USU 4-H Magnet Tote

BIG IDEA:
Making observations help people better understand the natural world.

UNDERSTANDINGS:
Magnetic forces between objects does not require those objects to be in contact.
People design and build using tools and knowledge of the natural world.

ESSENTIAL QUESSTIONS:
In what ways are magnets used in everyday life?
How does experimenting and observing help people design and build?

THREE DIMENSIONS, UTAH SCIENCE STANDARDS, AND INTENDED LEARNING OUTCOMES:
See pg. 7-8

Supplies

- Paper*
- Pencils*

Fishing for Magnets p. 4

- Magnet Fishing Rods*
- Various Magnetic and Non-magnetic Items*

Magnet Exploration p. 5

- Magnet Wands
- Sizzler Magnets
- Floating Rings Magnets
- Ceramic Magnets
- Neodymium Magnets
- Horseshoe Magnets
- Marble Magnets

Magnets in Our World p. 7

- Cow Magnet
- Floating Rings Magnets (Maglev)

*Not included in tote

Activity 1: Fishing for Magnets

Time: 15 min

Grade Level: 3-6

Materials:

- Magnet fishing rods
- Various everyday magnetic and non-magnetic items

To Do:

1. Gather magnetic and non-magnetic items. Have students suggest items they would like to put in the "pool" to test.
2. Place the items on the floor or in a tub.
3. With the magnet fishing rods, have one student at a time call out an item they think might be magnetic for another student to try to try "catch."

REFLECT:

- What items were able to be picked up?
- What was it about those items that made them magnetic?
- Did it matter what part of the item the magnet touched?
- What items did you think would be magnetic that were not?
- Did any of the magnetic items surprise you?

APPLY:

Many materials like plastic and glass are not magnetic. Magnets attract or pull certain types of metal like iron, nickel, and cobalt.

Just because an object is made of metal does not mean it will be magnetic. Most metals, such as aluminum and copper are not magnetic. However, an item does not need to be purely made out of magnetic material. Parts of the item can be magnetic if it is only partly made of magnetic material.

Magnetism is a type of force. Even if an item is magnetic, it may not be able to actually be picked up if the force of gravity acting on it is stronger than the magnetic attraction.

Activity 2: Magnet Exploration

Time: 30 min

Grade Level: 3-6

Materials:

- Magnet Wands
- Ceramic Magnets
- Neodymium Magnets
- Horseshoe Magnets
- Sizzler Magnets
- Magnetic Marbles
- Magnet Wands
- Marble Magnets

To Do:

1. Discuss how magnets are made of different items. These items have different properties that they will explore. Let the students know to be careful not to break the magnets or to pinch their fingers between the magnets.
2. Have students make a hypothesis about which magnet will be the strongest and create one more question and hypothesis of their own that they will explore.
3. Divide the class into groups to experiment with the five different types of magnets. Have them spend five minutes at each station. Write down observations and new questions.

REFLECT:

- Which magnet did students think would be strongest?
- What makes some magnets stronger than others?
- Were students able to manipulate the strength of the magnets?
- Did shape make a difference?
- Did combining magnets make a difference?

APPLY:

Magnets are made out of many different types of materials. Many of the magnets we use are made out of alloys, combinations of different metals, which are then magnetized with a powerful magnetic field. Magnetic fields are made from moving electric charges (Science

Matters, p. 50). There are some naturally occurring magnets as well. Lodestone, or magnetite, was discovered anciently. People learned shards of lodestone always pointed north and south and could use the shard as a compass.

All magnets have two poles, a positive pole and a negative pole. Even if a magnet gets broken down the middle it will still have two poles. The poles are created from positive and negative electric charges. The earth also has magnetic fields with a north and south pole. That is why compasses always point north and how many animals, like birds, can navigate.

