ACTIVITY 29

Good Vibrations

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 1—Quarter 3
Activity 29

SC.B.2.1.1
The student recognizes systems of matter and energy.

SC.C.1.1.2
The student knows that there is a relationship between force and motion.

SC.C.2.1.2
The student knows that sound is caused by vibrations (pushing and pulling) to cause waves.

SC.H.1.1.3
The student knows that in doing science, it is often helpful to work with a team and to share findings with others.

SC.H.1.1.4
The student knows that people use scientific processes including hypothesis, making inferences, and recording and communicating data when exploring the natural world.

SC.H.1.1.5
The student uses the senses, tools, and instruments to obtain information from his or her surroundings.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 40 hands-on activities at this grade level.

1. Say, *All musical instruments make sounds.* Then ask, *Does this mean that all musical instruments must have something that vibrates to make that sound?* (yes; a string, a reed, a musician's lips, a "skin") Have students name or draw musical instruments and tell what part they think is vibrating to make the music.

2. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide an opportunity to identify areas that may require additional review before proceeding further with the activity.

ACTIVITY 29

Good Vibrations

OBJECTIVES

Students hear, feel, and see the effects of vibrating objects on various materials. They infer that vibration produces sound.

The students

- use a tuning fork to produce a sound
- feel a tuning fork's vibration and observe it ripple the surface of water
- produce sound by causing a piece of paper and a strip of plastic to vibrate
- infer that vibrations produce sound

SCHEDULE

About 50 minutes

VOCABULARY

tuning fork
vibrate
vibration
vocal cords

MATERIALS

For each student

1	Activity Sheet 29
1	comb

For each team of two

1	cup, plastic, 9-oz
1	tuning fork

For the class

	paper towels*
1 sht	plastic, 30 cm × 30 cm
1 pair	scissors*
	water, tap*
1 roll	waxed paper

For the teacher

1 pair	gloves, disposable

*provided by the teacher

PREPARATION

1. Make a copy of Activity Sheet 29 for each student.
2. Cut a piece of waxed paper 8 cm × 12 cm (about 3 in. × 5 in.) for each student. Cut a strip of plastic 1.25 cm × 10 cm (about ½ in. × 4 in.) for each student.
3. Fill each plastic cup three-quarters full of water.
4. Each student will need a comb, a piece of waxed paper, and a strip of plastic. Each team of two will need a tuning fork, a cup of water, and a paper towel.

BACKGROUND INFORMATION

A ***vibration*** is a rapid back-and-forth motion. When an object ***vibrates,*** its motion moves the molecules of a surrounding medium, such as air. Pressure waves, resulting from the alternate compression and expansion of air, travel outward in all directions from the vibrating object. When our eardrums receive the impact of these waves, they also vibrate, sending signals through the ear to the brain, which interprets them as sounds.

All sounds are produced by the vibration of objects. Vibration is produced by applying some kind of energy, or force, to an object—by striking it with another object, for example, or even by blowing air against it.

A ***tuning fork*** produces a sound of a particular pitch; musicians use it to check the accuracy of a musical note their instruments produce. When struck, a tuning fork may vibrate at a rate of more than 200 times per second.

Vibrations are also produced by electronic means through stereos and radios, by animals through their utterances and movements, and by such natural phenomena as water, wind, and thunder.

In humans, the trachea—the upper end of the passageway to the lungs—contains the ***larynx,*** also called the voice box. Inside the larynx are the ***vocal cords,*** a pair of elastic membranes with a narrow slit between them. When a person speaks, the vocal cords stretch. As air from the lungs passes between the stretched vocal cords, they vibrate and produce sounds. Muscles in the mouth, lips and tongue shape the sounds into speech.

▼ **Activity Sheet 29**

Good Vibrations

Object	Action	Observed Results
Tuning Fork	Striking against desk and holding it close to ear	I hear: a ringing sound
Tuning Fork	Striking against desk and touching palm of hand	I hear: a tickling sensation
Tuning Fork	Striking against desk and then touching it to surface of water	I see: water rippling
Vocal Cords	Touching neck with fingers and humming	I hear: a humming sound I feel: vibrations
Waxed Paper over a Comb	Blowing a stream of air onto it while humming	I hear: louder humming I feel: a tickling on my lips
Strip of Plastic	Blowing it while it is held between thumbs	I hear: a loud screeching sound
Strip of Plastic	Watching it while another student blows on it	I see: the plastic strip vibrating rapidly

Guiding the Activity

Additional Information

1 Divide the class into teams of two. Without saying what it is, give a tuning fork to each team. Instruct students to examine the tuning fork carefully.

