

SCSU CRISP CCSA Kit Pages 2016

Title of Module: Electromagnets
Subject or Unit of Study: Electricity and Magnetism

GRADE LEVEL 9-12 LENGTH OF DEMO/LESSON: _____

STUDENT OBJECTIVES

Students will...

Understand the relationship between current and magnetism

STANDARDS

Next Generation Science Standards (NGSS)

NGSS Performance Task	HS – PS2-5. <ul style="list-style-type: none">Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
NGSS DCI Standards	PS2.B: Types of Interactions <ul style="list-style-type: none">Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-4)Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. PS3.A: Definitions of Energy <ul style="list-style-type: none">"Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. (<i>secondary</i>)
NGSS CC Standards	CC 3 - Cause and Effect <ul style="list-style-type: none">Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
NGSS SEP Standards	SEP 4 - Planning and Carrying out Investigations <ul style="list-style-type: none">Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Common Core Standards (CC)

<p>CC-ELA Standards</p>	<p>WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p> <p>WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p> <p>WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.</p>
<p>CC-MATH Standards</p>	<p>HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.</p> <p>HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.</p> <p>HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p>

MATERIALS

List all materials needed for this lesson/demonstration

- 1 Battery (D)
- 1 Battery holder
- 1 Battery switch
- 2 Banana wires with alligator clip
- ~ 2 ft. Black Coated Wire
- 1 Small square mesh wire (metal)
- 1 Small square mesh wire (Nylon)
- 1 Small magnetic compass
- Long metal screws
- Paper clips
- ~30 small washers
- Variety of Bolts, nuts, screw, nails and washer (MADE OF DIFFERENT MATERIALS)

SAFETY

List all safety precautions needed for this lesson/demonstration

- Battery can overheat if wire is connected too long with little resistance. Please use the battery switch to prevent batteries from being drained
- Batteries should be disposed in a proper reciprocal.

LEARNER BACKGROUND

Describe the students' prior knowledge or skill related to the learning objective(s) and the content of this lesson, using data from pre-assessment as appropriate.

Students should have some understanding of current, electricity, magnetism and the relationships between each other

LEARNING ACTIVITY OR PROCEDURE:

Explicitly layout the lesson or demonstration

See additional materials: Electromagnet student lab worksheet

ASSESSMENT:

Provide an assessment to measure student progress of objectives.

ADDITIONAL RESOURCES:

Apply any links or additional information for students or teacher including videos, websites, etc.

TEACHER NOTES:

Describe any tips/tricks for implementing this lesson/demonstration that might be helpful to future educators. Provide answer keys if applicable.

- Ask students to try this experiment by changing variables. Having the student choose their own variables will enable them to create their own experiment and hypothesis. (For example, there are several different screws included varying in length or thickness)
- If you decide to provide additional washers, make sure they are the same size and weight

STEM CAREERS:

Electrical Engineer
Materials Scientist
Researcher
Electrician
Engineer
Computer hardware Engineer
Electrical Engineering Technologists
Electrical and Electronic Engineering Technicians
Electro-Mechanical Technicians
Nanosystems Engineers