Activity 2: Magnets in Our World

Time: 30 min

Grade Level: 3-6

Materials:

- Paper and Pencil
- Cow Magnet
- Floating Ring Magnets (Maglev)
- Materials for Magnet Inventions (optional)

To Do:

1. Have students, or teams of students, write down all the items they use in their daily life that use magnets. Have one student/group at a time read their list. Have students cross off common items. Whoever has the most individual items left on their list wins!
2. Talk about some of the items in our world that use magnets and the different ways the magnets are used (ex. Cow magnets, alarm systems, motors, electromagnets, maglevs)
3. Design an invention that uses magnets. Have students share their inventions with the class (or in groups depending on number of students and time). If time and resources permit, make your inventions.

REFLECT:

- How would your life change if we could not use magnets?
- What other inventions use magnets?
- What in the natural world functions because of magnetism?
- Have the students think of questions before you give them away

APPLY:

Magnets are used many different ways in our world. From being simple fasteners, to making alarm systems work, to making motors, to moving trains, magnets have a wide range of uses. When electromagnets were first invented people would use them for magic tricks where a little person could pick something off of the floor and then a very strong person would come to pick it up and be unable to because the electromagnet had been activated. Cow magnets are used to protect cows from the metal they may swallow as they graze.

Additional Activities

- Research how to make a simple electromagnet
- Research how to make a motor
- View magnetic fields using an iron filings case or a magnetic field viewer

Contents of Magnet Tote

- Sizzler Magnets (one is broken) (11)
- Floating Magnets and Stands (9)
- Large Neodymium Magnets (2)
- Ceramic Bar Magnets (6 fairly chipped) (28)
- Cow Magnets (5)
- Bag of Metal and Magnets
  - Disc Magnets (some with holes) (~100)
  - Colorful Donut Magnets (6)
  - Plastic Tubes with Magnetic Ends (13)
  - Metal (nuts, washers, metal strips)
- Magnet Wand
- Magnet Marbles
  - Small Marbles (~50)
  - Large Marbles (~35)
- Horseshoe Magnets
  - Blue (5)
  - Red (4)
- Metal, Red Horseshoe (2)
- Magnet Picker-Upper

Three Dimensions, Utah Science Standards, and Intended Learning Outcomes

Note: These applications of National and State Science Standards are not comprehensive. They are meant to serve as suggestions. While only standards for elementary levels have been listed, standards for more advanced grade levels can also be applied. Additionally, this tote is an excellent tool to facilitate inquiry for any age group.

THREE DIMENSIONS

3-PS2-3. Motion and Stability: Forces and Interactions (Activity 1: Fishing for Magnets, Activity 2: Magnet Exploration)

Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

Science and Engineering Practices:

Asking Questions and Defining Problems

- Ask questions that can be investigated based on patterns such as cause and effect relationships

Disciplinary Core Ideas:

PS2.B: Types of Interactions:

- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Crosscutting Concepts:

Cause and effect:

- Cause and effect relationships are routinely identified, tested, and used to explain change.

3-PS2-4 Motion and Stability: Forces and Interactions (Activity 3: Magnets in Our World)

Define a simple design problem that can be solved by applying scientific ideas about magnets.

Science and Engineering Practices:

Asking Questions and Defining Problems

- Define a simple problem that can be solved through the development of a new or improved object or tool.

Disciplinary Core Ideas

PS2.B Types of Interactions

- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on

the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Crosscutting Concepts: Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering and Technology

- Scientific discoveries about the natural world can often lead to new and improved technologies which are developed through the engineering design process.

UTAH SCIENCE STANDARDS

K-Grade 2

Standard 1 (Activity 1: Fishing for Magnets, Activity 2: Magnet Exploration, Activity 3: Magnets in Our World):

- The Processes of Science, Communication of Science, and the Nature of Science. Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

Grade 3

Standard 3 (Activity 2: Magnet Exploration, Activity 3: Magnets in Our World):

- Students will understand the relationship between the force applied to an object and resulting motion of the object.

Grade 5

Standard 3 (Activity 1: Fishing for Magnets, Activity 3: Magnets in Our World):

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

INTENDED LEARNING OUTCOMES (ILO'S):

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.