Magnets, Electromagnets, and Motors
Charles Jason Battles
Physics Teacher
Mount Zion High School

Objectives:

1. The students will understand the properties of magnets.
2. The students will make an electromagnet.
3. The students will test different foods with magnets to determine if there is any iron present that can be detected by a magnet.
4. The students will make simple electric motor in collaborative groups.
5. The students will be able to articulate their knowledge of magnets to others.

Materials Needed:

Holt textbook
Magnets
Copper wire
Total cereal
Special K
Electric motor kit from Sargeant Welch
Batteries

Schedule:

- Day One: The first day will be a basic introduction into magnetics. Students should have read the first pages of their text and answered the section review. TTW will provide each group with TTW guide a discussion over course text. Topics that will be covered first day are: poles, earth magnetic pole, how two magnets interact with each other. HW- read pages 770-772 and complete section review.
- Day two: TTW guide a discussion over the magnetic field of a current carrying wire. TTW show a demo where the teacher hooks a wire to a battery and bring a compass near the wire. Other topics that will be discussed will include magnetic domains and electromagnets. TSW will complete a quick lab. Each group is given some wire, different core materials (nails), a power supply (batteries), and ten-fifteen minutes to experiment and build an electromagnet. The group that picks up the most paperclip wins. HW- Read 773-775 and complete 1-3 on 775.
- Day three: TTW guide a discussion over magnetic force. TTW start with a demo showing the magnetic force between two wires with a current flowing through them. The remainder of the time will involve the teacher going over the math problems that were assigned the night before. TSW be able to play with a simple coil that will demonstrate a magnetic force.
- Day four: TTW introduce electromagnetic induction. The students will learn about the applications of induction such as door bells and tape recorders.
• Day five: TTW go over Faraday’s Law. The student will be assigned math practice with the teacher moving around the room helping as needed. HW- The students need to read about generators and alternating current.
• Day six: TTW go over the difference between AC and DC.
• Day seven & eight: TSW create simple motor using motor kit.
• Day nine: TSW recreate Faraday’s electromagnet induction experiment. Students will begin to study in partners if time permits. TSW begin performance assessment as homework. See below.
• Day ten: TTW guide a review for test.
• Day eleven: Test.

**Performance Assessment:**

Question: You are stranded on a desert island and have been captured by some potentially hostile natives. All you have in your pocket are four fairly strong magnets and some string. You must "wow" the natives in two different ways to save your life, what will you do?

**Rubric:**

5 points: The person designed a compass, taught the natives how to use it, left the island, and navigated back to civilization. Then sold the magnets and began a new life.  
4 points: The person clearly stated two different ideas and convinced you as a native that they understand magnetism.
3 points: The person has two ideas, but not clearly stated. You aren't completely convinced or "wow"-ed.
2 points: The person has only stated one idea, or has two ideas that lack explanation. This answer is poorly stated and incomplete.
0 points: The person threw the magnets at the natives and ran the other way.

**Standards:**

Benchmark addressed: 4G5

QCC’s addressed: 18.0, 18.1, 18.2, 18.3, 18.4, 19