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Grade 4

## **Cluster 3: Sound**

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### **Overview**

In this cluster, students expand their concept of energy by examining sound. This cluster complements the study of another common form of energy – light, which is addressed in *Grade 4, Cluster 2: Light*. Sound is a phenomenon that can be observed, measured, and controlled in various ways. Understanding that sound is caused by vibrations helps students when they explore how sound travels, how the human ear is designed to detect sound, and how certain factors can modify the sound produced. The varying abilities of humans and other animals to detect sound is also examined, which, in turn, leads to discussions about the necessity of protecting one’s sense of hearing. By investigating materials to ascertain whether they transmit, absorb, or reflect sound, students learn how these characteristics influence a material’s function. Students also explore the role of technology in extending one’s ability to produce, transmit, and detect sound.

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

**4-3-01** Use appropriate vocabulary related to their investigations of sound.

Include: energy, sound, vibration, vocal cords, pitch, loudness, sound waves, outer ear, middle ear, inner ear, brain, transmit, absorb, reflect, detect.

GLO: B1, C6, D4

- Introduce, explain, use, and reinforce vocabulary throughout this cluster.
- **Word Splash**  
Introduce students to their study on sound and activate prior knowledge by using a Word Splash (Saphier and Haley, 1993). Print the vocabulary words randomly on a large wall chart and provide smaller copies for each student. Read the words to the students and have them discuss their meaning.  
Have students write sentences to make predictions about the upcoming unit. Collect and save all predictions and review them at the end of the study. Students can then identify what they learned. (See *Success for All Learners*, 6.29.)
- **I Wonder Chart**  
Post a large sheet of chart paper entitled “I Wonder About Sound.” Invite students to record broad questions about this topic throughout this study. Ensure questions are answered throughout the study. (See *ELA, Grade 4*, pp. 166 and 168.)

**4-3-02** Recognize that sound is a form of energy.

GLO: D4, E4

**4-3-03** Recognize that energy makes things happen and can be found all around us.

GLO: D4, E4

- **How Do We Use Energy?**  
Have students use Think-Pair-Share (McTighe and Lyman, 1992) to think about and share ideas of the different ways we use energy. (Note: Think-Pair Share is discussed in *ELA, Strategies*, p. 15.)
- **Observing the Environment: Evidence of Energy At Work**  
Take a class tour of the school and its surroundings to identify evidence of energy. Examples: fans, lights, bells, whistles, echoes, machines running, airplanes, cars, computers, calculators, etc. Have students record their observations in learning logs.

**4-0-4g.** Communicate questions, ideas and intentions, and listen effectively to others during classroom-learning experiences. GLO: C6

**4-0-7d.** Construct meaning in different contexts by connecting new experiences and information to prior experiences and knowledge. (ELA 1.2.1, 2.1.2) GLO: A2, C6

**Producing Sound**

Part 1) Provide a series of pictures of objects and living things that produce sound for a picture sort. Have the students work in small groups to sort the visual images according to the source of the sounds. Have students share their observations with the class.

Part 2) Have students work with a partner to select one picture from the picture sort. Students should describe how sound energy is being used. Example: A singer uses sound energy to create music. Students can share their findings in a Sharing Circle. (See *ELA, Grade 4*, p. 212.)

## TEACHER NOTES

## SUGGESTIONS FOR ASSESSMENT

In later years students will define energy as the ability to do work (See Teacher Notes on Energy in Cluster 2: Light p. 4.21.) Energy makes things happen and includes movement, heat, electricity, chemical reactions (food), magnetic attraction, gravity, nuclear reaction, sound, and light. Energy can be stored and used at later times (potential energy). Sound is a form of energy because sound vibrations pass through solids, liquids, and gases, causing the molecules to vibrate sympathetically.

Outcomes 4-3-02 and 4-3-03 are very similar to outcomes 4-02-02 and 4-2-03 in Grade 4, Cluster 2: Light. If the class has already studied that cluster, a quick review with a “sound focus” should be sufficient.

