

MODIFIED UBD LESSON PLAN

COURSE: Introduction to Engineering

UNIT: Introduction to Electromagnetism and Induction

EXERCISE: Building a Foam Plate Speaker

TIME FRAME: 2 Hours



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

Teachers will need to ensure that the proper supplies are available for students to build their solutions.

Materials:

- NEODYMIUM DISC MAGNETS
- PAPER COPY 8.5"X11" WHITE
- WIRE COPPER MAGNT 26GA 1LB
- PLATE, FOAM 9"
- HEADPHONES/DIGITAL STEREO
- BOARD TAG WHITE 9X12 100
- TAPE MAGIC TRAN .5"X800"
- GLUE STIC MINI ALTEMP PK50

Tools:

- PLIERS LONG NOSE 6"
- GLUE GUN HIGH TEMP

Additional Resources:

- Business cards
- Regular Radio amplifier or mini amplifier with cell phone attached (web search mini-amplifier)
- Cardboard from the shipping boxes for the bases

Information:

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

- ✓ Video: How a Speaker Works



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

Heat: Hot glue guns and the glue they produce are extremely hot. Extra caution should be observed when using hot glue guns.

S1 DESIRED RESULTS:

ESTABLISHED GOALS:

Problem Solving Techniques and Applications Standards:

TRANSFER:

Students will be able to independently use their learning to...

- Understand and appreciate the various parts of speakers and their functions.

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MEANING:	
UNDERSTANDINGS <i>Students will understand that...</i> <ul style="list-style-type: none"> When current travels through a conductor, a magnetic field is created When a magnetic field passes by a conductor, voltage is induced in the conductor 	ESSENTIAL QUESTIONS <i>Students will keep considering...</i> <ul style="list-style-type: none"> How speaker technology differs from speaker to speaker Different types of speakers and how their parts are different
ACQUISITION OF KNOWLEDGE AND SKILL:	
<i>Students will know...</i> <ul style="list-style-type: none"> The various parts to a speaker How a speaker works The principles on how the speaker operates 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> Constructing speakers and other speaker technology Identifying different parts of a speaker

S2 EVIDENCE:	
EVALUATIVE CRITERIA:	ASSESSMENT EVIDENCE:
<ul style="list-style-type: none"> Functions as expected Constructed well 	<i>Performance Task(s):</i> <u>Building a Foam Plate Speaker</u> Students will construct a simple audio speaker using simple electrical device and tools in this exercise.
<ul style="list-style-type: none"> Completed 	<i>Other Evidence:</i> <ul style="list-style-type: none"> Foam plate speaker grading rubric

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

Outline:

- Set Introduction**
Pass out student activity sheets "Building a Foam Plate Speaker" to each student.
- Demonstrate**
Follow along in the activity with the students going over each step and demonstrating how that step is done. See the pictures in the student activity for detailed steps.

3) Procedures

OUTLINE:

- Introduction to Building a Foam Plate Circuit
- Review basic parts to an electric circuit (i.e. power source, conductors, load)
- Review basic structure of a series circuit
- Pass out student activity sheet "Building a Continuity Tester"
- Go through directions and materials necessary as given in activity sheet
- Show students work area and give work and clean-up expectations
- Give students work time (approximately 1 hour)
- Have students meet back in classroom after clean-up for discussion

LEARNING EXPERIENCES:

Tell students that today's activity is to build a simple speaker. When they are done with the speaker, they will have the basic knowledge to build a more complex speaker that will sound better and louder.

- Pass out student activity sheets "Building a Foam Plate Speaker" to each student
- Follow activity and go over each step of build while demonstrating
- Review safety when using tools

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- 4 Review clean-up procedures
- 5 Ask students if they have any questions
- 6 Show students supply table and go through clean-up procedures
- 7 Give students time to build continuity tester
- 8 Watch for things such as:
 - Magnets are very strong and students should be careful pulling them apart. Magnets can snap together and pinch fingers.
 - Magnets are very brittle. Students should be very careful not to drop them.
 - Depending on your glue guns, it may work better to keep them on a low setting to keep from burning through the foam plate
 - The better the students wrap the wire around the paper sleeve and keep it from unraveling with tape, the better the speaker will work.
 - If using a torch or lighter to burn the enamel off the wire, have the teacher do it.
 - It is a good learning experience to try different types of plates, different materials, different number of coils, different number of business cards, etc. Try some of these ideas out.

REMIND STUDENTS TO KEEP MAGNETS AWAY FROM COMPUTERS, CELL PHONES, CREDIT CARDS, ETC. THESE ITEMS CAN BE DAMAGED FROM THE STRONG MAGNETIC FIELDS

After completing packet, students should clean up their station. Once approved, students can go to the radio tuner and test their speaker.

- 4) **Student Table**
Set up work stations for students with all parts laid out and labeled.
- 5) **Student Time**
Give students time to construct their speakers. Once they are done, connect the wound wire to the tone generator and test the student-made speaker.
- 6) **Discussion**
A follow-up discussion of this activity should include having a student explain in detail how the speaker works. Have them trace the path of electrons from the wires coming out of the tuner through the speaker. Try putting a little pinch of salt on the speaker cone. You will see the salt oscillate up and down. Put all the students' speakers in series with alligator clips and see if you can get them to all work. If they do not all work, it is a good lesson to have students trouble shoot and check continuity down the line.

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 Understanding by Design: Connecting Content and Kids.
by Carol Ann Tomlinson, Jay McTighe

Integrating Differentiated Instruction and Understanding 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***Electrical Engineer**

Electrical engineers can design systems that oscillate electricity for products such as speakers.

Sound Engineer

Sound engineers manipulate speakers and electricity to produce desired sounds and effects.

System Engineer

System engineers utilize speakers for systems such as sound systems.

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

SPEAKER – an apparatus that converts electrical impulses into sound

IMPULSE – a sudden or strong motivating force

OSCILLATION – movement back and forth at a regular speed