



Musical Instruments: Part I¹

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Students experiment with various sound sources, including straw instruments and water bottles, to gain an understanding of the connection between sound and vibration.

Science Topics	Process Skills	Grade Level
Sound	Observing	6-12
Vibrations	Scientific inquiry	
Resonance	Predicting	
Comparing Frequency		

Time Required			
Preparation	Set-Up	Activity	Clean-Up
None	5 minutes	35-45 minutes**	5 minutes

Learning Goals

Students will be able to...

- describe how sounds are produced with vibrations
- describe how tones can be varied by changing the length of a resonant cavity
- list some of the instruments found in the woodwind, brass, and string families

Materials		
In the Kit	Not in the kit	Optional
Worksheet (pg. 4-6) – 1 per student	Water bottle – 1 per group	Straws – 1 per student
Straw instrument*	Water (to add to bottles)**	Computer***
	Scissors – 1 per group	Extra water bottles

*Students can use the straw instrument they built for the introductory Music and Sound lesson, or you can gather materials to make new ones.

**You will want a source to refill the water bottles (sink, extra containers of water, etc.)

***You might want to access www.dsokidts.com (see extensions below)

Advanced Preparations

Complete the Sound and Music introductory lesson before this activity.

Set-Up

Gather materials and arrange them so they can be easily distributed to students during class.

Introduce the Activity

Begin with a short pre-assessment, where students complete three questions making predictions about the upcoming activity. Students will answer questions 1-3 in their worksheets. After the students have answered 1-3, they should discuss their answers in small groups before moving on.

¹ This lesson is designed for uses AFTER the Sound and Music introductory lesson.

Doing the Activity

More with Straw Instruments

1. Students will need to use their straw instruments from the Sound and Music lesson to create sounds.
 - a) If you need to create new straw instruments, review the directions below and read the instructions from the Sound and Music lesson
 - Model the building of the instrument for the class and explain safety procedures to the students
 - Cut the tip of the straws into a point
 - Gently chew on the straw to soften the tip
 - Blow really hard into the pointy end to create a sound
2. With their straw instruments, students should answer questions 4-5.
3. For questions 6 and 7, students will need to modify their straw instruments by removing the white straw. They will then cut a small a 1-inch section off the red straw and blow on it, and note how the pitch has changed. They will continue to cut their straws down, writing down how much the pitch changes with each change in length. They should cut the straws down until there is nothing left to use.

NOTE: If you have extra straws, students can create new straw instruments instead of cutting their straw trombones.

4. Question 8 expects the students to have heard about resonance previously. If they did the Sound and Music lesson, they will have heard a definition before in the pasta/raisin demonstration.

Water Bottles

1. For question 9 and 10, one student should blow over the top of the water bottle until he or she makes a tone.
2. To figure out where the resonance is happening and to answer questions 12-13, students should try to make a new tone by add or removing water.

NOTE: Make sure students take turns blowing over the top of the water bottle!

Explanation

In-depth background information for teachers and interested students.

General Lesson Points

- The straw instruments create sound when the reed (cut tip of the straw) vibrates. The cavity in the straw allows the vibrations in the air to resonate. This not only defines the pitch of the straw but also makes it loud.
- The water bottle makes a higher tone the more water is in it. This is the same general principle as the straw instrument. The sound waves resonate in the air space of the bottle.

Key Lesson Terminology

- Resonance – A natural frequency of vibration determined by the size and shape of an object
- Pitch – how low or high a sound sounds to a person
- Tone – a musical sound of specific frequency or pitch
- Vibrations (oscillations) – a shaking back and forth movement

Optional Extensions

- For question 13, students can go to the website www.dsokids.com and go to Listen By Instrument to help determine what kind of instrument the straw instrument and water bottle can be classified as.
- Students can create a vocabulary sheet to keep track of the terms used in the lesson.
- Students who play a woodwind instrument can bring their instruments to class to show how the learning translates to real life.
- Complete the Musical Instruments Part 2 lesson

Modifications

- Hard of hearing students can feel vibrations with their hands and mouths.
- Visually impaired students can be assisted when cutting and descriptions of visual attributes can be given in detail.
- If the class does not have access to a computer for each student:
 - The last question can be completed as homework
 - If there are limited computers, students can work in small groups.

Supplemental Materials

Worksheet log below, pages 4-6.

Straw Instrument: Trombone

4. How do you make the lowest possible pitch with your straw trombone?
5. How do you make the highest possible pitch with your straw trombone?

Straw Instrument: modification

6. Test how your straw instrument sounds after you cut about 1 inch off the end.
7. Keep cutting 1-inch sections off and compare how the sound changes.
8. Think about resonance – the natural frequency of something, or the frequency it likes to vibrate at. Where do you think the resonance is happening in your straw instruments? *Hint: what determines its pitch?*

Water Bottles

9. Now use the water bottle. Blow over the top of the water bottle until you have a tone. Would you describe it as a low pitch or a high pitch?
10. What kind of instrument does the bottle remind you of?

11. Figure out how to make a new town with the same water bottle. Describe what you did to change the tone.

12. Where is the resonance happening with the water bottle instrument?

13. Would the straw instrument and the bottle instrument be woodwinds, strings, percussion, or brass? Look at www.dsokids.com for information. Look under “Listen By Instrument.”