



# Good Vibrations

*Students experiment with various noise sources, including their own voices, to gain an understanding of the connection between sound and vibration.*

## SCIENCE TOPICS

Hearing  
Sounds  
Vibration

## PROCESS SKILLS

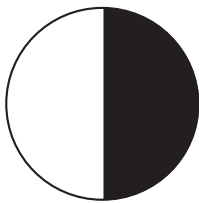
Listening  
Observing

## GRADE LEVEL

K, 1-2

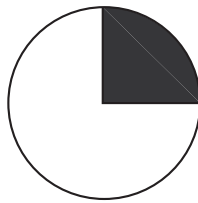
## TIME REQUIRED

### Advance Preparations



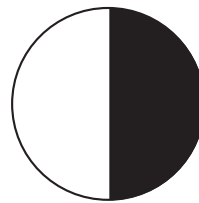
30 minutes

### Set-Up



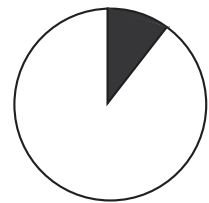
15 minutes

### Activity



30 minutes

### Clean-Up



5 minutes




## MATERIALS

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- tuning fork
- pan or unbreakable bowl, approx. 1–2 liter (1–2 quart)
- water (approx. 0.5–0.8 liters, or 2–3 cups)
- paper
- crayons
- drum(s) (any drum or tambourine will work)
- 2–5 small unbreakable containers (e.g., a plastic cup or 8 oz. clean, empty, yogurt container)
- spoon (plastic or metal, coffee spoon size is fine)
- rice grains
- cereal flakes
- optional: other small dry ingredients similar to rice and cornflakes
- wastebasket
- empty tissue box (flat rectangular variety)
- rubber bands of various sizes
- waxed paper
- new, small, plastic combs (1 per pupil) (small combs work well)

## ADVANCE PREPARATIONS

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-  Set up desks to create spaces for four “sound stations” with desks arranged in 4 groups.
-  Gather supplies (see materials above).
-  Cut one square of wax paper per student (have a few to spare). The wax paper squares should be approximately 10–20 cm. per side (about 4–8 inches).



### Make a Rubber Band Guitar:

Stretch a rubber band around tissue box so that the elastic crosses over the box opening. Place other rubber bands of different widths across the box in the same way. *Depending on the size of class, teachers may want to make several Rubber Band Guitars.*

## SET-UP

*Set the supplies at each station as follows:*

### **Station 1– Ripples on Water/Tuning Fork:**

- Add water to the pan or bowl to five centimeters depth (approximately two inches).
- Place crayons, paper, a tuning fork, and the pan of water at the table.

### **Station 2 – Drum Vibrations:**

- Half fill 3 – 5 small unbreakable containers (e.g., clean, empty 8 oz. yogurt containers) with different dry ingredients including uncooked rice grains, cereal flakes, etc. *(Note: you may need to refill these during the class period as groups use up the ingredients).*
- Place the containers of ingredients, a spoon, and a drum at the station.
- Place a wastebasket near the station.

### **Station 3 – Kazoos:**

- Place one plastic comb and one square of wax paper per student at the table.

### **Station 4 – Rubber Band Guitar:**

- Place one or more tissue box guitars at the table.

## INTRODUCING THE ACTIVITY

*Let the students speculate. Do not encourage a single correct answer. Do not offer answers to any questions. The answers at the right are provided primarily for the teacher's benefit.*

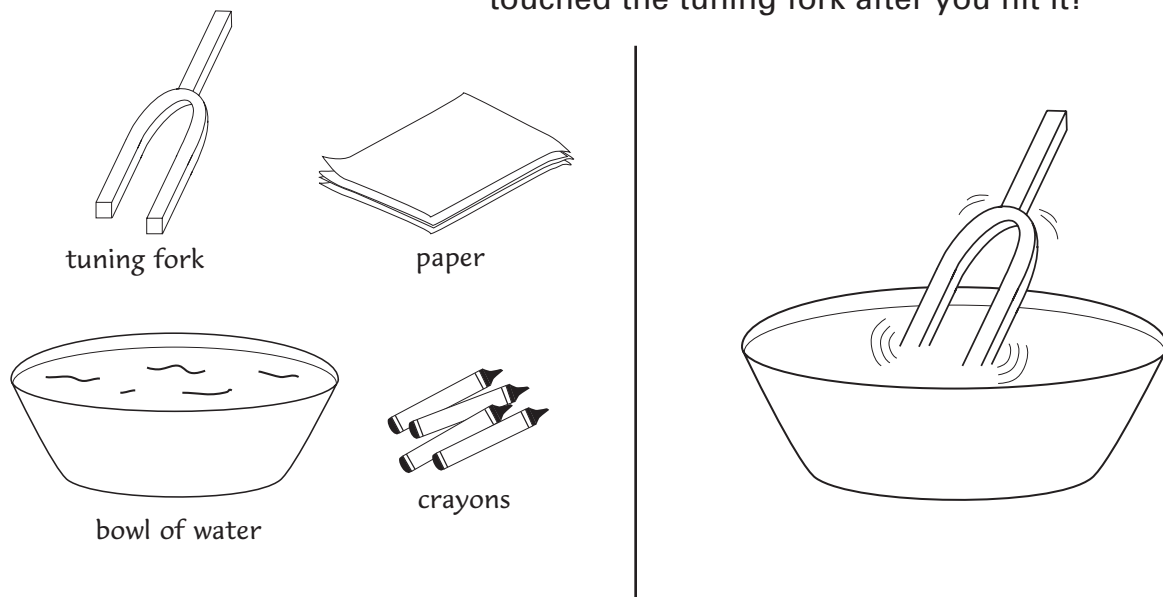
Begin with an introductory, interactive demonstration in which students feel the vibrations created by their own voices. Talk to or ask the students the questions in **bold**. Possible student responses are shown in *italics*.

