Lesson 4: Making a Splash and Musical Rulers

Length: 2- 30 minute sessions

Performance Expectations: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. (Standard 1-PS4-1) Students will observe simple objects, patterns and events and report their observations in a simple graph.

Background: All sound it made up of vibrations which produce sound waves that travel through the air to our ears. Vibrating matter can make sound and sound makes matter vibrate causing sound waves to travel through the air.

Materials:

- tuning forks
- bowl of water
- 12 inch plastic rulers

Student Grouping/Class Set Up: Split students into 2 groups (1 adult with each group if possible)

Engage: Today we will experiment with a musical tool called a tuning fork. Prompt students with prior knowledge questions and let them practice using the tuning forks and rulers in an appropriate way. They need to be in 2 groups (Suggestion- 1 group will do "Making a Splash" one day and "Magical Rulers" the next day.)

Explore:
Group #1: Put the bowl of water on a surface where students will be able to make observations. With one of the tuning forks, hit it so it vibrates. Quickly put it in the water and observe what it does. How far did the water splash? Try the same thing with each tuning fork. Using the Making a Splash (student journal page 4) observe patterns, cause and effect and record observations.

Group #2: Using a 12 inch plastic ruler observe the difference in the sounds when the ruler is extended over the table at different lengths. Put the ruler at the edge of the table so half of it hangs over the edge. Hold the ruler down with the palm of one hand on the table. With your other hand push the end of the ruler down and let it go. Observe the vibrations of your ruler and the sound it makes. Write your observations on Musical Rulers (student journal page Keep doing this until you can't press it down any more each time recording your results on your chart.

Elaborate: Compare your observations with a classmate.

Evaluate: Whole group discussion to determine if students have understood the concept that vibrations cause sound waves that our ears convert into noise or voices. Use attached discussion questions to lead and review of the similarities and differences that were observed with each experiment.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
☐ Asking questions (science) and defining problems (engineering) ☐ Developing and using models ☐ Planning and carrying out investigations ☐ Analyzing and interpreting data ☐ Using mathematics and computational thinking ☐ Constructing explanations (science) and designing solutions (engineering) ☐ Engaging in argument from evidence ☐ Obtaining, evaluating, and communicating information	**PS4-A: Wave Properties** **Sound can make matter vibrate and vibrating matter can make sound. (1-PS4-1)**	☐ Patterns ☐ Cause and effect: Mechanism and explanation ☐ Scale, proportion, and quantity ☐ Systems and system models ☐ Energy and matter: Flows, cycles, and conservation ☐ Structure and function ☐ Stability and change

Discussion Questions for Making a Splash:

What did you observe each time you put a tuning fork in the bowl of water?

What are some similarities that you noticed with the tuning forks?

What are some differences that you noticed with the tuning forks?

Why do you think there were changes between the tuning forks?

What conclusions can you make about this exploration?

Discussion Questions for Musical Rulers:

What did you observe each time you moved the ruler?

What are some similarities in sound that you noticed?

What are some differences in sound that you noticed?

Why do you think there were changes each time you moved the ruler?

What conclusions can you make about this exploration?

Making a Splash

Materials:

- Tuning Fork labeled A, B, C
- Bowl of water
- Colored piece of paper

Procedure:

1. Put the bowl of water on a colored piece of paper.
2. With one of the tuning forks, hit it so it vibrated. Quickly put it in the water. Observe what it does. Measure how far the water splashes.
3. Repeat #2 with each tuning fork and record observations below.

	Observations
Tuning Fork A	
Tuning Fork B	
Tuning Fork C	

Musical Rulers

Materials:

- Plastic Ruler marked 1, 2, 3

Procedure:

1. Put the plastic ruler on the table so that the edge is lined up with the first mark on the ruler.
2. Holding the ruler against the table with one hand, push the other side down gently and let go. Feel the vibration? Hear the music?
3. Observe the vibration and sound the ruler is making and record your observations below.
4. Repeat for the 2nd and 3rd mark on the ruler and record observations.

	Observations
Ruler Mark 1	
Ruler Mark 2	
Ruler Mark 3	