



Magnetic Magic Teacher Resource Guide

*Mad Science sparks imaginative learning with inquiry-based science for children.
Ask us about other programs that meet regional curriculum requirements.*

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This package includes activities for you to do with your class to reinforce the concepts and terms presented in the lesson. It also contains book titles, suggested resources and extension activities for a variety of subject areas related to the topic.

Magnetic Materials

Investigate magnetic and non-magnetic materials.

Materials

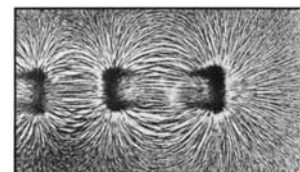
- ◆ Room full of different objects (some magnetic and some not)
- ◆ Magnets

Warning

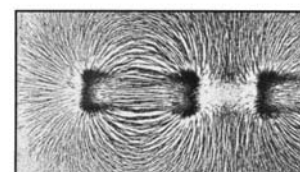
Do NOT place magnets near a watch, clock, videotapes, television or computers as they could damage the objects.

Procedure

1. Ask the students if anyone has any idea what magnets are and what they can do. Discuss this as a group for a few minutes.
2. Ask the class if they have any ideas about what types of materials magnets are attracted to. Explain that these are their **hypotheses** and that you are going to conduct an **experiment** to help draw some **conclusions**.
3. Explain to the class that a good way to test their hypotheses is to investigate. Tell the class that while they investigate the materials in your classroom to see which are attracted to magnets they should try and make some **observations**.
4. Ask the students to make a list of those items that are magnetic and those that are not.
5. After the students have had some time to investigate ask them why they think certain items moved towards the magnet and others did not. Depending on the age and ability of the group you may need to guide their thinking slightly by asking questions such as: What types of things were attracted to the magnet? What types of things were not attracted to the magnet? What were the items that were attracted to the magnet made of?
6. It might be a good idea to wrap up your discussion by highlighting the main concepts, for example, the



Field Lines of Unlike Poles



Field Lines of Like Poles

characteristics that made certain items attracted to magnets.

Explanation

Magnets are attracted to certain metallic items; the most common metal that they are attracted to is iron. Once the students have compiled a list of items that magnets are attracted to, it should be evident that magnets are attracted to objects that have iron, or another metal, in them. Inside objects that contain iron, cobalt or nickel there are particles that can temporarily line up in domains. These domains are particles that line up and are attracted to magnets.

Magnets and the Scientific Method

Use your thinking skills to investigate magnets.

Materials

- ◆ Paper Clip (or another metallic object that can be picked up by a magnet)
- ◆ A Glass or Jar
- ◆ Water
- ◆ Magnet (it must be powerful enough to pick up a metallic object through the glass)

Procedure

1. Fill a glass all the way to the top with water.
2. Drop the paper clip into the water so that it sinks to the bottom
3. Ask the class if they have any idea about how you can get the paper clip out of the jar without putting anything in the water. Explain that these are their **hypotheses**, or best guesses, and that you are going to conduct an **experiment** to help draw some **conclusions**.
4. Show the class the magnet and ask the students if they have any idea how you can use the magnet to get the paper clip out of the glass of water. Remind them that you still cannot put anything in the water.
5. Discuss the various options with the group.
6. Explain to the class that the paper clip is made of a metal that is attracted to the magnet and therefore, if you bring the magnet close to the paper clip it will follow.
7. Ask the students to **observe**, or watch carefully, while you conduct the experiment.
8. Place the magnet on the outside of the jar near the paper clip. The paper clip should move towards the magnet.
9. Slowly and carefully move the magnet up the side of the jar so that the paper clip follows.
10. When the magnet and the paper clip get to the top of the jar, remove the paper clip from the water.
11. Ask the students to share their **observations** with the group.

Explanation

Magnets are very useful and mysterious items. Certain metals, like iron, cobalt and nickel, are attracted to magnets. This experiment illustrates that magnets can attract items through water. It also demonstrates the usefulness of magnets.

Everyday Magnets

Here's one way that magnets are used in the real world.

Materials

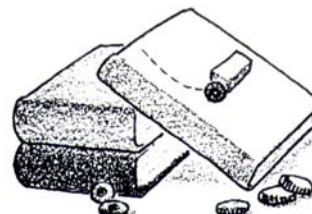
- ◆ 3 or 4 books
- ◆ Magnet
- ◆ Coins
- ◆ Metal Washers
- ◆ Tape

Note

Use American coins because they are not magnetic. Many other countries have coins that are magnetic so it would be a good idea to test out the coins you will use prior to the experiment.

