



Intro: This lesson is about the mysterious and intriguing force of Magnetism. I can't think of a better tool than a magnet to get students interested in science. This is the only time of the year when I seem to have the entire interest of the room. Magnets, they're small, inexpensive, and have limitless opportunities for exploration and investigation.

In this investigation students will explore how magnets can pull on things without actually touching them (ooooh ahhhh!), the force can even go right through a solid object. Mental conflict will arise when students encounter the idea that not all objects are affected by magnetism, only objects that contain iron. Magnets have a lot of interesting properties. The closer a magnet is to a magnetic object, the stronger its force will be. Also, magnets have two sides. On one side, they push away, on the other, they pull towards each other. This investigation is fun, puzzling, and open-ended.

Scientific and Engineering Practices (SEPs): Students will ask questions about magnets and develop and carry out investigations to observe the different properties of them.

Cross-curriculum Integration (focus standards beyond SCIENCE): Students consider the cause and effect relationship between this distance of a magnet and the strength of the force. Students consider the cause and effect relationship between which direction two magnets are facing and if they will push or pull on one another.

Performance Expectation (NGSS) 3-PS2-3; 3-PS2-4: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.



Materials: Each student will need:

- at least two ring magnets, which you can buy on Amazon, listed as “ceramic donut magnet.
- A “Magnets are Weird Worksheet.”
- An Ideas for Experimenters worksheet
- A pencil

- Paperclips
- A piece of thread or string or light ribbon. This material needs to be lighter than a paperclip.
- A few 3x5 cards
- And an arrangement of test items like tin foil, a button, maybe a crayon, a coin etc. The test items should include some metals that are attracted to magnets, some metals that are not, and some non-metal items. Here are some items that **are** attracted to magnets: paperclips, staples, nails, washers, binder clips, metal bottle caps, a stainless flatware, and anything else made of steel. Here are some items that **ARE NOT** attracted to magnets: pennies, quarters, dimes, nickels, and aluminum cans. Throw in some wooden and plastic items to build the mystery.
- The last material is a Ziploc bag for all materials. This will help keep the learning space tidy.

Learning Objective: “Students will explore the surprising properties of magnets and experiment with an invisible force that acts at a distance.”

Now here is how the lesson should go...

First, get the class to area close enough to observe you. Next, in one hand hold a paperclip, tied to a light piece of string. In the other hand, use a magnet to make the paperclip “LEVITATE.” (This will take some practice so try it a couple times before you perform this in front of students.)

At this point, with the paperclip floating in the air, ask how is this possible? What’s happening between the paperclip and the magnet? Can we make other things fly? How else do we use magnets? What aren’t we doing with magnets that we could be doing? Is this energy available to do anything that we do every day? I encourage all to come up with their own questions; this display really sparks the curiosity.

After the questioning, put students in pairs using a random reporter jar. I use this method of group choosing so that the same students don’t pair up every time. After pairs are created, distribute the worksheets and the materials. This lab is completely about experimenting.



I would give students about 30-45 minutes to experiment. Walk around the room and model ways of testing materials. This lab can sometimes be “too exciting” and lose track of the other part of science, the documentation of results.

After 30-45 minutes, regroup. With all materials back in their bags, ask if anyone else came up with questions on their own? New questions. Remind the students of the most important characteristic of magnets, the can pull on things without touching them. Every other force needs contact, not magnets! Magnets can pull on things without touching them.

Finish the lesson with the story about where magnets come from. I encourage you to research this and create a story-telling approach to tell where magnets come from. In short, magnets are from a part of Greece called “Magnesia.” A farmer was hiking through the hills and the nails in his shoes kept

slipping out. He would take a few steps, then his shoes would fall apart. This kept happening throughout his hike. Eventually he discovered that it was the material in the rocks that kept pulling the nails out of his shoes.

Close the lesson with a few other demonstrations like the one shown here and ask some questions to get the students thinking. This demonstration magnetism? When the magnet is removed, do the items stay magnetized? Another great demonstration is this: there is an invisible force preventing the two magnets from touching. How else can we use this force?



shown here and demonstration magnetism? When magnetized? invisible force touching. The magnets are hovering. How else can

Lastly, please show the video of the amazing Japanese hovering train. [Magnetic Train](#)



Assessment/Rubric: The science organizers will serve as your summative assessment. The conversations are your formative assessment. I have found the students miss the writing, scripting part of science and this is the area I must constantly reinforce. Like all subjects, I feel that a discussion about “why” scientists need to document all findings helps with motivation

