

# TRB 5:3 - Activity 5: Discovering Magnetic Fields

## Summary

Students will complete a number of activities to learn about magnetic fields.

## Materials

Many different types of magnets such as bar, domino, horseshoe, disc, donut, cow, and ball magnets

1 pound of iron filings

7 paper cups

7 tote trays

7 pint-sized plastic locking bag

Small stack of copy paper

Drawing paper for the whole class

## Additional Resources:

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.

Learn About Magnets, Steve Parker, Lorenz Books

Magnetism, Peter Riley, Franklin Watts

## Background for Teachers

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. The opposite occurs when the north end faces a south end. They attract each other and if they are close enough, they will collide.

There are unseen magnetic fields around single magnets, between two magnets attracting each other, and between two magnets repelling each other. With the use of iron filings we can see these magnetic fields. By sprinkling metal filings over a single bar magnet, we can see its magnetic field pattern. You will see a different magnetic field pattern when iron filings are sprinkled between two attracting bar magnets. A different magnetic field will be observed when iron filings are sprinkled on two repelling bar magnets. But it doesn't stop there. By getting all types of magnets and sprinkling iron filings on them, you will see all different kinds of magnetic field patterns.

The lines that form these magnetic field patterns are called magnetic field lines. These lines show the direction of the magnetic forces. When iron filings are sprinkled on a bar magnet, you see that these magnetic field lines start at the magnet's north end and will end at the magnet's south end. The field lines that curve toward each other show attraction. You will even see these curved lines if you sprinkle iron filings on two attracting bar magnets. However, if iron filings are sprinkled between two bar magnets repelling each other, the magnetic field line will curve away from each other and even stand on edge. The magnetic field forces are pushing each other away and this causes the curving and standing on edge.

## 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.

##### Instructional Procedures

###### Invitation to Learn:

Give the students a piece of art paper and have them fold it into eighths.  
Have them write their names and the title Magnetic Fields in the upper left hand square.  
Leaving the art paper at their desks, have them gather around you so they can see what you are doing.  
Place a bar magnet into a plastic locking bag.  
Put the bag into a tote tray and cover it with a piece of copy paper.  
Sprinkle some iron filings on top of the white paper.  
Ask them what is happening to the filings.  
Encourage them to try to explain why the filings are in the pattern they see.  
After your demonstration and discussion, explain what has happened.  
Have the students go back to their desks and have them label the first box "bar."  
Have them draw a picture of a bar magnet in that same box.  
Have them draw the magnetic field pattern they saw on the bar magnet. You may need to help them by drawing it on the board. Emphasize the magnetic field lines that show attraction and the iron filings standing on end that show repulsion.

###### Instructional Procedures:

Divide the students into six groups.  
Have the six remaining magnets in plastic locking bags in the six tote trays.  
Have a piece of copy paper by the side of each tote tray.  
Have a small paper cup with a small amount of iron filings by each tote tray.  
Have each group stand by a different tote tray with their art paper and pencils in hand.  
Have the students name the magnet they will be observing, and write it in any box on their paper.  
Have the students draw a picture of that magnet in the box they labeled.  
Have the students put the white copy paper on top of the bag.  
Have one student in each group, sprinkle the iron filings on top of the copy paper.  
Have the students observe the pattern created by the iron filings. Then have them draw that pattern on the magnet figure they drew. Make sure they draw accurately showing all the magnetic field lines and any iron filings that are standing on end.  
Everyone should finish about the same time. Have them clean up their iron filings and put them back into the paper cup.  
Have student groups rotate to the next station.  
The children will repeat steps 6 through 12 after each rotation until everyone has been to each station. (If there is time, each of the students at each station can sprinkle iron filings on top of the bag so they all have a chance to experience each one.)  
When groups have been to all the stations, have them clean their last station and go to their seats.  
Discuss how the iron filings reacted to each kind of magnet. This can be done a number of ways.1.) The teacher can draw the patterns on the board (or on an overhead) while the children compare what they drew with what is on the board (or overhead). 2.) The teacher can choose six children to go to the board and draw what they have on their papers. Each of them should tell what they think is happening.3.) Do the same as number 2 but have the students lead the discussions instead of the teacher.

##### Extensions

### Extensions:

Experiment by putting two magnets of the same kind in a bag with “N ” and “N” (north ends) facing each other. Sprinkle iron filings on them to examine the pattern.

Experiment by putting two magnets of the same kind in a bag with “N ” and “S ” facing each other. Sprinkle iron filings on them to examine the pattern.

Experiment by putting a nail or paper clip, or any other article that would stick to a magnet, and put them into a bag. Sprinkle iron filings on them to examine the pattern.

Magnetize a paper clip, a small nail, a pin, or any other article you think could be magnetized. Put it into a bag and sprinkle iron filings on top to see what patterns they may have.

Put a horseshoe magnet or any other odd-shaped magnet in the bottom of a bowl with about two inches of water covering it. Magnetize some small nails and stick them through some small square pieces of cork. Put them in the water to let them float. Ask what shape the magnetized nails are taking.

Put both pieces of a broken magnet in a plastic bag. Put a piece of copy paper on top. Now put metal filings on top. Ask how this is different from a whole magnet of the same kind.

### Integration:

When the metal filings are on top of the paper, spray paint the metal filings. Before the paint dries, shake off the metal filings and the magnetic field design will be left.

If there are enough iron filings, spray them with spray glue. It will keep the iron filings in place to show the actual pattern.

### Assessment Plan

#### Response questions:

What happens when metal filings are put on a bar magnet?

What happens when metal filings are put on a horseshoe magnet?

What happens when metal filings are put on a disc magnet?

What happens when metal filings are put on a domino magnet?

Describe what magnetic fields look like when iron filings show attraction.

Describe what magnetic fields look like when iron filings show repulsion.

#### Observational descriptions:

Have pictures of different kinds of magnets that have iron filings on them. Have the students describe on paper what is happening by using the vocabulary words magnetic field, repel, and attract. Have them label where the attractions and the repulsions are on the magnets.

### 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.

### Authors

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