

Noise Makers

Grade level: 6-10

Summary of lesson:

Students will explore sound, speakers, instruments, and electric pickups in this unit. They will build and understand how a speaker and an electric pickup work. They will think about how to use their knowledge of sound to create purposeful and useful inventions.

Time/Duration:

Each unit is designed to be 90 minutes. Teachers break down the lesson based on schedule minutes and available time. Example: 7th-8th grade science teaches 1 unit a week, and he meets 3 days a week, once for 55 minutes and twice for 90 minutes. It depends on deep educators who want to take it.

Topics covered:

Sound Science

Human hearing

Electromagnetism

Speaker technology

Musical Instrument Engineering

Electric Pickups

Prototyping and fabrication

Subject areas/Standards:

Noise Makers

Next Generation Science Standards - Middle School

Meeting	Core Ideas	Science Standards	Cross-Cutting Concepts	Practices
Meeting 1: Invention Introduction	ETS1.A ETS1.B	MS-ETS1-1 MS-ETS1-2	- Structure and Function - Systems and System Models - Cause and Effect	- Asking questions and defining problems - Constructing explanations and designing solutions - Engaging in argument from evidence - Obtaining, evaluating, & communicating information
Meeting 2: Light Rays & Lenses	PS4.A PS4.B	MS-PS4-2 MS-PS4-1*	- Structure and Function - Patterns - Cause and Effect - Influence of Science, Engineering, and Technology on Society and the Natural World	- Asking questions and defining problems - Planning and carrying out investigations - Analyzing and interpreting data - Using mathematics and computational thinking
Meeting 3: Sketch & Design	ETS1.A ETS1.B	MS-ETS1-1 MS-ETS1-2*	- Structure and Function - Systems and System Models - Influence of Science, Engineering, and Technology on Society and the Natural World	- Asking questions and defining problems - Constructing explanations and designing solutions - Developing and using models
Meeting 4: Test Components	PS4.A PS4.B	MS-PS4-2	- Structure and Function - Patterns - Systems and System Models - Influence of Science, Engineering, and Technology on Society and the Natural World	- Using mathematics and computational thinking - Developing and using models
Meeting 5: Build a Lens	ETS1.B ETS1.C	MS-ETS1-3 MS-ETS1-4	- Systems and System Models - Structure and Function - Influence of Science, Engineering, and Technology on Society and the Natural World	- Developing and using models - Constructing explanations and designing solutions - Analyzing and interpreting data
Meeting 6: Taking Digital Photos	ETS1.B ETS1.C	MS-ETS1-4	- Systems and System Models - Structure and Function - Influence of Science, Engineering, and Technology on Society and the Natural World	- Developing and using models - Constructing explanations and designing solutions
Meeting 7: Invention Extension	ETS1.A ETS1.B	MS-ETS1-1 MS-ETS1-2	- Influence of Science, Engineering, and Technology on Society and the Natural World - Structure and Function - Systems and System Models	- Asking questions and defining problems - Constructing explanations and designing solutions

* Loosely aligned

Standards alignment conducted by graduate students at Boston College's Lynch School of Education

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Next Generation Science Standards - High School

Meeting	Core Ideas	Science Standards	Cross-Cutting Concepts	Practices
Meeting 1: Invention Introduction	ETS1.A ETS1.B	HS.ETS1-3	- Structure and Function - Systems and System Models - Cause and Effect	- Asking Questions & Defining Problems - Constructing Explanations & Designing Solutions - Engaging in Argument from Evidence - Obtaining, Evaluating, & Communicating Information
Meeting 2: Light Rays & Lenses	PS4.A PS4.B PS4.C	HS-PS4-1 HS-PS4-5 HS-PS4-3*	- Structure and Function - Patterns - Cause and Effect - Influence of Science, Engineering, and Technology on Society and the Natural World	- Asking questions and defining problems - Planning and carrying out investigations - Analyzing and interpreting data - Using mathematics and computational thinking
Meeting 3: Sketch & Design	ETS1.A ETS1.B	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3*	- Structure and Function - Systems and System Models - Influence of Science, Engineering, and Technology on Society and the Natural World	- Asking questions and defining problems - Constructing explanations and designing solutions - Developing and using models
Meeting 4: Test Components	PS4.A PS4.B PS4.C	HS-PS4-1 HS-PS4-5	- Structure and Function - Patterns - Systems and System Models - Influence of Science, Engineering, and Technology on Society and the Natural World	- Using mathematics and computational thinking - Developing and using models
Meeting 5: Build a Lens	ETS1.B ETS1.C	HS-ETS1-3	- Systems and System Models - Structure and Function - Influence of Science, Engineering, and Technology on Society and the Natural World	- Developing and using models - Constructing explanations and designing solutions - Analyzing and interpreting data
Meeting 6: Taking Digital Photos	ETS1.B ETS1.C	HS-ETS1-3	- Systems and System Models - Structure and Function - Influence of Science, Engineering, and Technology on Society and the Natural World	- Developing and using models - Constructing explanations and designing solutions
Meeting 7: Invention Extension	ETS1.A ETS1.B	HS.ETS1-1 HS.ETS1-2	- Influence of Science, Engineering, and Technology on Society and the Natural World - Structure and Function - Systems and System Models	- Asking questions and defining problems - Constructing explanations and designing solutions

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Breakdown of lessons:

1. Invention Introduction

Students are introduced to invention and JV InvenTeams. Students complete warm-up activities and discuss invention. Students play “Four Corners” to determine their strengths for team assignments.

2. Hearing Sound

<https://lemelson.mit.edu/resources/curricula>

For more information, contact info-lemelson@mit.edu

Students brainstorm how they think sound works and are introduced to the basics of sound and human hearing. Students dissect earbuds to find and identify components of a speaker. Students are introduced to speakers and electromagnetism and build their own electromagnet to examine its properties.

3. Build a Paper Speaker

Students use their understanding of speakers to build a paper plate speaker. They then work in groups to refine their speaker according to a goal they select.

4. Making a Sound

Students are introduced to the human larynx and how we make sound through speech. Students apply their knowledge of sound production as they design and build a musical instrument out of everyday materials.

5. Build an Electric Instrument

Students are introduced to electric instruments using the diddley bow as an example. Students build an electric pickup and design a musical instrument to electrify. Students build, test, and refine their electric instruments.

6. Invention Extension

Students display their images in printed form and provide feedback to other teams. Students conceptualize a new purposeful invention that uses lens design, optical principles, and the prototyping process.

Materials: [Link to List](#)