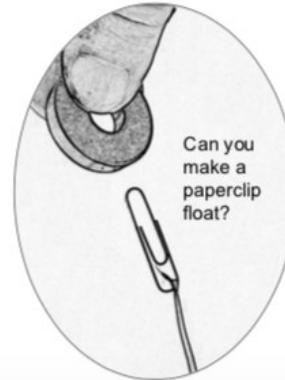
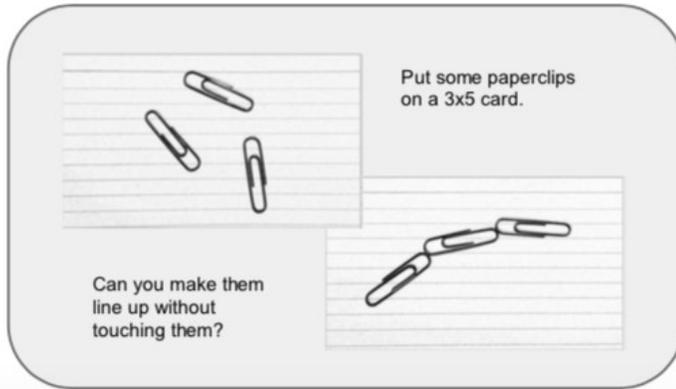
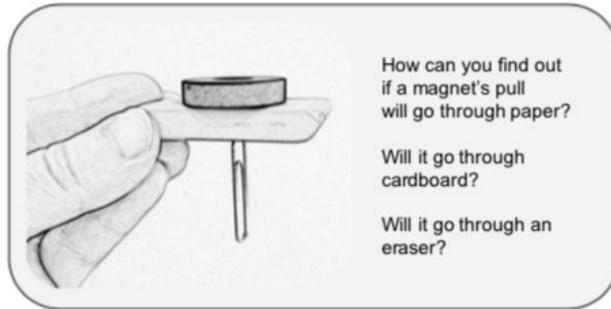
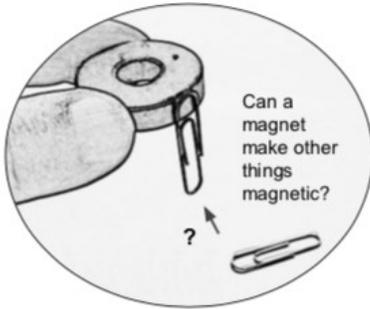
Organizers:

Magnets Are Weird

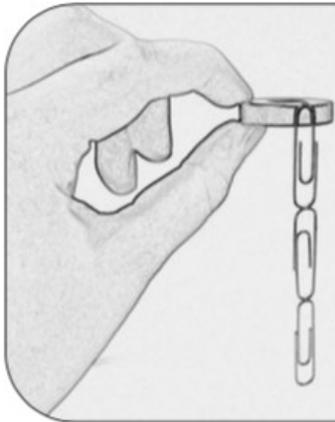
Name: _____

Questions:	My drawing of what I tried:	What happened:
<p>1. Will a magnet's pull go through paper?</p> <p>Will it go through cardboard?</p> <p>Other materials?</p>		<hr/> <hr/> <hr/> <hr/> <hr/>
<p>2. Can you make a paperclip float?</p> <p>Can you make a magnet float?</p>		<hr/> <hr/> <hr/> <hr/> <hr/>
<p>3. Write your own question:</p>		<hr/> <hr/> <hr/> <hr/> <hr/>

Ideas for Experimenters

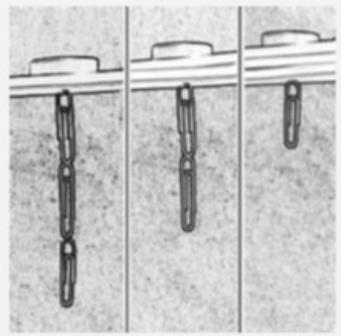


More ideas

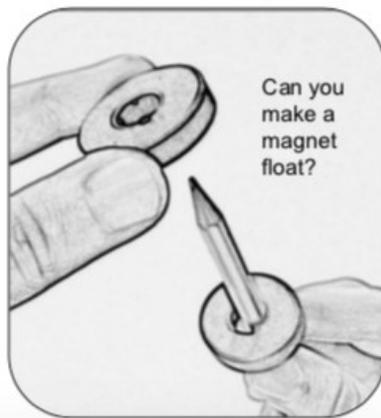


How many paperclips can you hang from a magnet?

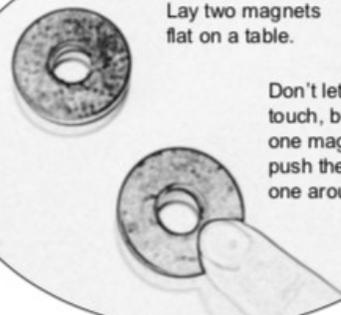
What happens if you stack up more magnets?



How can you make a magnet's pull weaker?



Can you make a magnet float?



Lay two magnets flat on a table.

Don't let them touch, but use one magnet to push the other one around.