Ask, **Does the object you are examining make a sound?**

Answers will depend on whether or not the students struck it against another object. By itself, it makes no noise.

2 Write the term *tuning fork* on the board. Tell students that the object they are examining is called a tuning fork. A **tuning fork** is an instrument that gives a fixed tone when struck.

Students may be interested to know that tuning forks are used by singers and other musicians to check the accuracy of pitch of a certain musical note sung or played on an instrument.

Challenge students to experiment with the tuning fork and try to produce a sound.

Guiding the Activity

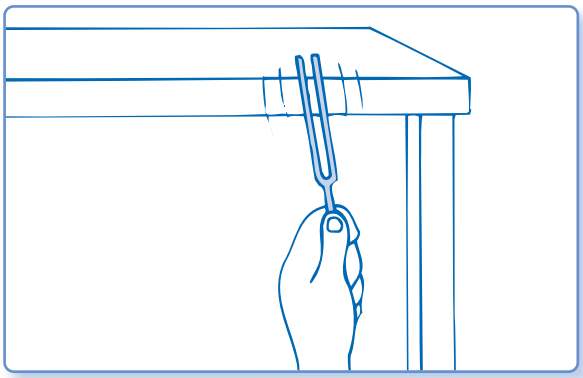
	Additional Information
Ask, **How can you make the tuning fork produce a sound?**	*Students should discover that they can produce a sound by striking one prong of the tuning fork against another object, such as a desk.*
Make sure that both students in each team have a chance to hear the sound produced by the tuning fork. Ask, **How can you hear the sound best?**	*Students should have discovered that they can best hear the sound made by the tuning fork when it is held close to the ear.*
Ask, **How would you describe the sound produced by the tuning fork?**	*It is a high-pitched ringing sound.*
Ask, **How do you think the tuning fork produces this sound?**	*Accept all reasonable suggestions.*
Give each student a copy of **Activity Sheet 29.** Instruct students to use the last column's first box to record the results of their experiment with the tuning fork.	*Help students with spelling and phrasing as needed. As an alternative, you could make a transparency of the activity sheet and project it, filling in answers for students to copy.*
3 Instruct one student on each team to gently tap the tuning fork against an object and then touch it lightly to the hand of the second student. Have students take turns repeating this procedure until each one has felt the tuning fork. Have the students record their observations in the second box of the last column.	
Ask, **What did you feel when the tuning fork touched your hand?**	*Students may describe feeling a soft, tickling sensation.*
Ask, **How can you explain what caused this feeling?**	*Students may suggest that the tuning fork was moving.*
4 Distribute a plastic cup three-quarters full of water and a paper towel to each team. Have students place the cup on the paper towel.	
Instruct students to gently tap the tuning fork against a desk and then quickly touch the surface of the water in the cup with the tip of the tuning fork (see Figures 29-1 and 29-2). Have students record their observations on the activity sheet.	*It is important that the tuning fork touch only the surface of the water and not be inserted down into the water.*

Guiding the Activity

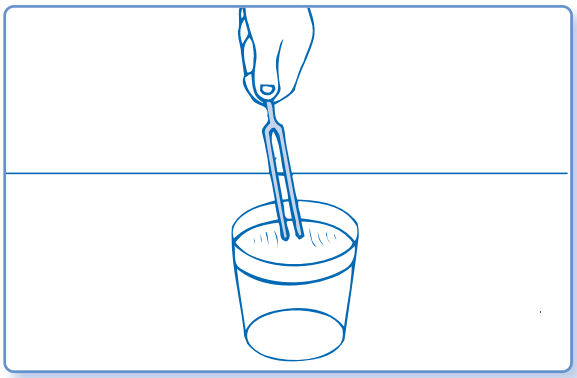
Additional Information

Ask, **What happened when the tuning fork touched the water?**

The water rippled in all directions.



▲ ***Figure 29-1.*** *Striking the tuning fork against the desk causes it to vibrate.*



▲ ***Figure 29-2.*** *A vibrating tuning fork touching the surface of water causes the water to ripple.*

Ask, **Why do you think the water rippled?**

Students should suggest that the tuning fork was moving and that it made the surface of the water move.

Write the words *vibrate* and *vibration* on the board. Tell the students that **vibrate** means to move rapidly back and forth. The **vibration,** or back-and-forth movement, is often so fast that their eyes cannot follow the movements. Ask, **Do you think the tuning fork could have been vibrating?**

Most students will agree that the tickling sensation on their hands and the ripples on the water's surface could have been caused by the vibration of the tuning fork.

