

STEAM Subject: Physics
Lab: Creating Sound

Grades: 2nd-6th

Learning objective:

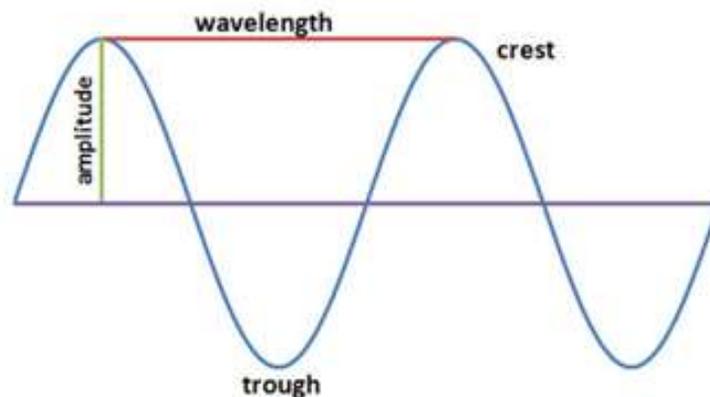
Students will learn what sound is and how it is modified. Students will use a simple model to create a musical instrument and experiment with various sounds.

ENGAGE:

Ask students the following questions:

- What is sound? *Sound is the vibration of air particles as a wave of energy passes through them.*
- What is the structure of a sound wave? *Troughs, Crests, Wavelength, Amplitude*
- How can we describe sound? *Frequency, Pitch, Loudness*
- What causes noises to sound higher or lower? *Changing the frequency, or how fast air particles vibrate when a wave passes through them, causes a sound to change pitch. Changes in frequency can be modeled by changing the length of an object, which changes how fast particles can move.*

EXPLORE:



Parts of a Wave

Musical Instrument Activity:

Students will participate in an activity where they will create different frequencies to produce higher and low pitch sounds.

Materials needed per student:

- Ruler
- Safety scissors

- Yarn or string
- piece of paper
- pencil

Directions:

Each student will carefully cut five strings of different lengths. Use the ruler to measure out five lengths between 20 and 40 centimeters. Write down the different lengths on the piece of paper. Have an adult or a friend pull and hold the two ends of a string tightly. Pluck the string in the center and listen for the sound. Repeat plucking of string with each different length.

Discussion:

Immediately, we can hear that each length of string will produce a different sound. Record observations for each different string length, noting how high or low its sounds. How does the length change the pitch of the sound? What pitch would be produced if a string increased in length? Decreased in length? This will lead into a discussion of how length influences the motion of particles, and how fast particles can move when length changes.

Optional Activity: Make a Marimba.

With the help of an adult, fill up five glasses with different amounts of water. Use the ruler to measure the depth of the water. Write down the different depths on a piece of paper. Arrange the cups from shortest depth to longest depth. Using a spoon, gently tap the side of each glass, and record the pitch of sound each glass makes.

EXPLAIN:

- Watch video about sound, pitch, and length
 - Explanation of Sound: https://www.youtube.com/watch?v=yMLTF_0PAQw
 - Sound Waves and Pitch: https://www.youtube.com/watch?v=riN_Tx5v_U
 - Length and Pitch: <https://www.youtube.com/watch?v=AQJw95-H9mM>
- Review Science vocabulary
 - **Crest:** the highest or tallest part of a wave
 - **Trough:** the lowest part of a wave
 - **Wavelength:** the distance between two points in a wave, usually measured crest to crest or trough to trough
 - **Amplitude:** the maximum distance moved by a vibrating particle from equilibrium, or the middle of a wave
 - **Frequency:** the number of waves passing through a fixed point in time. It is also a measurement of the vibration of particles over a point in time.
 - **Pitch:** another word for frequency, this one describes sound. A higher frequency, or faster movement of particles, will produce a higher pitch, such as a mosquito buzz. It is also connected to the length of an object: smaller lengths produce higher pitch sounds.

- **Loudness:** another word for amplitude, this one describes sound. The higher the amplitude, or more energy in a wave, the louder the sound. It is also known as volume, and connected to how hard an object is hit, plucked, or blown into.

EVALUATE:

Have students identify different musical instruments they see around them, and how length affects the pitch the instruments can produce. Listen to the sounds in your neighborhood, can you describe what pitch each sound makes? Write down the various noises you hear in your day.

Revisit the string and marimba experiment. How does sound change the harder you tap or pluck an instrument?

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