

STEAM SUBJECT: Physics

Lab: Straw Clarinet

Grades: 2-5

Learning Objective:

Students will be able to demonstrate how vibrations create sound and how the pitch of the sound can be manipulated.

ENGAGE:

Ask students the following questions:

- What is sound?
 - Sound can be music, car honks, talking, and more.
 - Sound is simply a form of energy that can be heard.
- How is sound created?
 - Sound is created by vibrations, when something vibrates, it creates a sound wave that travels through a medium, such as air.
 - Ask the students to place two fingers gently on the front of their throat as they talk, they should be able to feel the vibrations in their throat.
 - Have them make different sounds (high pitched versus low toned), and at different volumes. Do the different sounds feel the same?

Vibration Demonstration

Show a demonstration of vibrations by placing a ruler at the edge of a table and flicking it to vibrate the ruler and make sound.

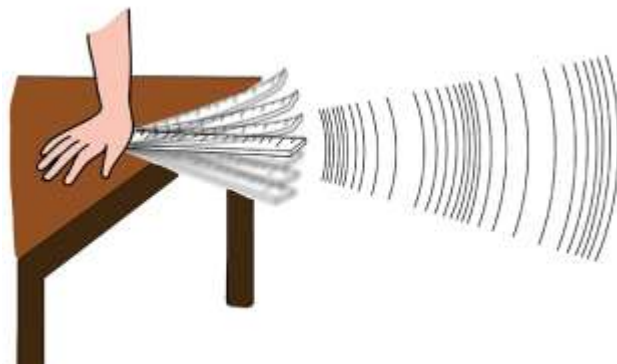


Image credit and more information about sound: <http://www.orbit-ri.org/ears/lessons/where-do-sounds-come-from/>

Vibrate the ruler on the table again but with a different length of the ruler each time. Vibrate 4 inches of the ruler, 6 inches, 8 inches, and 11 inches.

Different sounds should be produced each time. A shorter length of the ruler makes a higher pitched sound because the shorter length vibrates faster and makes a higher pitch sound while when the ruler is longer, it vibrates more slowly and produces a lower pitch.

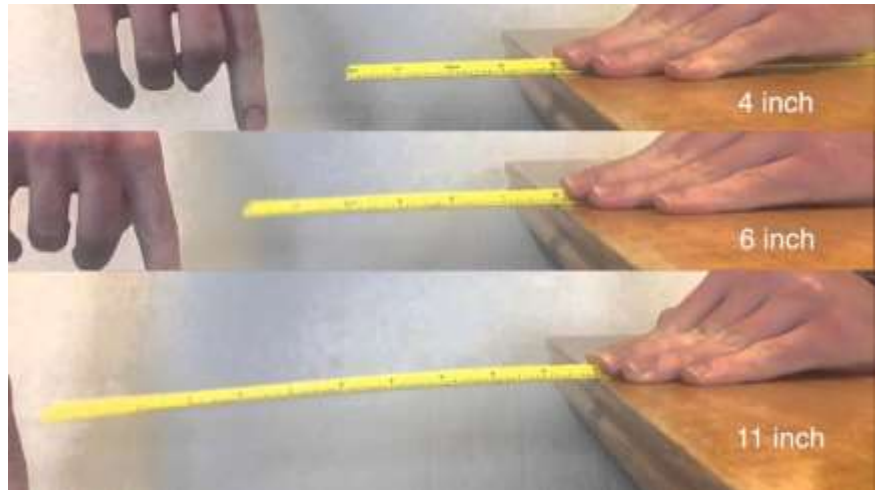


Image credit and slow-motion demonstration:

<https://youtu.be/4SpSwTvbZl4>

EXPLORE:

Straw Clarinet Activity

Students will make a straw clarinet to demonstrate how vibrations create sound and how pitch of the sound can be manipulated.

