

## 1. Essential Element

**Activity/Lesson Title:** Light and Sound Waves

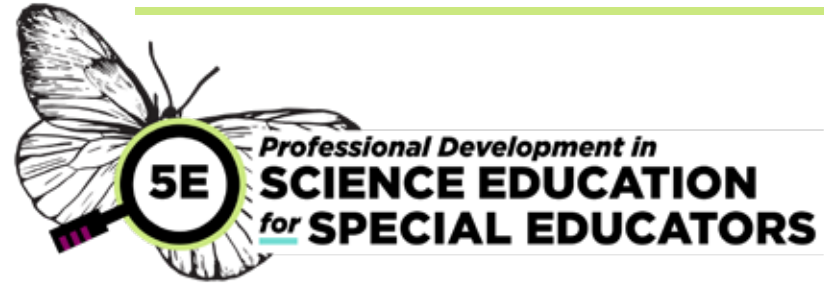
**EE.MS.PS4-2:** Use a model to show how light waves (e.g., light through a water glass, light on colored objects) or sound waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, table).

**Teacher:** Raquel

**Grade Level:** Middle (6-8)

**Student:** Milo

**Level:** Initial



## 2. Science and Engineering Practice

### **SEP 2: Developing and Using Models**

**SEP description:** Supports students as they develop and use a model to describe phenomena.

## 3. Disciplinary Core Idea

### **Wave Properties**

**Core Idea description:** A sound wave needs a medium through which it is transmitted.

## 4. Crosscutting Concept

### **Structure and Function**

**Concept Description:** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

## 5. Linkage Level Descriptors

**Initial:** Use a model to recognize that sound waves are transmitted by vibrations.

**Precursor:** Investigate changes in vibrations and sources of sound in everyday life.

**Target:** Use a model to show how light waves (e.g., light through a water glass, light on colored objects) or sound waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, table).

## 6. Student's Typical Accessibility Supports

- Noise-cancelling headphones
- Selecting and manipulating answers
- Picture cards

## 7. Student Prior Experiences, Prior Knowledge

- The student uses noise-cancelling headphones for areas with loud noises.
- The student loves movies about space.
- The student participates in chorus at school.

## 8. Phenomenon to Explore

**Question:** Where does music come from and how is sound made?

## 9. Possible Alternative Conceptions

**Some students may think (incorrectly) that**

- Sound only travels in one direction.
- Sound can only travel in air (not through solids or liquids).
- Matter does not show a physical reaction to sound.

## 10. UDL Options and Solutions to Potential Barriers

- Repeating a science activity or trying something out multiple times.
- Use multiple visual investigations, activities, and demonstrations with music to help the student recognize that sound comes from vibrations.
- Use pictures or dictate to a scribe to capture observation notes.
- Use materials the student is familiar with such as musical instruments to see and feel vibrations.
- Use noise-cancelling headphones to block background noise.

## 11. Engage

### Think

- How can I make sure to access students' prior learning?
- How can I use the CCC to connect everyday language with the scientific language of the phenomenon?
- How can I support student participation by scaffolding the SEP?

### Teacher Will

- Discuss and play music on string instruments for students (e.g., could include a piano if students can see the strings inside).
- Help students use a simple "telephone" model (two cups with a string attached) and discuss questions like "What makes sound? How do you think musical instruments make music?"

### Students Will

- Observe what they can see happening with the instruments and when they hear the music/sound clearly and when they can't.
- Discuss the kind of sound they heard using the "telephone" model.
- Discuss ideas about why they think string musical instruments make music.

## 12. Explore

### Think

- What is difficult or inaccessible about the phenomenon, and how can I make it more accessible in the Explore phase?
- How can students collect data in a way that helps answer a scientific question?
- How can I encourage students' careful observation and asking good questions vs. looking for only the "right answer"?

### Teacher Will

- Set up stations for students to investigate vibrations (bowl with plastic wrap and rice, video of speaker with paint, tuning forks and water).
- Assist students in seeing that rice, paint, and water moved.
- Use a video to assist students in making a "tissue-box guitar" to represent a simple musical instrument; discuss how music is produced from the guitar.

### Students Will

- Watch a video to be able to discuss ideas about how vibrations create sound, which can be music.
- Interact with each station and collect data about what they see or experience.
- Make a tissue-box guitar.

## 13. Explain

### Think

- How can I help students connect science topics, phenomena, data, and everyday experiences? How can I help my students differentiate everyday language from scientific language? What reasoning helps students see or explain the invisible?

### Teacher Will

- Assist students in reviewing data collected to answer, "How does a string instrument make music?"
- Discuss what vibrations are.
- Assist students in completing a CER statement.

### Students Will

- Review their data about where does sound
- Complete a CER statement

**Claim:** The strings needed to vibrate to make music on the tissue box guitar.

### Evidence:

- » I learned from the activities that things "move" and cause sound vibrations.
- » I learned from the tissue-box guitar activity that some materials vibrated better than others.

**Reasoning:** We moved the strings. When they moved, they vibrated. This vibration made the music.

## 14. Elaborate

### Think

- How can I help enrich or extend student ideas? Are there related science concepts that would support and extend student learning?

### Teacher Will

- Help students ask questions about sound and vibrations with a different type of instrument (e.g., spoons).
- Help students think about and explain how the sound from the spoon moves to their ears (e.g., in sound waves caused by vibrations).

### Students Will

- Think about questions about sound and vibrations using a different instrument.
- Share ideas about how sound travels to their ears.

## 15. Evaluate

### Think

- What do I need to see or hear from my students that assures that they have learned the science content? What information do I need to gather to inform my teaching as I move through the lesson?

### Teacher Will

- Have students demonstrate how to make sounds and tell what is happening as they demonstrate.
- Use the student responses to inform the evaluation, including the CER.

### Students Will

- Respond to questions posed by the teacher summarizing the investigation, what they did, and what they learned from it.
- Complete the CER.