5

Write the term *vocal cords* on the board. Tell students that their **vocal cords** are located in their throats and produce the sounds that their mouths shape into speech.

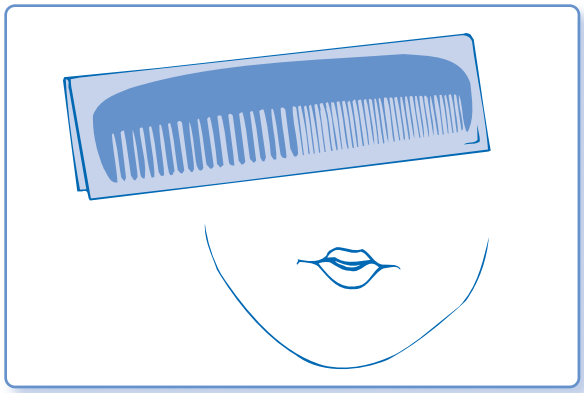
Instruct students to hum and put their fingers on their throats, as shown in Figure 29-3. Have them observe what they feel and hear and record their observations on the activity sheet.

Demonstrate where students should put their fingers by placing your own fingers on your throat over your vocal cords.

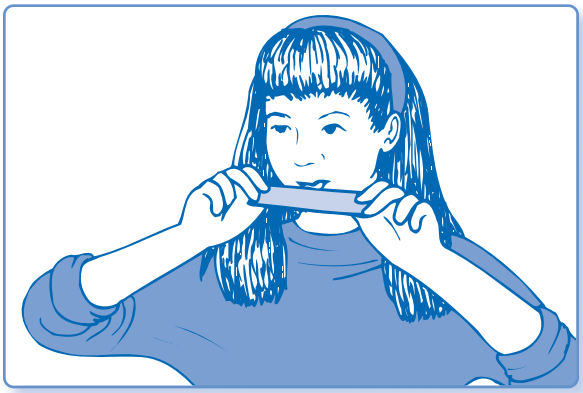
▲ ***Figure 29-3.*** *You can feel your vocal cords vibrating when you hum.*

Guiding the Activity

Additional Information



▲ ***Figure 29-4.*** *Fold the waxed paper in half lengthwise and place it over the comb.*



▲ ***Figure 29-5.*** *Playing a comb.*

6 Give each student a comb and a piece of waxed paper. Tell students to fold the paper in half lengthwise.

Demonstrate how to place the waxed paper over the comb (see Figure 29-4). Purse your lips slightly so that a thin stream of air comes out between them as you make a humming sound. Then hold the comb with the waxed paper over it just in front of your lips but not touching them as you continue to make the humming sound (see Figure 29-5).

Ask the students to watch and listen closely.

Instruct students to follow the same procedure. Tell them to practice making the sound before trying it with the comb and paper. Tell them to notice both the sound and the feeling as they blow and hum against the waxed paper. Have them record their observations on the activity sheet.

Ask, **What did you hear when you "played" the comb?**

a different and louder humming sound than without the comb and paper

Tell students that the same humming sound is different when done against the comb and paper because when vibrating air leaves the mouth, it causes the paper to vibrate against the comb, producing an additional vibration and a different and louder sound.

Ask, **What did you feel?**

Students may answer that they felt a tickling sensation on their lips. Encourage answers that include the terms vibrate *and* vibration.

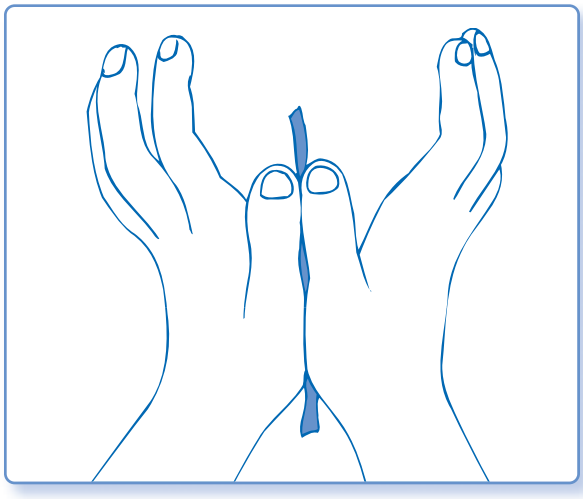
Guiding the Activity

Additional Information

7 Give each student a strip of plastic. To explain how to hold the strip, first tell students to put their thumbs together, side by side, thumbnails up. Tell them to note the small space in the middle between their thumbs (see Figure 29-6).

