

Stronger Electromagnets

Estimated Time: 30-60 minutes

SUMMARY

Building off the earlier experiment of making your own electromagnets, here students see how to make stronger magnets with different design choices.

WHAT YOU'LL LEARN

- The more turns in an electromagnet the stronger its magnetic force.
- Electromagnetism is one effect that builds and diminishes together.

Materials Used	Resources Used
<ul style="list-style-type: none"> • Insulated copper wire (thin insulation or magnet wire works best) • Paperclips (many small ones work best) • Several screws and/or bolts (thick ones work best) • One 9V battery 	<ul style="list-style-type: none"> • Electromagnet Basics Video

WHAT TO DO

1. Follow the instructions for making your own electromagnet in the STEM at Home activity titled "[Magnetism at Home](#)" (found in our Forces week). As you wind the wire around the electromagnet, count the number of wraps you do.
2. Use your electromagnet to attract paperclips by holding the electromagnet above the paperclips and lowering it until they are attracted.
3. Undo your electromagnet and *using a new bolt*, wrap the wire again. This time only make *half* as many wraps as you made before.
4. Repeat step 2 with your new, half-strength electromagnet. Did you have to move the electromagnet closer this time?
5. Repeat this process with different numbers of wraps (a quarter of the original, three-quarters, etc.) and if you have a longer screw or bolt try making even more wraps. Keep track of the relationship between number of wraps and how close the magnet needs to be to attract paperclips.
6. Do some brainstorming at the end. Why might more wraps of wire make a stronger electromagnet?

TIPS

- As explained in the video, electromagnets are magnetized because of the movement of electricity. A *dynamic* (moving) electrical field creates a magnetic field and a larger electric field means a larger magnetic field. The reverse is also true, which is how electric generators work. If you have a moving magnet (driven by the power of rushing

water, wind, etc.) then it can create an electric current. The larger the magnet, the bigger the current.