

WHAT DO I HEAR?

Science Concept:

Waves can move through a variety of media

Objectives:

The student will:

- describe how waves travel through gases, liquids and solids;
- investigate sound waves and predict which media produce the loudest and softest sounds; and
- write a report about waves.

GLEs Addressed:

Science

- (6) SB4.3 The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by making waves move through a variety of media.
- (6) SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.

Writing

- (6) W 2.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms using appropriate information and structure (i.e., step-by-step directions, descriptions, observations, or report writing).

Vocabulary:

Sound wave – a longitudinal wave in an elastic medium, such as air; especially a wave producing an audible sensation

Wave – a progressive disturbance propagated from point to point in a medium or space without progress or advance by the points themselves, as in the transmission of sound or light; a regular movement on a surface or within a material when energy travels through it. On the surface of an ocean or body of water, it is usually in the form of a curving swell or ridge

Media – plural of medium; medium = an intervening substance, as air, through which a force acts or an effect is produced; in biology, the substance in which specimens are displayed or preserved

Vibration – the oscillating, reciprocating, or other periodic motion of a rigid or elastic body or medium forced from a position or state of equilibrium; the analogous motion of the particles of a mass of air or the like, whose state of equilibrium has been disturbed, as in transmitting sound

Wave generation – the cause or source of production of waves, or progressive disturbances propagated from point to point in a medium or space without progress or advance by the points themselves

Motion – agitation or disturbance of a physical substance; an irregular movement, shaking, or oscillation

Materials:

- Wind-up clock
- Large resealable plastic bags
- Water
- Tabletop
- Empty metal coffee can
- Paper bag
- Glass jar
- Shoebox

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- Newspaper
- Leaves
- Rocks
- Twigs
- Different liquids: milk, soda and coffee
- Drum with paper clips
- Tuning fork
- Rubber band strung between two nails
- Ruler
- Two spoons

Activity Preparation:

1. Fill plastic bag with water and seal tightly. Collect the coffee can, paper bag, glass jar, and shoebox with newspaper, make sure that all of the items are big enough to fit the wind-up clock inside.
2. Set up the six Explore stations.

Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear Up

Process Skills: observation, communication, collecting data

1. Using a string with 2-3 large washers tied on the end of the string try to determine whether waves of energy will be transferred from the washers to your ear. Tie the string around your finger and place string on finger in your ear. Then drop the washer on the table top what do you hear?
2. Questions:
 - a. What did you hear when the washer touched the table?
 - b. How do you think the sound went from the washer to your ear?
 - c. What do you think will happen to the sound if the string is tight?
 - d. What do you think will happen to the sound if the sting is loose?
 - e. What will you hear if you hit the washer on the carpeted floor?

The teacher or a student will write the response on the white board. Students' initials will be written next to their response.

Explore

Process Skills: Observing, Comparing,

3. Explain students will explore how waves can move through a variety of media. Divide students up into small groups. Have each group go to a different station and follow the directions at each station. Have them rotate among stations and record their observations.

STATION 1: Drum with paper clips on top – tap on the drum. What do you see? What do you hear?

STATION 2: Tuning fork in water – Gently strike the tuning fork on the pad and then place it in the water. Describe what you observe. What do you see? What do you hear?

STATION 3: Rubber band strung between two nails – Pluck the rubber band. What do you see? What do you hear?

STATION 4: Two spoons – Strike the two pencils together and bring them close to your ear. What do you see? What do you hear?

STATION 5: Ruler on the edge of the table - Hold one end of the ruler firmly against the top of the table. Snap the other end. What do you see? What do you hear?

STATION 6: Using mirrors, investigate voice sounds. What is needed to make varying sounds? How are different body parts used? What do you see? What do you hear?

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Generalize

Process Skills: Inferring, describing, making generalizations

- How did the sound travel?
- How do we know the sound traveled in waves?
- What media did the waves travel through?
- Where did the waves travel?
- What do you think a sound wave would look like if we could see it?
- What happens if a wave hits a solid surface?
- What medium do waves travel best through?
- What media conveyed the sound better?
- Why do you think so?
- Does sound travel through metal?
- How did the liquid affect the media?
- How do we know sound travels in waves?
- How did you use your body to produce sound?
- Did you produce sound waves? How do you know?

Apply

Process Skills: Inferring, generalization, communication

In your science journal, describe what you think is happening to the sound waves when you hear echoes in a canyon. Be sure to give examples or include details that support your thinking.

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RUBRIC

Assessment Task:

Divide students up into small groups. Give each group the following materials: Wind-up clock, large resealable bags, water, empty metal coffee can, paper bag, glass jar, shoebox filled with newspaper, leaves, rocks, twigs, milk, soda and coffee. Using the materials provided, investigate sound waves by exploring if sound from a wind-up clock can travel through different media. Make at least two predictions about which media will produce the largest and softest sounds. Use a minimum of three media types, with at least one liquid, one solid, and one gas. After you have completed the investigation, write a report about your investigation describing how waves travel through solids, liquids, and gases, citing examples of the media investigated. The report should have no more than three spelling and punctuation errors.

Rubric:

Objectives	GLEs	Below Proficient	Proficient	Above Proficient
The student will describe how waves travel through gases, liquids and solids	(6) SB4.3	May state that sound travels through gases, liquids, solids without citing examples or citing less than one example for each media.	Describes how sound travels through gases, liquids, and solids and cites an example of each.	Describes how sound travels through gases, liquids and solids citing four or more examples.
The student will investigate sound waves and predict which media produce the loudest and softest sounds.	(3-9) SA1.1	Investigates sound waves in two or fewer media and makes less than two predictions on which media will make the loudest and softest sounds.	Investigates sound waves in three media and makes two predictions on which media will make the loudest and softest sounds.	Investigates sound waves in four or more media and makes three or more predictions on which media will make the loudest and softest sounds.
The student will write a report about waves	(6) M6 2.2 S&P2	May write a report on waves with less than three examples and with more than three punctuation and spelling errors.	Writes a report on waves with three examples and no more than three punctuation and spelling errors.	Writes a report on waves with more than three examples and no punctuation and spelling errors.

