# Magnetism at Home

**Estimated Time: 60 minutes**

**SUMMARY**

In this activity, students learn about the Earth's magnetic field and magnetizing objects by making a simple magnetic compass. They then explore the relationship between electricity and magnetism by making and testing small electromagnets.

**WHAT YOU'LL LEARN**

- How to make a compass
- That Earth has a magnetic field
- How electricity can induce a magnetic field

| **Materials Used** | **Resources Used** |
|---|---|
| Making a Compass<br>● A pin or needle<br>● A bowl<br>● Water<br>● A cap from a plastic bottle<br>● Tape<br>● A magnet (refrigerator magnet works)<br>Making an Electromagnet<br>● Insulated copper wire (thin insulation or magnet wire works best)<br>● Paperclips (many small ones work best)<br>● Screw and/or bolt (thick ones work best)<br>● A 9V battery | ● How Compasses Work Video - https://www.youtube.com/watch?v=Aq8s2SF17zY<br>● Electromagnet Basics - https://www.youtube.com/watch?v=cxELqN7wjS0 |

**WHAT TO DO**

Making a Compass

1. Fill the bowl with water about halfway.
2. Rub the needle with the magnet towards the point. It's important to only rub the needle in one direction to induce the needle into a magnet.
3. Attach the pin to the open side of the bottle cap so that it lays across.
4. Float the cap in the water with the needle above the water. You should notice the cap turn and then stay in one spot. You can also hold the magnet near the bowl to change where the needle points.

Making an Electromagnet

1. The video from the Resources section is very helpful as an introduction if you're unfamiliar with electromagnets.
2. Take a pencil and mark the length of your screw or bolt. This will be used to keep track of how many times the wire is wrapped around the bolt.
3. Leaving about 3 inches of wire hanging off, wrap the wire around the bolt.
    a. Make sure that only the insulated part touches or your magnet will be weaker.
    b. Try not to overlap wire or your magnet will be weaker.

    c. Leave extra on both ends of the wire to attach to the battery.
    d. Count how many times you wrap the wire around the bolt.
4. To power the magnet attach one end of the wire (with insulation stripped off) to the battery. Touching the other end to the other pole of the battery will power the magnet.
5. Try out your electromagnet!
    a. See how many paperclips it can pick up.
    b. Try using it near your compass from the first activity.
    c. Try switching the poles that the wires are connected to on the battery. How does it change how the electromagnet works?

**TIPS**

6. For younger kids, watching the “How Compasses Work” video before making the compass can help the activity make more sense. Older kids may get more from the activity by watching it at the end after trying to guess how it works.
7. Older kids should try changing their electromagnets to learn more about them. A few examples of experimental designs include:
    - Changing the number of times the wire is wrapped around the bolt and measuring how many paperclips it can pick up with each number of winds in the wire.
    - Try changing the diameter of the bolt by winding the wire around bolts the same number of times and measuring the number of paperclips each can hold.
    - Try changing the length of the bolt.
    - Try changing what type of wire or type of bolt or really anything you can come up with!
    - Make sure to keep a table of data to keep track of your evidence.