The Straw Oboe

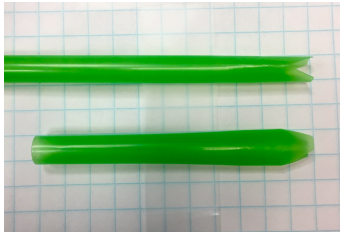
Determine the frequency of a straw
A math and science activity

Materials:

Scissors, ruler, tape, straws

Making your straw oboe:

Use your teeth or fingers to flatten about 2 cm at one end of the straw.
Cut two, small, angular cuts on each side of the flattened end.
It looks like a ducks beak and is called a **reed**.



To do and notice:

Put the reed end of the straw in your mouth. Position the reed just inside your lips and apply light pressure on the straw.
Blow through the straw, you should feel the reed vibrating on your lips.
You may need to make adjustments with the straw to make the sound.
Try making a single pitch when blowing through the straws.
Explore:
Cut several different lengths of straw; remember to cut the reed on each one.
Blow through each one and notice the different sounds.
What is the relationship between the length of the straw and the sound you hear?

Calculating the frequency of your straws.

Part 1

1. Measure the length of your straw in centimeters and convert to meters. Ex: 23.3 cm = .233 m (length)
2. We have already measured the speed of sound – Activity – Sound travels. The speed of sound = distance / time.
3. Divide the speed of sound by the length. (330-345m/s)
4. Example: 345 m/s ÷ .233m = 1480 vibrations per second, or Hertz.

Table Part 1

Note	Frequency (Hz)	Wavelength (cm)	Speed of sound ~345m/s

Calculating the frequency of straws.

Make straw oboes that are double, half, quarter lengths of one of the straw oboes used in Part 1.
Measure each one and complete the table below.

Table Part 2

Note	Frequency (Hz)	Wavelength (cm)	Speed of sound ~345m/s

Using the chart provided "Physics of Music – Notes" find the musical note for each of the straw oboes.
Each of the straws should be an octave of the first length. When the length is doubled or cut in half it is still the same note, just an octave higher or lower in pitch. Your straw oboes frequency may not be exactly the same as the chart, find the frequency that is the closest.

What's going on?

First of all, what is sound? The vibration of objects produces sounds. The push and pull on air molecules, changes the air pressure. Pushes are compressing air and pulls are separating air, rarefactions.
When you blow into the reed and get it vibrating, you send pulses of compressed air down the straw, causing the air in the straw to start vibrating too. Affected by the length of the straw, this vibrating air in turn affects the reed's vibrations. When the reed vibrates at just the right frequency, the air in the straw vibrates powerfully and you hear a loud

sound, sort of like an oboe. When the length of the straw changes the sound or pitch changes. Pitch is how high or low a sound is perceived. We made 4 different length straws with different pitches. The longer the straw the lower the pitch – the shorter the straw the higher the pitch.

LIGO connection:
Noise is LIGO's biggest challenge. Sound is a vibration.
Vibrations are all around us. Some we can hear and feel, other we cannot. Earthquakes from all over the world, waves crashing on shores and winds pushing on buildings and trees, all move the ground underneath LIGO. LIGO is the most sensitive measuring device in the world and is affect by all of these noises.

For more ideas and information visit the following website:
Science Buddies Staff. "Do-Re-Mi with Straws" Science Buddies. Science Buddies, 7 May 2015. Web.6 June 2017
http://www.sciencebuddies.org/science -fair-projects/project_ideas/Music_p016.shtml

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Notes and diagrams