**Science Journal Entry: Energy**

Have students answer the following questions:

1. What is energy?
2. Where do you find energy? Give six examples.
3. Is sound a form of energy? Explain.

Look for

- makes things happen
- found all around us
- six examples given
- sound is a source of energy
- makes reference to Investigating Sound Vibrations

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

**4-3-04** Identify and classify various sounds using student-generated criteria.  
GLO: C2, D4

**4-0-6c.** Choose and identify relevant attributes for use in a classification system, and create a chart or diagram that shows the method of classifying. (Math PR-II.2.4) GLO: C2, C3, C5

**4-0-6d.** Sort and classify according to an established classification system. (Math PR-II.2.4) GLO: C2, C3

**4-3-05** Recognize that sounds are caused by vibrations.  
Include: the human voice relies on the vibrations of vocal cords.  
GLO: D3, D4

**4-0-4h.** Use tools and apparatus in a manner that ensures personal safety and the safety of others. GLO: C1

**4-0-5a.** Select and use tools to observe, measure, and construct. *Examples: tuning fork, prism, binoculars, measuring tape...* GLO: C2, C3, C5

**4-0-7e.** Communicate results and conclusions in a variety of ways. *Examples: point-form lists, sentences, graphs, labelled diagrams, charts...* (ELA 2.3.5, 4.2.5; Math SP-III.1.4, SP-III.2.4; TFS 2.1.4) GLO: C6

**4-0-8b.** Recognize that scientists must support their explanations using evidence and scientific knowledge. GLO: A1, A2, C2

➤ **Sorting Sounds**

Brainstorm to create a list of familiar sounds. In small groups, have students sort the sounds according to their own categories. Have students share their categories. Encourage students to review their categories and make changes. Examples of categories can include: pitch (high/low); volume (loudness); and purpose of the sound (communication, warning, entertainment). Include terms on a Word Splash chart (Saphier and Haley, 1993). (Note: Word Splash is discussed in *Success for All Learners*, 6.28.)

➤ **Investigating Sound Vibrations**

Have students work in small groups to investigate how sound vibrations are a source of energy. Have the students stretch plastic wrap over a large can and place grains of salt, sugar, or sand on top of the plastic wrap. Have one student in each group strike a tuning fork and bring it near the plastic wrap (not touching). The grains will begin to jump in response to the sound vibrations. Instruct students to move the tuning fork farther away from the plastic wrap and observe the effect. Discuss the results, focussing on the following questions:

- What made the grains jump?
- What effect did moving the tuning fork closer to or farther away from the plastic wrap have on the grains?
- What did you learn about sound?

➤ **Sound Centres**

Set up a series of Sound Centres to explore sound vibrations. Examples of centre explorations might include the following:

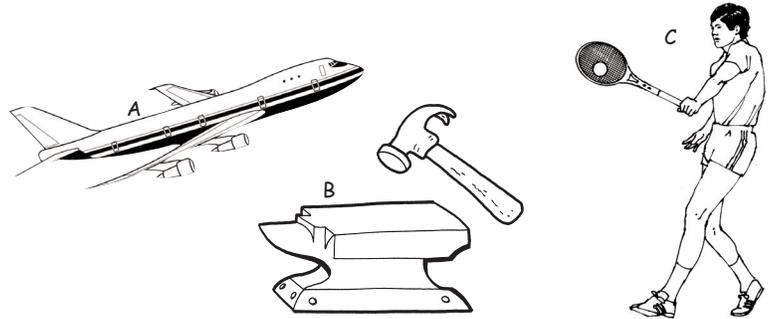
- plucking an elastic that has been stretched across a tin or a box
- blowing across the top of an empty pop bottle
- rubbing a moistened finger around the rim of a wine glass
- striking a tuning fork and placing it beside the ear
- extending a ruler over the edge of a desk and gently plucking it
- wrapping a comb with wax paper and buzzing your lips on it (change the paper after each child for sanitary reasons)

(continued)

TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

Paper and Pencil Task: Sound Vibrations



For each picture, tell what sound you would hear and what makes the sound.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

PRESCRIBED LEARNING OUTCOMES
<i>Students will...</i>

**SUGGESTIONS FOR INSTRUCTION**

As students explore each Sound Centre, have them complete the following observation charts:

Centre No. \_\_\_\_\_

What I saw: \_\_\_\_\_

\_\_\_\_\_

What I heard: \_\_\_\_\_

\_\_\_\_\_

What I felt: \_\_\_\_\_

\_\_\_\_\_

One question that I have about this sound device is \_\_\_\_\_?