Procedure

1. Ask the students if they have ever used a vending machine before. Depending on the age and ability of the students you may need to remind them that a vending machine are the machines in which you must insert money and then you get a can of pop or a chocolate bar.
2. Ask the class if they can think of any way in which a vending machine might use magnets. Explain that these are their **hypotheses**, or best guesses and that you are going to conduct an **experiment** to help draw some **conclusions**.
3. Place 2 or 3 books on top of each other.
4. Place another book so that it leans on the other books, as is illustrated in the diagram below.
5. Tape a magnet in the middle of the leaning book,
6. Explain to the students that while you conduct the **experiment** you would like them to **observe**, or watch carefully.
7. Slide a coin down the leaning book and close to the magnet.
8. Ask the students what they **observed**.
9. Slide a washer down the leaning book close to the magnet.
10. Ask the students what they **observed**.
11. Ask the children how they think a vending machine might use magnets. Depending on the age and ability of the students you may need to guide their thinking by asking questions such as; What happened to the coin when it slide passed the magnet? What happened with the washer when it slides passed the magnet? What would happen if you placed a washer in a vending machine?



Explanation

Magnets have many uses in the real world. They are used in everything from telephones to electric doorbells. In a simpler way, magnets are sometimes used in vending machines. They help decide whether money is real or not depending on whether it is magnetic. Coins made in the United States are made up of a combination of metals and they tend not to be magnetic. One way the vending machines can tell whether someone is using real money or not is by using magnets.

Confused Compass

Even compasses occasionally lose their way.

Materials

- ◆ Compass
- ◆ 30 cm (12 in) Enameled Copper Wire
- ◆ Sandpaper
- ◆ Battery (“D” Cell works well)
- ◆ Optional: Electrical Tape

Safety Warning:

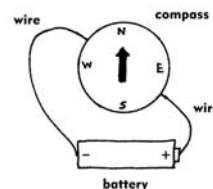
When the electricity goes through the wire, it tends to heat up quickly. Be careful not to place the ends of the wire on the terminals of the battery for too long.

Note

You can use insulated copper, but you will need to remove the ends of the insulation of both ends of the wire with wire strippers. If no wire is available, you may substitute a long strip of aluminum foil which has been folded many times to create a thin strip of foil.

Procedure

1. Remind the children that during the Mad Science Workshop they learned that magnetic fields and electrical fields occur together. You can refer to the electromagnet they made in class to refresh their memories. The following experiment is another way to illustrate the magnetic field that is created by an electrical current.
2. Cut a 30 cm (12 inch) piece of wire.
3. Using the sandpaper, sand each of the ends of the wire so that the enamel comes off. (This is the protective covering, or insulation, on the wire.)
4. Wrap the wire around the compass so that the wire is parallel to the direction of the needle. Make sure that a piece of each end of the wire sticks out.
5. Ask the students to **hypothesize**, or make their best guesses, about what they think will happen when you touch the ends of the wire to the battery terminals.
6. Explain to the class that you are going to conduct an **experiment** to help draw some **conclusions**.
7. Ask the students to **observe**, or watch carefully, when you touch the two wires to the terminals on the battery.
8. Ask the children to share their **observations** with the group.



Explanation

The children learned that magnetic fields and the electrical fields occur together. In the above experiment, when the electricity passed through the wire, it created a magnetic field perpendicular to the coil. The needs of the compass would move when the electricity was passing through it. Because the needle in the compass was parallel to the coils, the magnetic fields of the electromagnet will cause the needle to turn 90 degrees. The magnetic needle is attracted by the magnetic field created when the electric current passes through the coil of the wire.

MORE TO DO

Math

- Provide students with a variety of magnets and items that the magnets will be able to pick up. Ask the students to measure the distance between the magnet and the object when it picks it up. Have the students graph the results.
- Integrate magnets into word problems. For example, if there are 25 paper clips on the floor and a magnet can pick up five at a time, how many times will you have to use the magnet to pick up the paper clips?
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Language Arts

- Ask the students to write a short story about what would happen if our bodies worked like magnets and were attracted to everything that had metal in them. Have them write about their potential adventures and disasters and illustrate their stories.
- Challenge your class to write poems about magnets in the shape of a magnet.
- Provide your students with an assortment of pictures and photographs related to magnets and ask them to write a newspaper story about the imagine. Interesting examples include large magnets, large electromagnets used in junkyards to pick up cars.
- After researching the uses of magnets have your class create advertisements about the amazing powers of magnets. They can also illustrate their final products.