Materials needed per student:

- Plastic disposable straws
- Scissors (**Adult supervision recommended**)

Directions:

- Flatten the tip of the straw (about an inch) with the handle of the scissors (or pencils etc.).
- Using the scissors, cut a v shape at the flattened tip of the straw.
 - Each triangular tip will act as a reed (thus the name straw clarinet) and the two reeds will vibrate to make a kazoo like sound.

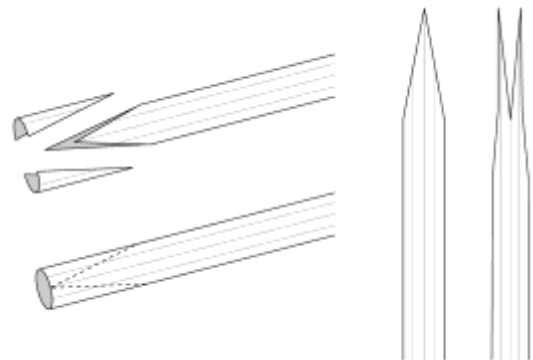


Image credit and more information:

<https://www.exploratorium.edu/snacks/straw-oboe>

- To use: Place the bottom of the reed (the end of the triangle) by the lips, make sure there is no air escaping by the sides of the mouth. Students may have to move the straws up and down a bit to find the “perfect” spot. It will take multiple tries, but the students should be able to make a sound with the straw
- Once the students are able to make a sound with the straw clarinet, they can also bore/cut small holes starting from the other end of the straw clarinet
 - This will allow the students to make it more like an instrument and have the instrument make different notes by covering and uncovering the small holes.



Image credit and additional activities:
<https://www.tactivity.in/Guide/DIY+Music/381>

EXPLAIN:

- What is sound?
 - Sound is vibrations that travel through a medium when an object is hit, plucked, strummed, banged on, etc.
 - Think of when a guitar is played; the strings are plucked or strummed, causing them to vibrate and create a sound. When a drum is hit or banged on, the top covering vibrates and creates a sound. When you speak or sing, your vocal chords in your throat vibrate and create a sound.
 - Sound can make matter vibrate, and vibrating matter can make sound
- What is a medium?
 - A medium is a substance that allows sound to travel through it. There are three types of mediums: solid, liquid, and gas.
 - When someone talks, the sound is traveling through the air to reach another person's ears.
 - In space, where there is no air, one cannot hear sound as there is no medium for the sound to travel through.



- In the ocean the songs of the whales filter in from thousands of miles away.
- Bats, dolphins, and some whales can echolocate, using their calls to find objects through reflected soundwaves.
- Watch videos about sound and vibrations:
 - Vibrations in a Steel Ruler: <https://youtu.be/dDshiu5um9g>
 - Dubstep Pen Beats: <https://youtu.be/3qPzsoQzo9s>
 - Pitch: An Instrument from a Drinking Straw: <https://ca.pbslearningmedia.org/resource/phy03.sci.phys.howmove.zkazo/pitch-straw-kazoo/>
- Review STEAM Vocabulary:
 - **Vibrations:** Quick back and forth motion.
 - **Medium:** A substance that allows sound to travel through, such as air or water.
 - **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.
 - **Volume:** 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 loudness, and connected to how hard an object is hit, plucked, or blown into

ELABORATE:

Download EIS Physics Lab: Creating Sound for grades 2-6 at:

https://eisca.org/wp-content/uploads/2020/04/EIS_Physics_Creating_Sound_10APR2020.pdf

Both lessons can be taught independently or as a mini unit about sound.

EVALUATE:

Have students create multiple straw clarinets with different lengths, straws of different thickness (ex: using ones from different fast food restaurants), different holes cut in different places, etc. How does each clarinet vary in sound, pitch, volume? Have students try to play a well-known song using the clarinet, such as “Twinkle Twinkle Little Star” or “Mary Had a Little Lamb” and see if someone else can identify the song. If the student plays an instrument, have them recall where the vibrations occur when they create music. How does pitch, sound, and volume change in their instrument?

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