**Sound Waves**

**Benchmarks:**

* “I can produce sound by vibrating objects.”
* “I can explore how sounds travels through different mediums.”
* “I can change the pitch of the sound as it relates to the rate of vibration.”

**Objective**:

Students will answer the questions: Can sound travel in water? Can sound travel through solids? Can we always see things vibrate when we hear something? What do sound waves look like?

They will describe and summarize observations of the transmission, reflection, and absorption of sound. They will describe that changing the rate of vibration can vary the pitch of the sound.

**Materials**:

Water chimes:

Tuning fork

8 glasses (or more) - Can use the beakers

water

spoons to tap glasses

Skim milk

Whole milk

Heavy cream

Salt for saltwater (can try various concentrations)

Worksheets: each kid should have 1 page to write observations and draw pictures

Cups for telephones

**Initial Discussion**:

Begin by taking 5-10 minutes to introduce yourselves and tell the kids 1-2 sentences about the science you study. Be sure to ask if they have any questions!

We will discuss that sound is a form of energy that travels in invisible waves. They should understand what a vibration and a medium are. They should understand that when a vibration travels through the air and into the ear canal it vibrates the eardrum.

Students will be asked to describe what creates a sound. **They will generate a list of hypotheses on the blackboard/in their lab notebooks.** Students will then be asked to hum and feel their throats above their voice boxes and they should understand that the vibration of vocal chords creates our voice. They will be asked 'What do you think a sound wave would look like if we could see it?' We will have student volunteers come up to the board to illustrate. Then demonstrate that a sound wave looks like a slinky being pushed back and forth. Explain to students that sound waves are also called compressional waves because they have compressed sections and sections that are more spread out. (See sample drawing below).

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**Target Observations**:

· Vibrations cause sounds

· Sound travels in waves

· We can see, hear, and feel sound waves

· Sound travels through solids, liquids, and gases

· Sound frequency is the number of vibrations per second

· Pitch is related to the amount of sound vibrations

**Demonstration:**

Divide the students into groups. 1 volunteer per group of students.

The students will be asked to hypothesize what happens when a tuning fork is struck and placed in a glass of water (visible waves move from the fork). Fill a glass with water, hit the tuning fork on your knee and let the students put their ears next to it. Place it in the water and have them record their observations. They can visualize the sound waves in the water. Do this a few times to make sure everyone can see. **Have the students draw in their lab notebooks what they see.**

Next, tap an empty glass with a spoon to hear its pitch. Fill up several glasses with different volumes of water and tap the glasses. Compare them to an empty glass (they will notice the different pitches). Give each group a different medium to test (skim milk, whole milk, heavy cream, saltwater, etc.). Have them make hypotheses on what will happen, test it, and compare the sounds. **They can make observations in their notebooks. Have each group share their findings with the class.**

**Fun Experiment: (Telephone)**

Students will get into groups of 2-4 to make telephones with string and cups and should be able to explain to you how these simple telephones work. They may need your help with stringing the string through the hole and tying knots. Walk around as they try out their telephones and talk to them about how you can get the best sound out of the telephones and why, based on what they learned.

Allow the students to get creative and play around with the cups by adding string and combining multiple cups and strings. Let them find the longest distance they can go before they cant hear their partners voice anymore, or see how many strings and cups can be tied together for it to still work.

**Target Observations**:

· Sound travels in waves

· Vibrations cause sounds

· Pitch is related to the amount of sound vibrations

· We can see, hear, and feel sound waves

· Sound travels through solids, liquids, and gases

**Optional: Follow-up Discussion Questions:**

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| Hypothesize what happens to sound waves when they reach a wall or other solid, flat object. |
| Can sound travel in space? Why not? Hypothesize what other modes of communication astronauts can use when they are outside the space shuttle? |
| Explain why, based on the behavior of sound waves, a classroom with a tile floor is louder than a library that is carpeted. |
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| Think about what it is like to hear things under water. Debate whether sound travels better in liquids (like water), gases (air), or solids (like putting your head down on a desk and tapping your finger on the desk)? (Have you ever tried to talk to a friend underwater in a pool?) |
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Science Lab Notebook: Sound Waves

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