VIRTUAL CLASSROOM VISIT
MAGNET EXPLORATION

NATIONAL HIGH MAGNETIC FIELD LABORATORY

Center for Integrating Research & Learning
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Activity: What Do We Already Know?

Teacher Background: A simple, yet effective learning strategy, a K-W-L chart, is used to help students clarify their ideas. The chart itself is divided into three columns:

**K** WHAT DO YOU KNOW  
**W** WHAT DO YOU WANT TO KNOW  
**L** WHAT HAVE YOU LEARNED

**MATERIALS:** > Chart Paper  > Markers

**ACTIVITY INSTRUCTIONS**

1. Copy the K-W-L chart and pass out so that each student has their own sheet. Explain how the chart is to be filled out, then brainstorm with the class and have the students list everything that they know about magnets and magnetism. There are no right or wrong answers.

2. Next have the students list everything that they want to know about magnets and magnetism. You may need to provide prompts such as:
   
   *If magnet experts were here, what questions would you ask them?*
   *If you were a scientist, what would you like to discover about magnets?*

3. Keep the chart accessible so that you and the students can enter ideas, new information, and new questions, at any time. The class can return to the K-W-L chart after completing the activities. As students learn the answers to their questions, list the answers in the L column of the chart.

4. K-W-L charts are useful in identifying misconceptions that students have about magnets and magnetism. Once the misconceptions are identified, have students design a way to test their ideas, reflect on what they observe, and refine the original conclusion.

5. Periodically, return to the K-W-L chart during the activities to check off items from the W column and to add to the L column. Students may want to add items to the W column to further their explorations.
Teacher Background:
A magnet is a material with poles and a magnetic field created by the configuration of its electrons. Magnets can attract and repel because of the magnetic fields around the magnet. All magnets have magnetic fields and it is this magnetic field, and the poles of the magnet, that are defining characteristics of all magnets. There are two groups of magnets. Permanent magnets are magnets with magnetic fields that cannot be turned off. The other group is called temporary magnets. This category includes items that are magnetic, but do not stay magnetic. Items in this group include paper clips, scissors, staples, and various other items. Temporary magnets must be made out of one of the three metals that are naturally magnetic. They are iron, nickel, and cobalt. If something attracts to a magnet, it must have one of these metals in it.

What’s happening?
When it comes to the creating magnetic fields, the spin of the material’s unpaired electrons is the crucial element. In most materials, electrons spin randomly. But in magnets, the electrons group into magnetic domains, created when a number of electrons line up and spin in the same direction. If a majority of magnetic domains match spins, then that material is said to be a magnet, so it has north and south poles and a magnetic field. As long as the spins maintain their alignment, the material will stay magnetic.

MATERIALS:
- Various permanent magnets of different shapes, sizes, and strengths.
- Paper clips
- Random Magnetic items
- Metal non-magnetic items

ACTIVITY INSTRUCTIONS
1. Using a simple colored bar magnet, show the powers of attraction by bringing like poles together. Next place the opposite poles together to show the repulsion. Point out that all magnets have two sides — a north pole and a south pole. Tell the students that a four word phrase highlights the basic science of magnets: “opposites attract, likes repel.”

2. Show the students a paperclip, and ask them if this is a magnet. Then ask if the paperclip is magnetic. The paperclip is a temporary magnet. Ask the class if they can think of temporary magnets they may have in their home. Some answers include their refrigerator doors, car doors, the metal legs of their chairs and desks.

3. Attach the paperclip to the magnet, and ask the class if you can attach another paperclip to the first one. Since the paperclip has been magnetized, it can attract another paperclip. Ask the students what will happen if you remove the top paperclip (and the one below it) from the magnet. Gently pull the top paperclip, and both of them should still attract to each other. If you’re very gentle, you can even separate the two paperclips and bring them back together. They still attract! But if you drop them on the table, their field will be lost.

4. Pass out the magnets, and challenge the students to discover something new about magnets. Tell them it can be anything, something interesting or curious as long as it is new to them. During the exploration they can utilize objects in the classroom like tables, chairs, and other school supplies to test what is magnetic and what isn’t.

