LESSON PLAN – MAGNETS_VASOLSCIENCE_2.2

TARGET AGE GROUP: 2ND Grade
ESTIMATED TIME: 30 Minutes

PURPOSE

This activity can be used to complement classroom instruction related to the following VA SOLs:

Grade Two: Science

Life Processes 2.2: The student will investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals. Key concepts include:

a.) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel; and

b.) important applications of magnetism including the magnetic compass.

OBJECTIVES

1) Teach students how to form a hypothesis.
2) Teach students the properties of magnetism.

MATERIALS

- **Activity #1:** Chart paper/Markers or Chalk/Dry Erase Board, Horseshoe Magnets *(1 per group),* Magnetic Hunt Worksheet *(1 per group)*
- **Activity #2:** Chart paper/Markers or Chalk/Dry Erase Board, Bar Magnets *(1 per group)*, Ziploc Bags Containing the Following Objects *(1 per group)*: two pieces of differently colored construction paper (laminated) with one labeled "magnetic" and the other "non-magnetic", pencil, eraser, paper clip, butter knife, keys, coins, piece of cloth, piece of paper, small comb or other plastic object (suggest plastic spoon/knife), nail/screw, an aluminum can, tin can, straight pins, marble, any other available objects that could be tested for magnetism.
- **Activity #3:** Chart paper w/ Markers or Chalk/Dry Erase Board, Horseshoe Magnets *(1 per group)*, Ziploc Bags Containing the Following Objects *(1 per group)*: straight pins, steel ball bearings, paper clips, hairpins, staples,

PART I: INTRODUCTION TO NATURAL RESOURCES, MINERALS, AND MAGNETS

If this is the first activity of the day, introduce yourself and the agency/organization you represent. Briefly discuss what you do and how it correlates with this particular lesson.

Instructor Dialogue Example: Good Morning! My name is Jane. I work for XYZ Soil and Water Conservation District. We protect and preserve the natural resources of XYZ County.

Student Question: What is a natural resource? *Answer: A natural resource is something that occurs naturally and has value.*

The conservation district and our many partners primarily focus on five natural resources. Let's identify those five natural resources: S = Soil; W = Water; A = Air; P = Plants; A = Animals.

Explain that minerals are also a natural resource. Some minerals found in the soil have magnetic properties. Iron, Nickel, and Cobalt are three minerals that have magnetic properties.

Student Question: What is a magnet? *Answer: A magnet is a material or object that produces a magnetic field. The magnetic field is invisible and causes a force that pulls on nearby magnetic materials, and attracts or repels other magnets.*

Student Question: Did you know the earth is a giant magnet?

Background Information

1. A magnet is an object that can push or pick up materials made of iron, steel, or nickel. A magnet is made of these same materials.
2. Objects that are attracted by magnets have similar properties.
3. Magnets attract to ferrous metals such as iron, nickel, cobalt, certain steels and other alloys. Brass, aluminum, copper, and most stainless steels; however, are non-ferrous.
4. Every magnet has two places where its strength is concentrated.
5. A magnet has poles on either end – a north pole and a south pole.
6. A magnet that is free to turn will come to rest with its poles aligned in a north-south direction.
7. Unlike poles of a magnet attract each other. Like poles of a magnet repel each other. The north pole of a magnet will attract the south pole of a magnet and repel the north pole of another magnet. Think "opposites attract".
8. A magnet can be made from a steel object by striking it with a magnet.
9. Once magnetized, a piece of steel can remain magnetized indefinitely.
10. A magnetic compass consists mainly of a freely turning magnet.
11. All magnets, and thus all compasses, have a north-south seeking pole.
12. A magnetic compass works because the earth itself is a magnet: the compass magnet interacts with the earth-magnet.

PART II: PROPERTIES OF MAGNETS - ACTIVITIES

This part will involve three group activities to teach students the properties of magnets.

