

RAFT IDEAS

Topics: Sound, Waves,
Musical Instruments

Materials List

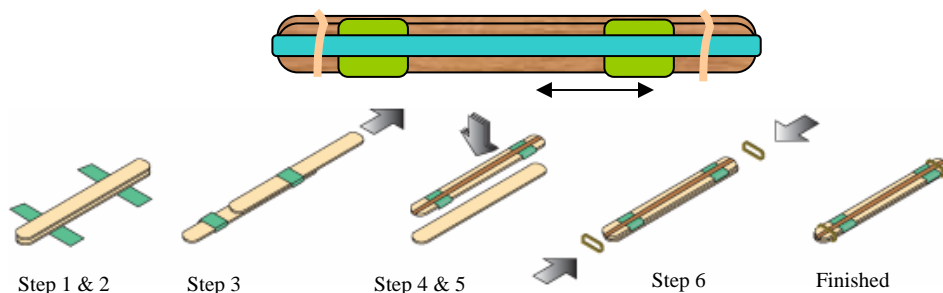
- ✓ 2 large craft sticks (tongue depressors)
- ✓ 2 cardstock strips about 2 cm x 8 cm ($\frac{3}{4}$ " x 3")
- ✓ Tape
- ✓ A long, wide rubber band [size 64, 6 x 87 mm ($\frac{1}{4}$ " x $3\frac{1}{2}$ ") or similar]
- ✓ 2 small rubber bands 1-2 mm ($\frac{1}{16}$ " wide)

This activity can be used to teach:

- Sound and Sound Waves (CA Science Standards: Grade 2, 1.g; Grade 3, 1.d)
- Investigation and Experimentation (CA Science Standards: Grades K-3)
- Playing classroom instruments (CA Music Standards: Creative Expression, 2.0; Grades K-8)

Tongue Depressor Harmonica

Or is it more of a Kazoo?



Perhaps not the most traditionally sounding blues harmonica, but students will love the razzzy, jazzy sound of this fun-to-make and easy-to-play instrument.

Assembly

1. Stack the jumbo craft sticks (tongue depressors) together.
2. Create 2 "sliders" by wrapping 2 cardstock strips around the stack of 2 craft sticks and securing the ends with tape. A longer strip will create a thicker slider – which will affect the sound. Build a sample and experiment.
3. Remove one of the craft sticks and save to use in step 5.
4. Stretch the wide rubber band lengthwise around the craft stick and sliders.
5. Place the unit made in step 4 on top of the removed craft stick from step 3.
6. Wrap small rubber bands around the each end of the craft sticks, as shown.

To Do and Notice

1. Blow on the side of the harmonica between the craft sticks and the two sliders.
2. Move the sliders together or apart. Blow hard or soft. Does the sound change?

The Science Behind the Activity

Sound is caused by vibrations that travel in the form of compression waves through a medium, such as air, and into the ear. For the Tongue Depressor Harmonica, the pitch, or frequency, produced is equal to the number of times per second (hertz) that the rubber band vibrates. Higher pitched sounds are created by waves with a higher frequency. Players can change the pitch by moving the slider(s) or blowing with varying speeds. In general, a shorter length of material (string, rubber, metal) will vibrate more quickly (at a higher pitch) than longer lengths. When the sliders are closer together, the pitch will be higher. The airflow around the rubber band will also affect the sound. The air flowing above and below causes the rubber band between the craft sticks to vibrate due to air turbulence, eddy currents, and vortex shearing. The sound's frequency depends on the air speed; an increase in speed causes an increase in frequency. The same phenomenon actually caused the famous Tacoma Narrows Bridge in Washington to collapse in 1940!

Taking it Further

Experiment with other RAFT music makers, such as *Glove-a-Phone* and *Straw Oboe*.

Web Resources

- Harmonicas: http://www.musicfolk.com/docs/Features/Feature_Harmonica.htm
- Turbulence: <http://hyperphysics.phy-astr.gsu.edu/hbase/pturb.html#turb>
- Tacoma Narrows Bridge information: <http://www.wsdot.wa.gov/TNBhistory/Machine/machine2.htm>