5. Ask a few students to share with the class what they have learned, and have the other students repeat the demonstration using their own magnets. Can they figure out which magnet has the largest field? The strongest field?
**Teacher Background:**

This experiment addresses a question that students often ask. How do various substances affect a magnet? This experiment can be repeated, each time changing the variable (the substance), allowing the children to explore not only magnets, but the scientific process.

**Activity: Does a Magnet Work in Water?**

**MATERIALS:**
- Round donut magnet
- 500 mL beaker (a mason jar will also work)
- Metal paper clips
- Six-sided pencil
- 8 inch piece of string
- Water
- Scissors
- Tape

**ACTIVITY INSTRUCTIONS**

1. Tape a piece of string to the middle of the pencil so it winds as the pencil turns. Tie the other end of the string to the magnet. Turn the pencil so that the magnet is wound all the way to the top.

2. Place the paper clip inside of the beaker and hold the pencil on top of the beaker so that the magnet is hanging inside the beaker.

3. Slowly turn the pencil so that the magnet is lowered into the center of the beaker. Keep unwinding until the paperclip is attracted to the magnet. Have students record their observations.

4. Repeat steps 2 & 3 with the beaker half full of water.

5. Have students record their observations after the addition of the water. Pay particular attention to any changes.

6. This experiment can be repeated several times, each time using a different liquid and observing changes. Try using salt water, clear soda, juice, etc.

7. Have students compare results among groups and devise a way to quantify them. One way is to mark the string in equal units, and observe the magnet in different liquids.
**Teacher Background:**

The human body needs iron for many reasons. The iron in hemoglobin attracts oxygen molecules, allowing the blood cells to carry oxygen to the rest of the body. Red blood cells have a very short life span, and new cells are always being created. Therefore, there is a constant need for a new supply of iron. Many people buy certain foods in an effort to increase the iron in their diets. Cereal is one of those foods.

In this activity, students will literally pull the iron from cereal. Be sure to use a Neodymium magnet (NIB) to attract the iron from the food. Traditional magnets don’t have the attraction needed to pull in these small bits of iron. Try this with different food products that claim to be “iron rich.”

**Activity: Iron In Our Food**

**MATERIALS:**
- NIB magnets
- Total brand Cereal
- Small bowls
- Clear plastic disposable cups
- Water
- Ziploc sandwich bags

**ACTIVITY INSTRUCTIONS**

1. Have students predict what will happen if they put a magnet in a bowl of cereal. Place 1 cup of cereal in the bowl. Students then crush the flakes with their hands.

2. Transfer the crushed flakes to a Ziploc bag. Add water and mix. The mixture should be thin and soupy.

3. Let the mixture sit for at least 1 hour; overnight is fine.

4. After the cereal mixture has been allowed to sit, pour some of it into the plastic cup.

5. Drag the wand magnet against the side of the cup for about a minute. Then tip the cup so that the cereal mixture runs to one side of the cup, away from the magnet. Students will observe iron particles on the side of the cup. Have students record their observations.
Kindergarten:
SC.K.N.1.1, SC.K.N.1.2, SC.K.N.1.5

1st Grade:
SC.1.N.1.1, SC.1.N.1.2, SC.1.N.1.4, SC.1.P.13.1

2nd Grade:

3rd Grade:
SC.3.N.1.1, SC.3.N.1.2, SC.3.N.1.4, SC.3.N.1.5, SC.3.N.1.6

4th Grade:

5th Grade:

6th Grade:

7th Grade:

8th Grade:

NGSS:
K-PS2-1, 2-PS1-1, 2-PS1-3, K-2-ETS1-3, 3-PS2-1, 3-PS2-3, 3-PS2-4

VOCABULARY LIST

Attract
To cause to draw near by a force.

Electromagnet
A temporary magnet that is run with electricity.

Magnet
An object that is surrounded by a magnetic field and that has the property, either natural or induced, of attracting certain metals. All magnets have a North and South pole.

Magnetic field
A region around a magnet in which objects are affected by the magnetic force.

Magnetic Pole
The north or south pole of a magnet, where the magnetic field is the strongest.

Permanent Magnets
A piece of magnetic material that retains its magnetism after it is removed from a magnetic field.

Repel
To push back or away by a force.

Temporary Magnets
A piece of magnetic material that demonstrates the properties of a permanent magnet only while in a magnetic field.

If you have any questions, please contact Carlos Villa: villa@magnet.fsu.edu