ACTIVITY 1: MAGNETIC HUNT

- Activity Objectives: To illustrate that magnets produce an invisible force, and that some things respond to magnetic force or pull, others do not
- Materials: Chart paper w/ markers or Chalk/Dry Erase Board *(Instructor)*, 1 horseshoe magnet per group, 1 Magnetic Hunt Worksheet per group
- Prior Knowledge for Students: None
- Key Vocabulary: Magnet, Magnetic, Force
- Procedures:
  1) Divide students into groups of 2 or 3, depending on class size.
  2) Introduce the unit of study – Properties of Magnets. Display chart paper with the heading, "What we already know about magnets." As students offer responses, record them on the chart. *Suggestion: Do not correct the students' inaccurate responses. This will be helpful in ascertaining the students' prior knowledge, including accurate and inaccurate assumptions. This chart can be referred throughout the unit of study as a way for students to reflect upon their learning and to rethink inaccurate ideas*.
  3) The study of magnets begins with an open exploration of magnetic and non-magnetic objects. Provide each group of students with a horseshoe magnet and a **Magnetic Hunt Worksheet**. Have the students work with their assigned group to go on a "magnetic hunt." Students should explore the room, predicting what objects are magnetic and what objects are not magnetic. At this time define "Hypothesis" and "Conclusion". **(A hypothesis is an "educated guess" which needs to be tested in order to determine the answer.)** *Magnetic Hunt Worksheet Explanation: Students should list 5-10 classroom objects they*

wish to test in Column 1 (Time allotted for this lesson will determine how many objects should be tested.). Next, students should form a hypothesis about that object (whether it is magnetic or non-magnetic) and document the hypothesis in Column 2. Finally, students should use a magnet to test their hypothesis and record the results in Column 3. This should be done for each object. **IMPORTANT: It might be a good idea to tell students which objects they should not test with magnets, i.e. computer screens, computer disks, audio cassette tapes, etc.

4) Have students come back together to share their findings. Discuss any objects the students found in common. Allow students to share any other observations or things they noticed in experimenting with the magnets.

ACTIVITY 2: WHAT CAN A MAGNET ATTRACT?

- Activity Objectives: To illustrate that magnets produce an invisible force and that some things respond to magnetic force or pull, while others do not; To classify objects and formulate hypotheses regarding materials and their magnetic properties
- Materials for Activity #2: Bar Magnets *(1 per group)*, Ziploc Bags Containing the Following Objects *(1 per group)*: two pieces of differently colored construction paper (laminated) with one labeled "magnetic" and the other "non-magnetic", pencil, eraser, paper clip, butter knife, keys, coins, piece of cloth, piece of paper, small comb or other plastic object (suggest plastic spoon/knife), nail/screw, an aluminum can, tin can, straight pens, marble, any other available objects that could be tested for magnetism.
- Prior Knowledge for Students: Magnetic, Hypothesis, Conclusion
- Procedures:
  1) Maintain groups. Pass out bags of materials to each group but ask student to keep the bags closed until instructed to open. The instructor should have his/her own bag of materials and pull out items one by one asking students (as a class) to predict which objects will be attracted to the magnet. Record their predictions on the chart paper or board. From these predictions, ask the students to formulate a hypothesis i.e. "Metal objects are attracted to magnets." Also record the hypothesis on the board so that it may be referred to at the end of the lesson.
  2) Instruct students to open their group's Ziploc baggie and experiment with the objects in their bag to determine if they are magnetic or not. As each item is tested, students sort the objects into two groups by placing them on the appropriately labeled construction paper – "magnetic" or "non-magnetic".
  3) After the groups have completed the activity, bring the class together for discussion: Were more objects magnetic or non-magnetic? Were there any objects that surprised you? Why? Do you see anything in common among the objects that are magnetic? Were all the metal objects magnetic? Was our hypothesis correct? What conclusions can we draw from our observations?

ACTIVITY 3: MAGNETIC FORCE FIELD

- Objective/Goals: To illustrate magnetic pull is greatest when the object is closest to the magnet; magnetic power passes through objects it attracts, however the magnetic force decreases with distance; a magnetic force can hold a limited amount of weight.
- Materials for Activity #3: Chart paper w/ Markers or Chalk/Dry Erase Board, Horseshoe Magnets *(1 per group)*, Ziploc Bags Containing the Following Objects *(1 per group)*: straight pins, steel ball bearings, paper clips, hairpins, staples
- Prior Knowledge for Students: Knowledge obtained in Activity 1 and 2.
- Key Vocabulary: Magnetic Force Field. **(Magnetic Force Field is the range of the magnets effectiveness.)**
- Procedures:

1) Maintain Groups. Pass out bags of materials to each group but ask students to keep the bags closed until instructed to open. The instructor should have his/her own bag of materials. Introduce the lesson by asking students to consider how far magnetic force reaches, and introduce the vocabulary term, "force field." Model the procedure for the lesson. Ask students to predict which items the magnet will be able to hold the most (straight pins, ball bearings, paper clips, hairpins, or staples). Ask students to explain their hypotheses for their predictions (explain why they made that prediction).
2) Instruct groups to open their Ziploc baggies. Each group will work together to explore the strength of the horseshoe magnet by picking up a straight pin with the end of the magnet. They add another pin to the first, then another and another. They keep adding pins in a dangling string from the magnet until the last one no longer sticks. How many pins could the horseshoe magnet hold?
3) Students repeat the procedure with each of the objects, recording their findings.