\_\_\_\_\_?

➤ **How Does the Human Voice Work?**

Provide students with a simple diagram of the human throat and mouth. Challenge students in small groups to explain how humans produce sound. Their answers should be based on what they have learned.

**4-3-06** Use the design process to create a musical instrument.  
GLO: C3, C5, D4, E2

➤ **Building a Musical Instrument**

Activate students' prior knowledge and stimulate their thinking by providing a variety of musical instruments whose sounds are produced in different ways. Substitute pictures if instruments are not readily available. Encourage students to explore the instruments to determine how each one produces a sound. Sample criteria for evaluation may include the following:

- 4-0-1c.** Identify practical problems to solve in the local environment. GLO: C3
- 4-0-3d.** Brainstorm possible solutions to a practical problem, and identify and justify which solution to implement. (ELA 1.2.3) GLO: C3
- 4-0-3e.** Create a written plan to solve a problem or meet a need. Include: identify steps to follow, prepare a labelled diagram. GLO: C3
- 4-0-3f.** Develop criteria to evaluate an object, device, or system based on its function, aesthetics, and other considerations such as materials, and cost. GLO: C3
- 4-0-4b.** Construct an object, device, or system to solve a problem or meet a need. GLO: C3
- 4-0-4c.** Test an object, device, or system with respect to pre-determined criteria. GLO: C3, C5
- 4-0-4d.** Identify and make improvements to an object, device, or system, and explain the rationale for the changes. GLO: C3
- 4-0-7c.** Identify new problems that arise. GLO: C3
- 4-0-8c.** Recognize that designing a solution to a simple problem may have considerations, such as cost, materials, time, and space. GLO: B2, C3

- produces three different sounds
- is hand-held
- is sturdy
- uses everyday materials
- includes a labelled design plan
- has a way to modify pitch/loudness
- is visually appealing

Have the students follow the design process to create their own instrument.

**TEACHER NOTES**

**SUGGESTIONS FOR ASSESSMENT**

Have students use Blackline Master 4: Design Process Recording Sheet: Grades 3 and 4.

**Design Process Checklist**

The student

- understands the problem
- brainstorms possible solutions
- creates a written plan
- develops criteria for success
- includes labelled diagram
- constructs the musical instrument
- tests the device
- identifies and makes improvements
- identifies new problems that arise
- recognizes that designing a solution may involve cost and materials

**Self-Assessment of the Design Process**

Musical Instrument Design Project

I chose to make a \_\_\_\_\_.

1. One problem I had was \_\_\_\_\_.
2. One thing I did well was \_\_\_\_\_.
3. If I did this project again I would \_\_\_\_\_.
4. I would still like to learn more about \_\_\_\_\_.
5. I think my design \_\_\_\_\_.

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

**4-3-07** Demonstrate how the pitch and loudness of sounds can be modified.  
*Examples: differences in sound when plucking a loose rubber band vs. a stretched rubber band...*  
GLO: C2, D3, D4, E3

**4-0-4h.** Use tools and apparatus in a manner that ensures personal safety and the safety of others. GLO: C1

➤ **Investigating Pitch and Loudness**

Set up stations or centres to explore pitch and loudness or have students re-visit the existing Sound Centres with this new purpose. (See 4-3-05.) Some centre suggestions include the following:

- Have the students make a pan flute with straws by cutting the straws into different lengths. Students arrange straws from longest to shortest and tape these together. Have them: pinch one end of each straw together approximately two cm from the end, cut the corners so they make a “V” shape, and separate the ends.
- Have students examine a guitar, banjo, or ukulele.
- Have students make a drum using a large container and a balloon and explore to see what happens when the balloon is stretched tighter across the opening.
- Have students place a ruler over the edge of a desk and pluck the ruler while varying the length of the overhanging end.
- Use several pop bottles. Put varying amounts of water in the bottles. Have students tap the bottles and blow across the openings.
- Use several various-sized elastics stretched around a metal pan. Have students pluck the elastics to explore the various sounds.