- **We are going to feel the movement made by our voices when we talk, sing, hum, or shout.**  
*(Tiny repeating movements are called vibrations.)*
- **Can you feel the sound of your voice by putting your hand on your body while you talk?**
- **Where do you think is the best place to feel your body vibrate when you talk, sing, or hum?**  
*(Encourage a variety of answers. Each answer represents what they know about sound. Students may think the vibrations will be strongest coming from their mouths, but they are actually stronger at the throat.)*
- **Test your hypotheses with a partner.** Have students test various hypotheses suggested by the class and possibly the teacher. Test by having students place their hand on a part of their body while they talk.
- **Include testing of the face and throat:** Have each student hold her hand against her own face as she talks and feel the movement (vibrations). Next, have students put a finger on the front of their throat, close to their "voice box" (*middle of the throat*), being careful not to press too hard.
- **Do you feel tiny movements from speaking? Where do you feel them best?**
- **Ask students to share their observations.**

**Demonstrate each of the four activity stations before students divide into groups and do the activities.**

**Station 1– Ripples on Water/Tuning Fork:**

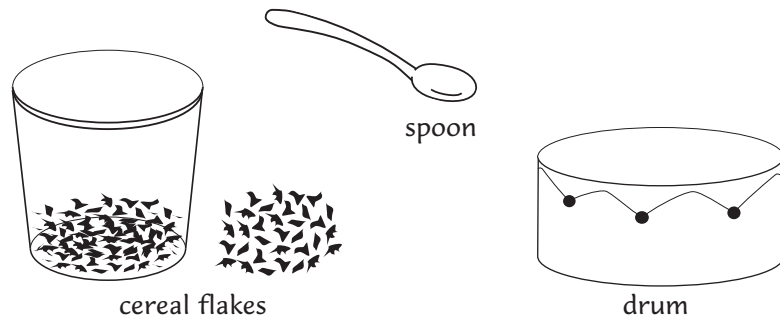
- Strike a tuning fork against a book and dip the fork in the pan or bowl of water.
- Tell students that when they do this activity, they will also have paper and crayons to draw what they see.
- To think about: What did you feel when you touched the tuning fork after you hit it?



**Caution:** the resonating (fork) end of the tuning fork should *only* be placed in the water. Do not put the resonating end of the fork against the furniture, windows, or any part of the body.

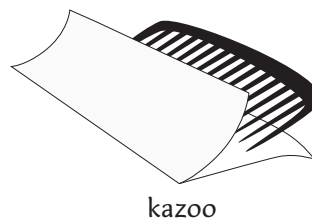
### **Station 2 – Drum Vibrations:**

- Tap on the drum and notice if you can see movement.
- Place a spoonful of cereal flakes on top of the drum.
- Tap on the drum again.
- Notice if the cereal flakes move.
- The students will have a variety of materials (cereal flakes, rice, etc.) that they can test.
- Remind students to clean up the first material before testing a new one.
- To think about: Did the cereal flakes move or stand still? Did some materials move more than others?



### **Station 3 – Kazoos:**

- Make a kazoo by folding a piece of waxed paper in half.
- Slip a comb into the waxed paper so that the teeth are against the fold.
- Put the comb into your mouth so that your lips rest on the folded edge of the waxed paper. (*It is best if students avoid getting the paper wet.*)
- Blow or hum.
- To think about: How did your lips feel when you played your “kazoo”? What happened to the waxed paper when you hummed?



#### **Station 4 – Rubber Band Guitar:**

- Strum the Rubber Band Guitar. Watch the rubber bands as they are plucked.
- To think about: What did the rubber band do when you plucked it? Did you feel movements (vibrations) in your other hand (the hand holding the box)?



rubber band guitar

## **CLASSROOM ACTIVITY**

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*Divide the students into 4 groups. Have the students rotate through the stations, and do the activities as demonstrated (see above).*

**Caution:** Remind students that the resonating (fork) end of the tuning fork should *only* be placed in the water, and nowhere else.

