is Magnetism. Encyclopedia Britannica, 1989