

LET'S MAKE A MAGNET

Electromagnetism

Aaron Spurling, UT/TSU Extension 4-H Youth Development
Jennifer Richards, Curriculum Specialist, Tennessee 4-H Youth Development



Tennessee 4-H Youth Development

Let's Make a Magnet

Electromagnetism

Skill Level

Intermediate, 8th Grade

Learner Outcomes

The learner will be able to:

- Identify components of an electromagnet and how they work together.
- Explain real life examples of electromagnetism.
- Assemble an electromagnet and describe the process.

Educational Standard(s) Supported

Science

- GLE 0807.12.1
- SPI 0807.12.2

Success Indicator

Learners will be successful if they:

- Explain the components of an electromagnet and the roles of those components from the experiment.

Time Needed

30 Minutes

Materials List

- 9-volt or D-cell batteries (one per group)
- Copper lead wires with alligator clips (2 lead wires with clips approximately 18 inches per group)
- One long steel nail (per group)
- Magnetic and non-magnetic items for testing

Introduction to Content

This lesson introduces the basics of electromagnetism and encourages students to think about polarity and electrical currents as they build an electromagnet.

Introduction to Methodology

Before the lesson, watch this video to better understand the process of creating an electromagnet: tiny.utk.edu/magnet.

This lesson uses modeling and hands-on approaches to aid students' comprehension. The lesson begins with assessing students' prior knowledge of magnets before they construct their own electromagnet.

Author

Aaron Spurling, UT/TSU Extension
4-H Youth Development.



Terms and Concepts Introduction

Magnetism – a physical phenomenon where the motion of electric charge creates attractive or repulsive forces between objects

Magnet – an object that makes a magnetic field

Electromagnetic – a core of magnetic material (such as iron) surrounded by a coil of wire through which an electric current is passed to magnetize the core

Polarity – a magnet has positive and negative poles

Electrical current – when positive or negative electric particles move and produce heat, magnetic fields or chemical transformations

Setting the Stage and Opening Questions

Begin by asking the students about where they have seen magnets. The most readily available answer will probably be a refrigerator, but encourage students to think of other examples.

Discuss how currents are part of magnetic and electrical fields. Explain how these fields are similar. Share applications of electromagnets.

After sharing with the students, ask questions to assess prior knowledge.

- What is a magnet?
- What two types of currents are there?
- How do you think the strength of an electromagnet compares to a permanent magnet?

Tell students, **“By the end of this lesson, you will be able to identify components of an electromagnet, identify how they work together, explain real life examples of electromagnetism, assemble an electromagnet and describe the process.”**

Experience

Before the lesson, watch this video to better understand the process of creating an electromagnet: tiny.utk.edu/magnet.

Show students the materials and complete the following steps to construct an electromagnet:

1. Take the longer lead wire and wrap it around the nail. Explain to the students that this represents the core.
2. Then, attach the shorter lead to the battery. The alligator clips can hold the wire in place.
3. Next, connect the other lead wire to the opposite pole of the battery to create a small electromagnet.
4. Using the magnetic and non-magnetic materials, demonstrate how to test the electromagnet.

Divide students into groups and ask them to independently complete the process.

Tips for Engagement

To save time, pre-cut wires and strip ends. This will also help avoid complications encourage quicker success.

Involve the students in the experiment. Have them gather materials and inventory before beginning to take ownership of the experiment.

You can also show the electromagnet construction video to students.

Share

Ask the students the following questions:

- Does the polarity direction matter?
- Did you have any issues attaching the electromagnet components?

Process

Encourage students to experiment with the number of wraps on the nail.

- Did the number of wraps on the nail affect the strength of the electromagnet?
- Why could the electromagnet not pick up some metal items?

Generalize

- Where would you find electromagnets being used in the real world?
- Can you think of large or small real-world applications?

Apply

Show students the following video of large and small electromagnets being used in the workforce: tiny.utk.edu/everydaymagnets. Then, have students compare the components to the electromagnet they constructed.

Life Skill(s) 8th Grade

Communicate accurate information on a given topic to someone else. (Head Thinking)

Communicate effectively. (Hands Working)

Supplemental Information

Educational Standards Met

8th Grade Science

GLE 0807.12.1: Investigate the relationship between magnetism and electricity.

SPI 0807.12.2: Describe the basic principles of an electromagnet.