At each centre, have students complete an investigation sheet such as

I can change the pitch by \_\_\_\_\_  
\_\_\_\_\_.

I can change the volume by \_\_\_\_\_  
\_\_\_\_\_.

I can modify my instrument to change pitch by \_\_\_\_\_  
\_\_\_\_\_.

**4-3-08** Observe and describe properties of sound.  
Include: travels in waves in all directions.  
GLO: C2, D4

➤ **Find the Sound Game**

Have one student stand in the middle of the room with his or her eyes shut. Have the other students move around the room and in turn, make sounds. The person in the middle identifies where the sound is coming from by pointing in that direction.

Variation: The person in the middle makes the noise and the other students try to move around the room to a location where they cannot hear the sound. Use the following questions for discussion.

- Why could the person in the middle identify the location of the sound?
- Was there any location in the room in which you could not hear the sound? Why?

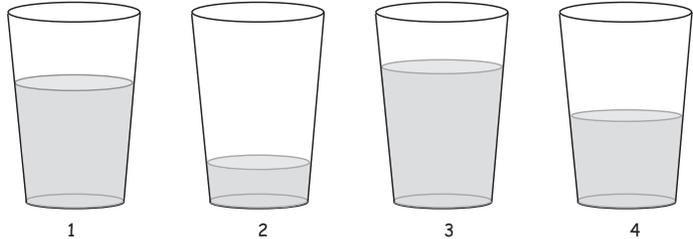
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## TEACHER NOTES

Pitch is defined as the relative height of a sound (high, low, etc.). The pitch is dependent on the number of vibrations per second. Objects that are thin and/or taut will vibrate faster, therefore creating a higher sound. Objects that are thick and/or loose will vibrate more slowly, thus creating a lower sound. The length of the object also affects the pitch. The shorter the object, the higher the pitch.

## SUGGESTIONS FOR ASSESSMENT

## Multiple Choice: Pitch and Loudness



- If you tapped each glass with a spoon, which one would make the lowest-pitched sound? (C)
  - 1
  - 2
  - 3
  - 4
- When constructing her musical instrument, Anna-Ruth wanted to make a higher pitched sound on her banjo strings. What should she do? (C)
  - use thicker strings
  - lengthen the strings
  - tighten the strings
  - pluck the strings harder
- How can you decrease the pitch of a sound? (A)
  - lengthen the object
  - shorten the object
  - leave the object the same
  - tighten the object
- Paul has two elastics. The first elastic is thin and the other is thick. He plucks the thin elastic. What will be different when he plucks the thick elastic? (B)
  - it will vibrate faster
  - it will vibrate slower
  - it will vibrate at the same rate
  - it will make a higher sound

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

➤ **Investigating Properties of Sound**

Have students work in small groups to observe the properties of sound. Give each group a tuning fork and a pan of water. Have students strike the tuning fork and then touch the prongs to the surface of the water. Use the following discussion questions:

- What happened to the water?
- What does it show about sound?
- How is the way that sound travels different from the way that light travels? (Ask this only if students have completed Cluster 2 on light.)

**4-3-09** Describe how the human ear is designed to detect sound vibrations.

Include: sound is transmitted from the outer ear to the middle ear and the inner ear, which relays messages to the brain.

GLO: D1, D4

➤ **Inquiry: How Humans Detect and Process Sound**

Follow the procedure for using the Inquiry Chart (Hoffman, 1992) to research and present information about how humans detect and process sound. (Note: The Inquiry Chart is discussed in *ELA, Strategies*, pp. 83 - 88.) Ensure the resources are at a level appropriate for students. You may want to implement the following research strategies.

**Skimming**

Model how to determine if a science reference will provide needed information by rapidly glancing through a text. (See *ELA, Grade 4*, p. 236.)