Art

- Ask students to bring in an assortment of materials that are attracted to magnets. Provide them with a variety of magnets and ask them to create sculptures with the magnets and metal objects. They can either create them using the power of the magnets or they can glue the items together.
- Cut out a magnet shaped “U” from a variety of materials, such as potatoes, sponges, clothes, towels, apples, oranges; these will be used as stamps. Ask the class to create pictures using their magnet shaped stamps.

Social Studies

- Have children locate iron deposits on a map. They should also highlight both the North and South Poles where there are large deposits of iron.
- Challenge your students to conduct research projects on the history of magnets and those individuals involved in the discovery of their powers. Greeks discovered magnetic stones, called magnetite, almost 2,000 years ago. The Chinese also discovered similar properties in a rock they called lodestone. Other people who were prominent with regard to the history of magnets are William Gilbert who wrote a book called “Of Magnets and Magnetic Bodies” in 1600 and Hans Oersted who discovered the link between magnets and electricity in the 1820’s.
- Have your students conduct research projects on the inventions that have used the power of magnets. Examples include magnetic catches on doors and cabinets, videotapes, metal detectors, microphones. Other students to investigate uses of magnets. For example, iron filings are sprinkled on animals caught in oil spills. Magnets are then used to remove the excess oil in a way that is less traumatizing for the animal.

Field Trip Suggestions

- Visit a science museum and concentrate on the section with magnets.
- Visit a junkyard to see how large electromagnets are used to pick up cars.

Thematic Units

Magnetic can be integrated into a number of thematic units and below are a few suggestions.

- A unit on Greek or Chinese Civilization.
- A unit on rocks and minerals.

BOOKS

There are numerous books available on magnets. Below are some suggested resources for students in Kindergarten to Grade 6.

Reference Books

Title: Amazing Magnets

Author: David Adler

Publisher: Troll Communications

ISBN#: 0893758957

Description: *This book provides answers to basic questions about magnets. It also includes several experiments to reinforce the concepts presented and is appropriate for students in Grades 3 to 6.*

Title: Magnet Science

Author: Glen Vecchione

Publisher: Sterling Publications

ISBN#: 0806908882

Description: *Complete with color illustrations this book provides students with information on what gives magnets their power and the different forms of magnetism. This book is appropriate for students in Grades 3 to 6.*

Title: Super Science Stuck on Magnets

Author: Kate Mason

Publisher: Troll Associates

ISBN#: 0816736707

Description: *This book is full of facts and entertaining pieces of information that help teach children about what magnets are and what they can do. It is intended for students in Grades 3 to 6.*

Experiments & Activities

Title: Experiments with Magnets

Author: Helen Challand

Publisher: Children's Press

ISBN#: 0516412795

Description: *This book provides experiments that introduce magnets and magnetism. The activities presented demonstrate the power of the magnetic field as well as the properties and strength of magnets. This book is intended for students in Grades 1 to 3.*

Title: What Makes a Magnet?

Author: Franklyn Mansfield Branley

Publisher: Harper Trophy

ISBN#: 0064451488

Description: *This book discusses the properties of magnets and describes hands on activities that are appropriate for students in Grades 1 to 3.*

Title: Playing with Magnets

Author: Gary Gibson

Publisher: Cooper Beech Books

ISBN#: 1562946331

Description: *Hands-on experiments are described in detail to help clarify the understanding of the basics of magnets. It is intended for students in Grades 1 to 3.*

Title: Science Book of Magnets

Author: Neil Ardley

Publisher: Harcourt Brace

ISBN#: 0152005811

Description: *Simple experiments intended for students in Grades 1 to 3 are outlined in this book that helps to explain the basic principles of magnetism.*

Title: Science Magic with Magnets

Author: Chris Oxlade

Publisher: Barrons Juveniles

ISBN#: 0812065018

Description: *This book provides simple magic tricks using magnets along with everyday materials to illustrate the properties of magnets in a fun and entertaining fashion. The activities are described in a language that is appropriate for students in Grades 3 to 6.*

Title: Science with Magnets

Author: Helen Edon

Publisher: EDC Publications

ISBN#: 0746012594

Description: *The basic principles and properties related to magnetism are described in this book that also contains simple experiments to help illustrate the concepts through hands on activities. It is intended for students in Grades 1 to 3.*

VOCABULARY

Domains: They are like little magnets inside certain metals (like iron), that when lined up create a strong magnetic field.

Electromagnets: When electricity moves through a wire, it creates a magnetic field around the wire.

Magnet: Seemingly ordinary pieces of metal or ceramic which are surrounded by an invisible field of force.

Magnetic Fields: The spaces around magnets in which magnetic forces act.