Do Vibrations Make Sound?

Grade 1: Sound Probe

Aligned with National Standards

ward's science
Single Probes

overview

Students will learn about sound and vibrations. This activity will allow students to see and hear how vibrations do in fact make a sound and that sound can make materials vibrate.

This activity uses the WARD's Single Sound Probe to collect data, allowing students to focus on the science discovery and leaving more time for learning and developing higher level thinking skills.

time requirement:

This activity can be completed in one session of 20 minutes.

materials required for the activity:

Ward's Single Sound Probe
Tuning fork, any frequency
Empty metal can (soup can, tuna fish can, etc.)
Plastic wrap
Rubber band
Salt
Sheet of paper (rolled up like a megaphone)
Small piece of cotton
Tape
Instructions (this guide)

safety precautions

general safety:

- Read all instructions before starting the lab activities. Review the lab procedures and safety precautions with your students and remind them to ask questions.
- Consider establishing a safety contract that students and their parents must read and sign. This is a good way to identify students with allergies (e.x. latex) so that you (and they) will be reminded of specific lab materials that may pose risks to individuals.

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DIMENSION 1 Science and Engineering Practices

×	Asking questions (for science) and defining problems (for engineering)		Use mathematics and computational thinking
×	Developing and using models	×	Constructing explanations (for science) and designing solutions (for engineering)
×	Planning and carrying out investigations		Engaging in argument from evidence
	Analyzing and interpreting data	×	Obtaining, evaluating, and communicating information

DIMENSION 2 Cross Cutting Concepts

	Patterns		Energy and matter: Flows, cycles, and conservation
×	Cause and effect: Mechanism and explanation	×	Structure and function
	Scale, proportion, and quantity		Stability and change
×	Systems and system models		

DIMENSION 3 Core Concepts

Discipline	Core Idea Focus
Physical Sciences	PS4.A: Wave Properties

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NGSS STANDARDS

Elementary School Standards Covered
1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

national science education standards © 1996

Content Standards (K-12)			
	Systems, order, and organization		Evolution and equilibrium
×	Evidence, models, and explanation	×	Form and function
×	Constancy, change, and measurement		

Physical Science Standards Elementary School	
×	Properties of objects and materials

× Indicates standards covered in activity

prior to class

- Review basic information about how to use and read the WARD's Single Sound Probe. Tell students it will be important for them to be quiet during the activity so the probe is able to "hear" the sounds of the activity.
- If you want the students to experience the activities in small groups, collect enough metal cans and make enough paper megaphones for the number of groups in the class.
- Cover the open end of the metal can with plastic wrap. You may want to secure the wrap with a rubber band. Place some salt on top of the plastic wrap.
- Roll a piece of paper to make it like a megaphone, tape it to hold its shape. Place a small piece of cotton in the small end. This is to prevent air (from the student talking) from passing through but will allow sound waves to travel through. Otherwise the movement of the salt could be from their breath.

objective

Students will observe vibrating materials making sound and sound making materials vibrate.

background

Vibrations are generally small repetitive movements. Almost all objects, when hit or plucked or strummed or somehow disturbed, will vibrate. If you drop a pencil or meter stick on the floor, it will vibrate. If you pluck a guitar string, it will vibrate. The vocal cords of a person actually vibrate. Also, if you blow over the top of an empty soda bottle, the air inside will vibrate.

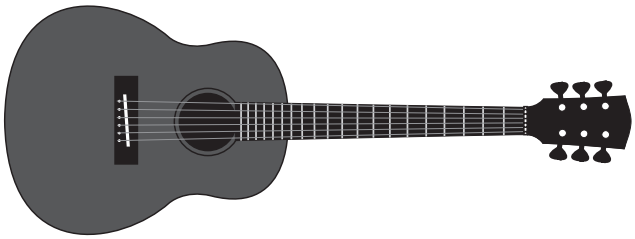
When each of these materials vibrate, they tend to vibrate at a particular frequency (or speed). The frequency at which an object tends to vibrate when hit, plucked, strummed or somehow disturbed is known as the natural frequency of the object. If the amplitude (or strength) of the vibrations are large enough and if the natural frequency is within the frequency range humans can hear, then the vibrating object will produce sound waves that are audible.