## DISCUSSION

Ask the students the questions in **bold** and facilitate an open-ended discussion. Possible answers are shown in *italics*.

### Questions from Stations:

#### Station 1– Ripples on Water/Tuning Fork:

**What did you feel when you touched the tuning fork after you hit it?**

#### Station 2 – Drum Vibrations:

**Did the cereal flakes move or stand still? Did some materials move more than others?**

#### Station 3 – Kazoos:

**How did your lips feel when you played your “kazoo”? What happened to the waxed paper when you hummed?**

#### Station 4 – Rubber Band Guitar:

**For the rubber band guitar, what did the rubber band do when you plucked it? Did you feel movements (vibrations) in your other hand (the hand holding the box)?**

**What was each one of these objects doing as it was making a sound (including your throat)?**

**What else did you notice (observe) with your eyes or ears?**

#### **Can we see sound move?**

*The sound made by the tuning fork made a pattern of waves that showed in the water. If we could see the air around us, we would be able to see the same kind of waves as sound moves through the air from a radio to your ears.*

#### **Can sound move things?**

*The rice and cereal was moved on the drum by the sound of the drum. The sound from your humming voice moved the wax paper on the comb and tickled your lips.*

*This sound movement is felt by special parts of your ear (tiny hair cells of the inner ear). Deep inside your ear, sound waves actually move small structures that look like very tiny hairs (stereocilia). These parts of your ear are much smaller than grains of sand. If sound is strong (loud) enough, the sound waves cause some of them to bend or break. When you are around loud noises often, or for a long time, you may begin to have trouble hearing. (See Appendix D, Stereocilia pictures, page 94).*

**Do you know any older people who seem to have trouble hearing some sounds?**

**Give examples of some loud sounds you are exposed to in your environment.**

*Check to see if your sounds are on the Decibel Meter on the “thermometer” poster that comes packaged with the teacher training DVD for this curriculum. Review the sources of sound on the chart.*

*Note: Noise is not the only cause of hearing loss, but it is the most common cause in America (and in other industrialized nations). Loud noises (above 85 dB) can hurt your ears by damaging the sensitive hair cells of the inner ear. It makes no difference whether you like the loud sounds or not – if they are 85 dB and over, they can begin to damage hair cells in your inner ear. **Remember, if you have to raise your voice to be understood, it's probably loud enough to be dangerous!***

Doctors cannot fix ears that have been damaged by loud sound. So it is very important to protect your ears.

Here is what you can do:

- Turn down the volume (make the TV quieter)
- Walk away (get far away from the loud sound)
- Wear ear muffs or ear plugs

QUESTIONS TO SEE IF YOU ARE AROUND SOUND THAT MAY HARM YOUR HEARING:

- Do you often have to shout for people to hear you?
- After being around loud sound, did you ever have a ringing or other noises in your ears or head (tinnitus)?
- Does music sound a little strange after you listen for a while?
- After being near loud sound, does it sound like people are talking to you through a pillow?
- After being near loud sound, do your ears sometimes feel “full” or “stopped up”?
- When you are listening to stereo head-phones or a Walkman, can a person standing next to you hear it too?

If you answered YES to any of these questions, you have been exposed to damaging sound levels.

## EXPLANATION

*In-depth background information for teachers and interested students.*

Read about the **Physics of Sound** on page 4.

Sound is produced when an object vibrates. Near the vibrating surface, air follows that surface and the air molecules begin to vibrate, or **oscillate**. These oscillations spread from one molecule to the next, and a sound wave moves outward from the vibrating surface. The intensity of the waves (**amplitude**) and how rapidly they repeat (**frequency**) produce the differences in sound. More intense oscillation produces a louder sound. Faster oscillations produce higher pitched sounds. When sound waves travel through the air, the oscillation of the air molecules next to the surface of an object (such as the surface of the drum) will cause that object to vibrate. You can even feel the sound energy with a light fingertip touch on many of the objects used in this activity.

Speech and other vocalized sounds are produced in your **larynx** (voice box). The larynx is made of muscle tissue and cartilage, which can be seen as the bump protruding from the front of your neck. The larynx moves when you swallow. The vocal cords, which are made of tough, elastic tissue, are stretched across the opening of the larynx. When you exhale, the air passing through your larynx causes your vocal cords to vibrate. This produces sound waves that are converted into vocal sounds by the muscles of your throat and the shape of your mouth. The faster the air moves through the vocal cords, the higher the volume, or the louder the sound; the more tightly the vocal cords are stretched, the higher the pitch.

## OPTIONAL EXTENSIONS

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### Music

Have a class concert, using the drum(s), kazoos, guitar(s), and voices!