Tell students to place the strip of plastic between their thumbs, pulling it tightly and holding it in place with the bottoms and tops of their thumbs. Tell them they should blow on the part of the plastic that is in the space between their thumbs. Demonstrate how to blow to create a screeching sound (see Figure 29-7).

When the air passes over the tightly stretched strip of plastic in the space between the thumbs, it causes the plastic to vibrate and produce a sound.



▲ ***Figure 29-6.*** *The strip of plastic must be held tightly between the thumbs.*

▲ ***Figure 29-7.*** *Blow between the thumbs to make the plastic vibrate.*

Have students follow the same procedure to create their sounds with the plastic strip. Ask them to record their observations on the activity sheet.

Have students watch each other as they blow on the strip of plastic. Encourage them to watch for changes in the plastic. Have them record their observations on the activity sheet.

Some students may volunteer that they have blown on blades of grass to produce sound the same way.

Ask, **What did you see happening to the strip of plastic when your partner blew on it and it made a sound?**

The plastic was vibrating.

Guiding the Activity

Additional Information

8

Have students review the observations they recorded on the activity sheet. Invite volunteers to describe in general terms what they heard, felt, and saw.

Instruct students to focus on what they heard. Ask, **What did your ears tell you about all the objects you tested—the tuning fork, your vocal cords, the waxed paper over the comb, and the plastic strip?**

All the objects could be used to produce sound.

Ask students to focus on what they saw and felt. Ask, **What did you observe and feel when you tested the objects?**

Vibrations. Some objects could be seen to vibrate, such as the plastic strip. Vocal cord vibrations could be felt but not seen. Some objects showed they were vibrating by affecting other materials, such as the tuning fork rippling water.

Remind the students that none of the objects vibrated by themselves. They needed the energy the students supplied—the striking, humming, and blowing—to cause them to vibrate and thus produce sounds.

Reinforcement

Give students the opportunity to see other materials vibrate. Bring in a stringed instrument, such as a guitar, and other materials, such as rubber bands, a toy drum, and a ruler. Have students experiment with plucking or striking these objects, listening to the sounds they make, and watching the objects vibrate.

Science Journals

Have students place their completed activity sheets in their science journals.

Cleanup

Have students dump out the water and use the paper towels to dry the cups. Have them throw away the paper towels and return the cups to the kit. Collect the waxed paper, plastic strips, and combs yourself, wearing disposable gloves. (See Safety Note below.) Throw away the plastic strips and waxed paper. Wash the combs in warm, soapy water, dry them, and return them to the kit. Clean students' work surfaces.

Safety Note: *Due to universal precautions with bodily fluids (in this case, saliva), you should wear gloves while collecting the plastic strips, waxed paper, and combs at the end of the activity. You should also wear gloves while cleaning any surfaces. Students should wash their hands after completing the activity.*

Science at Home

Students can observe the effects of sound wave vibrations with this experiment at home: Lay a small radio on a table with the speaker facing up. Place a square of waxed paper on the speaker, and sprinkle a little salt on top. Turn on the radio and watch the salt dance! Change stations and adjust the volume to see how different sound waves affect the particles.

Connections

Science Extension

The following activity will give students a rough approximation of what happens when they make sounds with their vocal cords. Have each student blow up a balloon and pinch the neck to prevent air from escaping. The student should grip the balloon's neck with a thumb and index finger on each side and then let some air escape while stretching the neck. Ask students to explain how the sound is produced. (Air moving past the open neck makes it vibrate, producing sound.) Students will undoubtedly discover that they can make different sounds by stretching the neck farther or loosening it.

Science and the Arts

If you have access to a piano in school, gather the class around it, and open the top or front to expose the hammers and strings. Tell students to watch the hammers and strings carefully while you strike one of the piano keys repeatedly. Ask students to describe what they see. (Your finger hits a key, the key operates a hammer, the hammer hits a string, and the string vibrates, producing a sound.) Encourage them to use the terms *vibrate* and *vibration* in their descriptions. Repeat with other notes. If you know (or a student knows) how to play the piano, let the class listen while a complete tune is played. Challenge students to explain how the piano is able to produce different notes. (The strings are different lengths.)

Science and Social Studies

Students might like to find books or websites about Thomas Edison's invention of the first phonograph in 1877 and other early phonographs that used wax cylinders or the heavy, easily broken precursors of lightweight vinyl records. Try to obtain some old records (or tapes made from them) so students can compare the scratchy, fuzzy sound quality with the high quality we enjoy with compact discs today.