**Scanning**

Model and provide guided practice to teach students how to find target words, specific facts, captions, illustrations, and charts. The Internet is a valuable place to model and teach scanning. (See *ELA, Grade 4*, p. 238.)

**Interviewing Experts**

Invite a doctor or audiologist to discuss information related to the ear. Students can take notes and ask open-ended questions. (See *ELA, Grade 4*, p. 196; *Success for All Learners*, Ch.7.)

**Slim Jims**

Teach students how to use Slim Jims to record key information for their inquiry. (See *ELA, Strategies*, p.116.)

**4-0-2a.** Access information using a variety of sources. *Examples: school libraries, videos, traditional knowledge, CD-ROMs, Internet...* (ELA 3.2.2, 3.2.4, TFS 2.1.1) GLO: C6

**4-0-2b.** Review information to determine its usefulness to inquiry or research needs. (ELA 3.2.3, 3.3.3) GLO: C6, C8

**4-0-4e.** Identify problems as they arise, and work with others to find solutions. GLO: C3, C7

**4-0-5c.** Record observations in a variety of ways. *Examples: point-form notes, sentences, labelled diagrams, charts...* (ELA 2.1.1, 3.3.1, 4.1.1, 4.1.2; Math SP-1.2.4, SP-II.2.4) GLO: C2, C6

## TEACHER NOTES

## SUGGESTIONS FOR ASSESSMENT

**Science Journal Entry: Properties of Sound**

Three things that I know about sound are:

1. \_\_\_\_\_.
2. \_\_\_\_\_.
3. \_\_\_\_\_.

Look for

- travels in waves
- travels in all directions
- caused by vibrations

There are three main parts to the ear. The **outer ear**, **middle ear**, and **inner ear**. Sound enters the outer ear and is collected in the **pinna** (the fleshy part of the outer ear that is visible) and is funneled into the auditory canal. It passes to the middle ear through the **auditory canal** to the **ear drum**. As the ear drum vibrates, it moves the **malleus** (hammer) which in turn moves the **incus** (anvil) which pushes the **stapes** (stirrup) against another membrane in the **cochlea**. The cochlea, part of the inner ear, is a liquid-filled, shell-like coil containing numerous **nerve endings**. As the membrane is pushed it pushes the internal liquid across the nerve endings. The nerve endings respond by sending a message through the **auditory nerve** to the brain. The brain analyzes the responses as sound.

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
<p><i>Students will...</i></p>	
<p><b>4-3-10</b> Recognize that there is a range of sounds that humans can and cannot hear. GLO: D1</p>	<p>➤ <b>Can You Hear It?</b> Have the students brainstorm to identify examples of sounds that animals can hear but that humans cannot. Have students try to describe what types of sounds these are. Example: dog whistles emit a high-pitched sound that humans can't hear. Provide students with a decibel scale (unit used to measure sound) and relate this information to audible sounds for humans and other animals.</p>
<p><b>4-0-7d.</b> Construct meaning in different contexts by connecting new experiences and information to prior experiences and knowledge. (ELA 1.2.1, 2.1.2) GLO: A2, C6</p>	
<p><b>4-3-11</b> Describe practices that help ensure protection of the ears and hearing. <i>Examples: use of ear plugs in situations involving excessive noise...</i> GLO: B3, C1</p> <p><b>4-3-12</b> Describe harmful effects of high or sustained sound levels and identify potential sound hazards at home or in the community. <i>Examples: leaf-blowing machines, snowblower, stereo, drone of machinery...</i> GLO: B1, B3, C1</p>	<p>➤ <b>Protecting Hearing</b> Have the students list things or situations that may harm the ears and hearing. Discuss ways in which the ears and hearing can be protected in these situations. Identify safety rules for the ears (e.g., avoid putting any object in the ear; avoid loud sounds; if you need to be near loud sounds, use protective equipment, etc.). <b>Advertise and Present:</b> Have students create and advertise an apparatus that can reduce harmful sounds entering their ears, e.g., styrofoam cup head phones, a noise-limiting box to go around a radio, etc. Have the students present their “product” to the class through a commercial, newspaper report, etc.</p> <p>➤ <b>Ask an Expert</b> Invite an audiologist or local doctor to talk about hearing and the harmful effects of certain sounds.</p>
<p><b>4-0-4f.</b> Assume roles, and share responsibilities as group members. (ELA 5.2.2) GLO: C7</p> <p><b>4-0-4g.</b> Communicate questions, ideas and intentions, and listen effectively to others during classroom-learning experiences. GLO: C6</p> <p><b>4-0-7e.</b> Communicate results and conclusions in a variety of ways. <i>Examples: point-form lists, sentences, graphs, labelled diagrams, charts...</i> (ELA 2.3.5, 4.2.5; Math SP-III.1.4, SP-III.2.4; TFS 2.1.4) GLO: C6</p>	<p>➤ <b>Identifying Sound Hazards in the Environment</b> Take a walk in the school community. Have the students identify potential sound hazards. Use the following questions to focus student observations:</p> <ul style="list-style-type: none"> <li>• What potential sound hazards can you find?</li> <li>• What form of protection (if any) was used?</li> <li>• How can we reduce these potential sound hazards?</li> </ul>
	<p>➤ <b>Sound Hazards at Home</b> Extend the above activity to the home. Have students list potential sound hazards found in their homes. Once the list is made, have the students and their family devise a plan showing how to eliminate or reduce these hazards.</p>