A sound wave is created as a result of a vibrating object. Some of these sound waves are too small to hear. Musical instruments are made to magnify these vibrations and sound waves.

build upon prior knowledge:

Ask the students to look at the pictures below and ask the students how they would make each instrument make a sound. Lead the discussion to help students understand that these movements/ vibrations make sound. *(Student responses could include: 1. Guitar - strumming the strings, 2. Recorder/ flute - blowing air thru it, 3. Triangle - hit the metal, 4. Violin - plucking/strumming the strings, 5. Trumpet - blowing air thru it, 6. Drum - hit the top.)*

1



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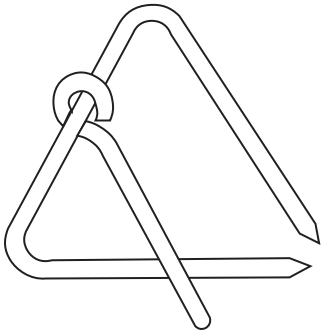

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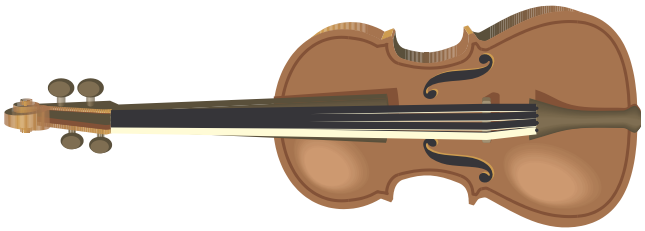

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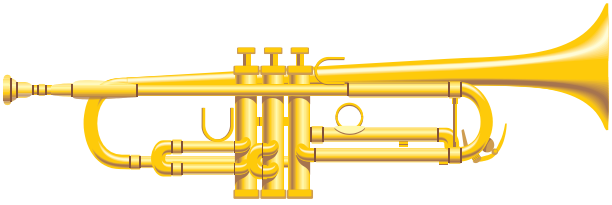

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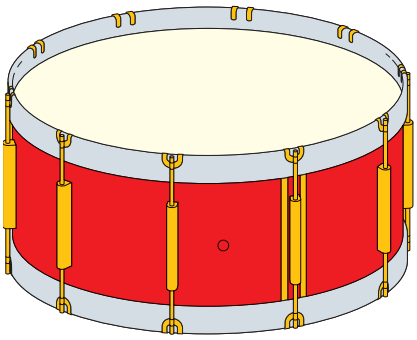

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guiding questions

- What do you think will happen? (Hypothesis)
- What do you expect to learn?
- What tools are needed?
- How can we record our findings?

procedure

Part 1: Vibration makes Sound

1. Have a student strike the tuning fork with their hand. Have the students listen to the sound and feel the vibrating tines of the tuning fork.

2. Have students make predictions whether the sound of the vibrating tuning fork will register on the sound probe.

# of students who think the tuning fork **will** make sound loud enough for the probe	
# of students who think the tuning fork **will not** make sound loud enough for the probe	

3. Have the student re-strike the tuning fork and ask another student to aim the Ward's Single Sound Probe at the tuning fork and share what it reads.

4. Write down the decibel reading of the tuning fork.

5. Have another student strike the tuning fork with their hand. This time, the student should place the tuning fork against the can with the salt on top.