CONCLUSION

Close w/ the following review questions:

1) What three materials can become magnetic? *Answer: Iron, Nickel, Cobalt*
2) What is a magnetic force field? *Answer: The range of the magnets effectiveness*
3) What can a magnet attract? *Answer: Materials containing Iron, Nickel or Cobalt*

Magnet Test
Experiment with Magnetism

You will need:
2 bar magnets
Horseshoe magnet
Objects to test Example: Tin foil, pencil, paper clip, can, coins, plastic spoon, bolt, Etc.

Explain to the students that all magnets have two ends with opposite forces to one another. These are called the north and south poles. The opposite poles of two magnets will attract each other. The same poles will repel (push each other way). Magnets attract things that are made of, or contain iron or steel.

1. Start with the two bar magnets. Hold the two bar magnets with the north pole facing the south pole. What happens? Do they attract or repel each other?
2. Do the same with the north or south poles facing each other. What happens?
3. Next arrange your selection of everyday objects on a table. Have the students guess which ones you can pick up with your magnet.
4. After seeing which objects could be picked up with the magnets ask the students which of the items can be recycled or may come from recycled material.

Kissing Fish

You will need:
Cardboard
2 small paper clips or sewing needles
Magnet
Water
Bowl or plate
Pen or pencil
Tape
Scissors

1. Cut out two fish shapes from the cardboard. If working with young children I recommend precutting the fish beforehand.
2. Tape the paper clips or needles along the lengths of the fish.
3. Rub the paper clips or needles with the magnet 20 times. Rub toward the nose of one fish and the tail of the other.
4. Fill your plate or bowl with water, and float the fish on top. What happens?
    a. The fish will begin to move towards each other
    b. The north and south poles of the magnetized clips or needles attract each other
    c. Eventually the fish "kiss" each other

Explain to the children that by stroking the needles/clips turns them into magnets. They have north and south poles, just like the bar magnets, and these attract and repel each other in exactly the same way. The magnetic attraction is strong enough to pull the fish toward each other across the water.

Tell them that in the real world fish are not magnetic but need clean water to survive.

Magnetic Rocks

You will need:
Sheet of posterboard
Rocks
Magnet

Have a collection of rocks that you have gathered from your garden, waterways, fields or any other place you can think of.

Explain to the students that there are many different types of minerals in rocks. That rocks are part of our natural resources. Just like all natural resources they offer many benefits to the environment. The rocks that are attracted to the magnet have iron in them. This is why they will move to the magnet.

1. Arrange rocks on your posterboard so that the students can see. Make sure to spread them out.
2. Now place your magnet close to each of the rocks.

Matchbox Cars

You will need:
Paperclips
Empty matchboxes
Colored pencils or markers
2 Sticks about 12 inches long
2 Magnets
Rectangular piece of posterboard
Tape
2 blocks of wood or can use 2 stacks of books

1. Decorate the matchboxes to make them into racing cars.
2. Tape a paperclip inside each box
3. Make the piece of posterboard into a racetrack for two cars
4. Attach a magnet to the stick
5. Lift the racetrack off the table by resting it on the blocks of wood or stacks of books
6. Move the magnet under the posterboard to make the race cars on tope of the posterboard racetrack move
7. Make another stick with a magnet so a student can play with you.

Now while playing is a good time to inform the students that unlike real race cars ours are environmentally friend cars. Our cars do not leak oil which can pollute our soils and water. Nor do they give off fumes that pollute the air.

Name: _____

MAGNETIC HUNT WORKSHEET

Directions:

Step #1: Look around the classroom and identify 10 items that you will test for magnetism. Record those items in Column 1.
Step #2: Draw a hypothesis or make a prediction to the following question: Will a magnet be attracted to the item? Write Yes or No in Column 2.
Step #3: Use a magnet to test each item and record the results. Was a magnet attracted to the item tested? Write Yes or No in Column 3.

Items to be Tested Look around the room and list 10 items that you will test for magnetism.	**Hypothesis/Prediction** Will a magnet be attracted to the item listed in Column 1? Yes or No	**Results** Was a magnet attracted to the item tested? Yes or No
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		