**TEACHER NOTES**

**SUGGESTIONS FOR ASSESSMENT**

**Performance Task: Advertise and Present  
Scoring Rubric**

<b>Scale</b>	<b>Protective Apparatus</b>	<b>Presentation</b>
4	creative and effective in reducing noise	detailed, complete, and clearly presented
3	effective in reducing noise	complete and clearly presented
2	complete but ineffective in reducing noise	complete but unclear or lacks sufficient detail
1	incomplete and ineffective in reducing noise	incomplete or unclear

PRESCRIBED LEARNING OUTCOMES
<i>Students will...</i>
<p><b>4-3-13</b> Investigate to compare how vibrations travel differently through solids, liquids, and gases. GLO: C2, D3, E1</p>
<p><b>4-0-1b.</b> Make and justify predictions based on observed patterns, collected data, or data provided from other sources. <i>Examples: graph, chart...</i> (ELA 1.1.1, 1.2.1; Math PR-III.1.4) GLO: A1, C2</p> <p><b>4-0-4a.</b> Carry out a plan, and describe the purpose of the steps followed. (Math SP-V.2.4) GLO: C2</p> <p><b>4-0-7a.</b> Draw a conclusion based on evidence gathered through research and observation. GLO: A1, A2, C2</p> <p><b>4-0-7b.</b> Identify new questions that arise from what was learned. (ELA 3.3.4) GLO: A1, C2, C3</p> <p><b>4-0-9b.</b> Demonstrate confidence in their ability to do science. GLO: C5</p>

SUGGESTIONS FOR INSTRUCTION

➤ **Investigating Sound Transmission**

Have students fill three plastic bags: one with air, one with water, and one with a solid, such as plasticine or a book. Have students take turns holding each bag against their ears while a partner scratches on or lightly taps the bag. Have the partners compare the sounds.

Before carrying out this investigation have students predict what they think will happen. Students should write their prediction in their learning logs, and during the investigation they should record the data in a chart like the following.

	Observations
Bag 1 Air	I heard...
Bag 2 Liquid	I heard...
Bag 3 Solid	I heard...

Have the students scratch the top of their desk or table with their fingernails and then listen to the sound. Have them place their ear on the desk or table and scratch again to compare the sounds. Students record the results in their learning logs. Ask students the following questions:

- Was there a difference in the sounds using the bags?
- Was there a difference in the sounds using the desk or table?
- What can you conclude from these investigations?

➤ **Family Science**

For homework, have the students try the “scratch test” in either a pool or a bathtub. First, keeping their head out of the water, students will scratch the side of the pool or tub. They repeat this with their head under the water to compare the sounds heard. (**Caution:** Ensure you discuss safety with your students before they attempt this activity.)

TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

**Paper and Pencil Task: Sound Transmission**

1. How do you know that sound travels through the following states of matter:  
Gas? \_\_\_\_\_  
Liquid? \_\_\_\_\_  
Solid? \_\_\_\_\_
  
2. List the following in order from the best material for sound to travel through to the worst: juice, cement wall, carbon dioxide gas. Explain your answer.

PRESCRIBED LEARNING OUTCOMES
<i>Students will...</i>
<p><b>4-3-14</b> Explore to determine the ability of materials to transmit or absorb sound. GLO: C2, D3, E1</p>
<p><b>4-0-3a.</b> Brainstorm, in small groups, one or more methods of finding the answer to a given question, and reach consensus on which method to implement. GLO: C2, C7</p> <p><b>4-0-3b.</b> Identify, in small groups, variables that have an impact on an investigation. GLO: A1, A2, C2, C7</p> <p><b>4-0-3c.</b> Create, in small groups, a plan to answer a given question. (ELA 3.1.4; Math SP-V.2.4) GLO: C2</p> <p><b>4-0-4a.</b> Carry out a plan, and describe the purpose of the steps followed. (Math SP-V.2.4) GLO: C2</p> <p><b>4-0-4e.</b> Identify problems as they arise, and work with others to find solutions. GLO: C3, C7</p> <p><b>4-0-4h.</b> Use tools and apparatus in a manner that ensures personal safety and the safety of others. GLO: C1</p> <p><b>4-0-5a.</b> Select and use tools to observe, measure, and construct. <i>Examples: tuning fork, prism, binoculars, measuring tape...</i> GLO: C2, C3, C5</p> <p><b>4-0-6e.</b> Evaluate, with guidance, the methods used to answer a question or solve a problem. GLO: C2, C3</p> <p><b>4-0-7a.</b> Draw a conclusion based on evidence gathered through research and observation. GLO: A1, A2, C2</p> <p><b>4-0-8a.</b> Recognize that experimental results may vary slightly when carried out by different persons, or at different times or places; but that if the results of repeated experiments are very different, something must be wrong with the design of the experiment. GLO: A1, A2, C2</p>

SUGGESTIONS FOR INSTRUCTION

➤ **Investigate Materials that Absorb or Transmit**

Have students work in small groups to develop a plan to determine whether materials absorb or transmit sound, using a loud ticking clock or other sound-making device. They must make predictions and identify variables that will have an impact on their investigations. Students will test a variety of materials to see whether they absorb or transmit sound. Students must evaluate their procedures following their investigations. Examples of procedures may include: covering the clock with a cloth, touching pieces of wood and metal to the clock, etc.

<p><b>4-3-15</b> Describe how materials that absorb or reflect sound are used in different situations. <i>Examples: concrete sound barriers are placed beside highways to absorb sound...</i> GLO: B1, C1, D3</p>
<p><b>4-0-1a.</b> Ask questions that lead to investigations of living things, objects, and events in the local environment. (ELA 1.2.4, 3.1.2) GLO: A1, C2, C5</p> <p><b>4-0-5c.</b> Record observations in a variety of ways. <i>Examples: point-form notes, sentences, labelled diagrams, charts...</i> (ELA 2.1.1, 3.3.1, 4.1.1, 4.1.2; Math SP-1.2.4, SP-II.2.4) GLO: C2, C6</p>

➤ **Observing the Environment — How Do They Do That?**

Set the context by asking students the following questions:

- What do you want to happen to the sound in a concert hall?
- What types of materials would you use in building a concert hall?
- People do not like to build homes beside busy highways/streets due to the noise. What can be done to reduce this noise?

Plan a field trip to a concert hall, multiplex theatre, or other location where students can see how these structures are designed to absorb, reflect, or transmit sound. Students make notes of their observations and ask pertinent questions. Students may access similar information through the Internet.

## TEACHER NOTES

Students must begin to recognize that factors or **variables** must be kept the same in order to be able to draw reasonable conclusions. Students should be encouraged to focus on one aspect or variable at a time, and try to control all the other variables. This way, any differences observed can be more accurately attributed to the variable being studied.

