# SCIENCE & MUSIC | Lesson 4: Make a Glass Xylophone 2-6

Make your own glass xylophone and explore how sound travels through a liquid and solid. Compare and contrast to how sound travels through a gas (air).

*Standards listed on next page*

## Supplies:

- 3 matching glasses or glass bottles
- Measuring glass (if possible)
- Water (with food coloring as option)
- Science log/notebook
- Metal spoon
- Dowel, pencil, or other wood tool
- Marker
- Tuner app (optional)

## Objective

Students will create a hypothesis and then observe and analyze experimental results while making a glass xylophone. Students will understand how matter affects pitch during travel of sound.

## Outline of Video

1. Line up the three empty, cleaned glasses (or bottles) and tap each with a spoon at the same height to see if their pitches match.
2. Try the same thing, but using a wooden tool such as a dowel or pencil, instead of a spoon. Listen for how the timbre changed from before.
3. In your science log, write the question: Will the sound change if we add water to the glass and tap it? If so, will the pitch be higher or lower with the added water?
4. Based on this question, write a hypothesis about what will happen when water is added. Hypothesis prompt at (2:51).
5. Find out how many ounces are in your glass by asking an adult or using the measuring glass. A typical bottle is 10oz, other glasses may be 8oz, 10oz, 12oz or 16oz.
6. Then divide the number of ounces of the glass by 3 and round to nearest whole number. Use a calculator if you need. Ex. 10 ÷ 3 = 3.33, rounded up to 3.
7. Then double the first number. Ex. 3 x 2 = 6
8. Place tape on each glass, or a note underneath to label the following:
9. A, 0oz
10. B, first # oz (in example: 3)
11. C, second # oz (in example: 6)
12. Using the measuring glass, pour the number of ounces indicated on your labels into each glass.

13. Using the spoon or wooden tool, tap the side of your glass and write down your observations on whether each glass is the highest, middle, or lowest pitch.

14. If you have a smart device, try downloading a tuner app (options on third page) to identify each glass pitch. Try humming to match the pitch you hear.

15. After testing each of the glasses, consider your theory: what happens to the pitch when water is added in the glass? Higher or Lower—pause to discuss or reflect at (8:51).

16. As we add water, the pitch goes lower.

17. Now, if you have a bottle shaped glass, repeat the experiment, but with blowing into the bottle like a flute, instead of tapping with a spoon or tool. **If you are using glassware that is not shaped like a bottle, watch Ms. Liz complete the re-trial.**

18. The results are flipped, with the empty glass being the lowest note, and the most filled, the highest.

19. Answer or discuss the question: why do you think adding water yields a lower note when tapping on the bottle, but a higher note when blowing into the bottle?

20. This relates to the earlier lesson about sound (vibration) traveling through matter: when the glasses are tapped with a spoon, the water (liquid matter) slows the vibration so the more water, the lower the pitch, but when blowing into the bottle, the air is vibrating so the more space in the glass for the air to move, the lower the pitch.

21. DIY at home: use your Glass Xylophone to create a melody or song!

**Experiment Results**

| Bottle | Tap with spoon | Blow like flute (Highest/Middle/Lowest) |
|---|---|---|
| A - ___ ounces | | |
| B - ___ ounces | | |
| C - ___ ounces | | |

## Tuner Apps

**Android:**

Pitch: https://play.google.com/store/apps/details?id=com.trycrescendo.pitch
Pitched Tuner: https://play.google.com/store/apps/details?id=com.stonekick.tuner

**iOs:**

Tuner Lite: https://apps.apple.com/us/app/tuner-lite-by-piascore/id635828559
insTuner Free: https://apps.apple.com/us/app/instuner-free-chromatic-tuner/id603425027

## Kentucky Standards:

K-PS2-1, K-PS2-2. Simple tests can be designed to gather evidence to support or refute student ideas about causes.
KPS2-1. Scientists use different ways to study the world.
KLS1-1. Analyzing data in K—2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.
K-LS1-1. Patterns in the natural and human designed world can be observed and used as evidence.
K-ESS3-3. Events have causes that generate observable patterns.
K-PS3-1. Make observations (firsthand or from media) to collect data that can be used to make comparisons.
K-LS1-1. Scientists look for patterns and order when making observations about the world.
1-PS4-1 Science investigations begin with a question. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
2-PS1-4. Scientists search for cause and effect relationships to explain natural events.
3-LS1-1. Patterns of change can be used to make predictions.
3-LS2-1. Construct an argument with evidence, data, and/or a model.
3-LS3-2,3-LS4-2. Cause and effect relationships are routinely identified and used to explain change.
4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
4-PS3-4. Science affects everyday life.

## Ohio Standards:

K.PS.2: Some objects and materials can be made to vibrate and produce sound
3.PS.1: All objects and substances in the natural world are composed of matter.
3.PS.2: Matter exists in different states, each of which has different properties.
3.PS.3: Heat, electrical energy, light, sound and magnetic energy are forms of energy.
5.PS.2 Light and sound are forms of energy that behave in predictable ways.