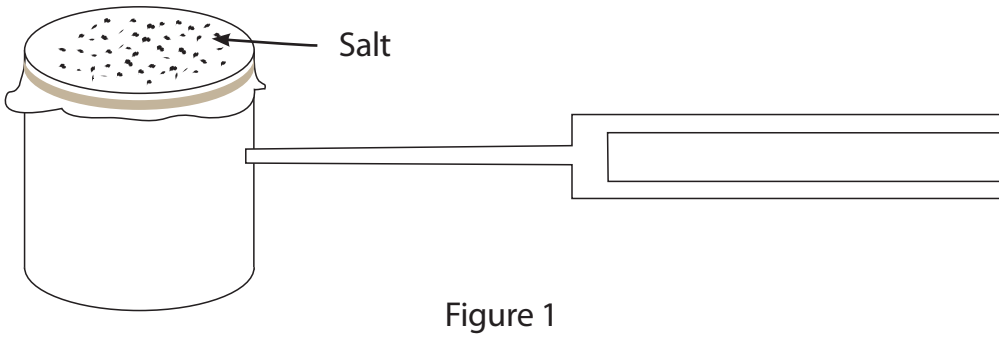

Figure 1

6. Ask the student holding the sound probe to observe the sound reading and share what the sound level is.

7. Discuss what happened to the salt. What made the salt move? Was the sound from the salted can louder than the tuning fork alone?

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Part 2: Sound makes Vibration

1. Ask the students to make a quiet humming noise and ask them to feel their own throat. What do they feel?

2. Using the sound probe, determine the decibel reading of the tuning fork.

3. Ask the students to try and recreate the same decibel reading with their voice through the megaphone.

4. Point the megaphone at the can with the salt on top and ask the students to try and create motion with their voice. Use the sound probe to insure the same decimal level is being used.

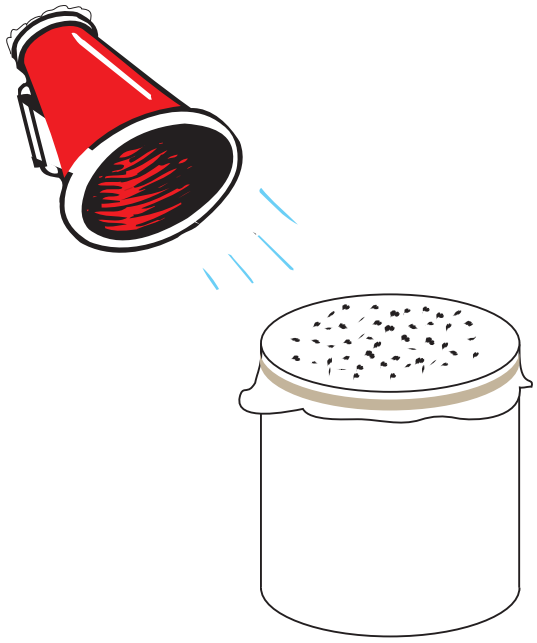

Figure 2

5. Ask the students if the sound of their voice made the salt move.

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note

teacher notes

- The Ward's Single Sound Probe has two settings; the default is decibel (db) and should be used for all elementary activities. The other setting is arbitrary (arb) and is used to see the wave form.

- Since the intensity of the sound is dependant upon the closeness of the sound probe, always make sure the sound probe is the same distance away from the object in question for each experiment.

- If the students ask why the cotton ball is required for the megaphone, tell then it is to block their breath but allow sound to travel through.

Students with special needs:

The sound probe offers an excellent opportunity for students with hearing issues. Instead of them having to focus on the sounds, they can **see** a number that represents the sound.

summarize

Ask students what they learned about sound and vibrations. (*Student responses may include: a vibrating object can produce sound and sound can produce vibrations.)*

extension

Help students further understand how vibrations make sound. Ask the students to strike the tuning fork. When the tuning fork stops making a noise that is able to be heard, place it gently on a student's head. The vibrations on the skull will stimulate the cochlea so that the student will hear sound. This will work on any part of the human skull.

Also, ask the students to tap lightly on their desk, then place their ear on the desk and repeat the same light tapping. Did the tapping sound louder when their ear was on the desk?

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