Have students use Blackline Master 2: Scientific Inquiry Recording Sheet: Grades 3 and 4.

## SUGGESTIONS FOR ASSESSMENT

**Observation Checklist: Investigating Materials that Absorb or Transmit**

The student

- brainstorms one or more methods of finding the answer
- creates a plan
- carries out a plan
- describes the purpose of the steps followed
- identifies problems as they arise, and works with others to find solutions
- uses tools and apparatus safely
- selects and uses tools to observe, measure, and construct
- evaluates, with guidance, the methods used to answer a questions or solve a problem
- draws a conclusion based on evidence gathered through research and observation
- recognizes that experimental results may vary

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

**4-3-16** Describe devices that extend our ability to produce, transmit, and detect sound.

*Examples: amplifier, hearing aids, megaphone, ear trumpet...*

GLO: B1

**4-3-17** Investigate to identify inventions related to sound, and describe their impacts on society.

*Examples: radio, telephone, microphone...*

GLO: A4, B1, B2

**4-0-2a.** Access information using a variety of sources. *Examples: school libraries, videos, traditional knowledge, CD-ROMs, Internet...* (ELA 3.2.2, 3.2.4, TFS 2.1.1) GLO: C6

**4-0-2b.** Review information to determine its usefulness to inquiry or research needs. (ELA 3.2.3, 3.3.3) GLO: C6, C8

**4-0-7e.** Communicate results and conclusions in a variety of ways. *Examples: point-form lists, sentences, graphs, labelled diagrams, charts...* (ELA 2.3.5, 4.2.5; Math SP-III.1.4, SP-III.2.4; TFS 2.1.4) GLO: C6

**4-3-18** Describe the role of sound in different jobs and hobbies.

*Examples: physician listens to a patient's heartbeat during a check-up, birders identify birds by their calls...*

GLO: B4

➤ **Extending Our Abilities: Research Projects**

Have students list practical applications of the principles of sound by focussing on devices that extend the ability to produce, transmit, and detect sound. Have students select and research one hearing device. Students may work with a partner. Have the students research other sound devices using books, the Internet, or CD-ROMs. Have them find out who invented the device, what the device looks like, what modifications have been made over time, how it works, and the impact it has made.

➤ **Great Inventions**

Read or tell the story of Alexander Graham Bell. Have the students discuss the impact that his invention has had on society over time. Have students imagine what it would be like not to have telephones. (Note: Students who do not have phones in their homes still have access to phones in other locations such as the school.) Ask the following questions:

- What are the advantages of not having access to a telephone?
- What are the disadvantages?

Have students select their own invention to research. In their reports, students should describe the invention, the inventor, and the impact of the invention on society. Reports should be presented to class. Note: Encourage students to research Canadian inventions wherever possible.

➤ **Interviewing Experts**

With students, develop a series of questions they can ask parents and community members about the role of sound in their jobs or hobbies. Develop a list of people to be interviewed by students. Interviews may be done in person or using the telephone or Internet. Have students present their interview information orally during a Sharing Circle (*Success for All Learners*, 7.5).

Have students record brief statements about how individuals use sounds in particular situations on fact cards. Fact cards can then be posted to create a “Uses of Sound” fact frieze.

TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

**Peer Assessment: Great Inventions**

This presenter (name) \_\_\_\_\_,

spoke clearly (yes/no) \_\_\_\_\_.

He/she made the presentation interesting by

using pictures, drawings, etc.

using actions

other \_\_\_\_\_

\_\_\_\_\_.

Included enough information \_\_\_\_\_.

Suggestions/Comments \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_.

**Self-Reflection for Sound Cluster**

Three things that I learned during the study of sound are

1. \_\_\_\_\_.

2. \_\_\_\_\_.

3. \_\_\_\_\_.

I liked \_\_\_\_\_.

I didn't like \_\_\_\_\_.

I still would like to learn more about \_\_\_\_\_

\_\_\_\_\_.

NOTES