MODIFIED UBD LESSON PLAN

STEM 101

COURSE: Middle School		
UNIT: Acoustics and Electromagnetism	**EXERCISE:** Build an Electromagnet	**TIME FRAME:** 2 Hours

PREPARATION: *Summary of "to do's" that the teacher should understand and prepare before bringing this lesson to the classroom.*

Information:

Before starting this activity, students should have an understanding of material covered in:

- ✓ Presentation: Introduction to Electromagnetism
- ✓ Video: Electromagnetic Crane Car
- ✓ Video: Scrap Yard
- ✓ Video: Magnetism

Materials:

- Alligator clips
- Magnetic wire
- 8, 10 and 16 penny framing nails
- 2.5-3" roofing nails
- Small paper clips
- C batteries
- D batteries
- Battery holders
- Sandpaper
- Compass

Tools:

- (Optional) Basic DC power supply (12 volts) or better. This could replace the batteries

SAFETY: *Summary of safety strategies in the lesson.*

There are no safety strategies for this exercise.

S1 DESIRED RESULTS:

ESTABLISHED GOALS:

Problem Solving Techniques and Applications Standards:

TRANSFER:

Students will be able to independently use their learning to…

- Understand how a speaker transmits sound waves and how the human ear picks up and deciphers sound waves.

MEANING:

UNDERSTANDINGS
Students will understand that...

- When current travels through a conductor, a magnetic field is created
- When a magnet field passes a conductor, voltage is induced in the conductor

ESSENTIAL QUESTIONS
Students will keep considering...

- How this induction process is scaled up to power cities
- Different ways electricity can be produced

ACQUISITION OF KNOWLEDGE AND SKILL:

Students will know...

Students will be skilled at...

	• How electricity is produced in large quantities • The different types of electrical currents and how the manufacturing process differ	• Constructing and understanding magnetic fields using electricity • Creating visual representations of magnetic fields

S2 EVIDENCE:

EVALUATIVE CRITERIA:	ASSESSMENT EVIDENCE:
• Notes taken	*Performance Task(s):* **Introduction to Electromagnetism** Students will follow learn the basics of electromagnetism and in this exercise.
• Students' attention	*Other Evidence:* • Introduction to Electromagnetism student notes page

S3 LEARNING PLAN: *Summary of Key Learning Events and Instruction*

Outline:

1. **Set Introduction**
   a. Option 1 – Ask students to name the different technologies used to create electrical power and list them on the board. Ask students if they know these systems work. Most will know, but you have created the need to learn more.

   b. Option 2 – Show the following videos that show the use of an electromagnet to lift heavy objects. Tell students that they are going to learn how electromagnets work and are ultimately going to make an electromagnet that will be used in their own homemade speaker.

2. **Videos**
   a. Show videos Electromagnetic Crane Car and Scrap Yard.

3. **PowerPoint**
   a. Go through the PowerPoint and tell students what the daily agenda/goals for them are and pass out the Notes Page and tell students to fill in as they follow along with the lecture.

4. **Review**
   a. Before starting, review from Electricity Unit: Current is designed as the number of electrons following past one point in the circuit per unit time.

5. **Review**
   a. Before starting, review from Electricity Unit: A basic circuit consists of power source, conductors and a load.

6. **Demonstration**
   Show students the first slide on electromagnetism and then do the following demonstrations

   a. Demonstration 1 – Make an electromagnet by wrapping wire around a 16-penny nail and then hook it up to a power supply or 6-volt lantern battery. Take the electromagnet and put it close to a compass and show the class how the compass needle is deflected.
   b. Demonstration 2 – Hook the electromagnet up to a power supply. Pick up some paperclips and then turn off the electromagnet and watch them fall.

7. **Review**
   a. Finish by reviewing different concepts. Possibly refer back to set induction and discuss how electromagnetism and induction are used in real life applications such as alternators, crank flashlights, desktop induction phone chargers, etc., and have students think of all the different things that use electromagnetis.

Progress Monitoring:

- The instructor will need to monitor the classroom, check students' work, and ensure students are on task and following directions.
- Ensure students store their projects at the end of class and leave all materials in the room.
- At the end of the activity, post student projects in the room and provide appropriate feedback.

DIFFERENTIATION: *Summary of Key Differentiation Techniques*

Please use this space to insert your differentiation techniques. Depending on the needs of students, various techniques might be needed in a classroom, therefore use the information below and experts in the area needed to design your plan for differentiation.

The ASCD Study Guide for Integrating Differentiated Instruction and Understating by Design: Connecting Content and Kids.
by Carol Ann Tomlinson, Jay McTighe

Integrating Differentiated Instruction and Understating by Design: Connecting Content and Kids.
by Carol Ann Tomlinson, Jay McTighe
ISBN-13: 978-1416602842
ISBN-10: 1416602844

Differentiating Reading Instruction
by Laura Robb.
ISBN13: 9780545022989

A Teacher's Guide to Differentiating Instruction
The Center for Comprehensive School Reform and Improvement

CAREER CONNECTIONS: *Summary of Career Opportunities Associated with this Lesson*

Please use this space to insert careers that might be connected to this lesson. This section will need continuous updating as new careers and emerging technologies change the opportunities available in the workforce.

Electrical Engineer
Electrical engineers develop and design systems that transport electricity such as power grids.

Sound Engineer
Sound engineers are responsible for manipulating sound waves to produce desired tones.

Civil Engineer
Civil engineers design public utility distribution systems.

KEYWORDS: *Please Insert Keywords from this Lesson with their Definitions*

Please use this space to insert keywords and their definitions

INDUCTION – the process or action of bringing about or giving rise to something

ELECTROMAGNETISM – the interaction of electric current or fields and magnet fields

WAVES – a wave of compression and rarefaction, by which sound is propagated in an elastic medium such as air