



**Day 4 – Grade
4 - Science**



*Investigating
Sound*

Performance Indicator: 4.P.4B.3: Define problems related to the communication of information over a distance and design devices or solutions that use sound to solve the problem.



Essential Question(s):

How does sound travel through matter?

How is sound created and sensed, and how does it transfer energy?



I-Can Statements:

- I can explain the relationship between pitch, volume, and frequency.
- I can explain how sound travels through different states of matter.



Engage Activity

Directions: Use the picture to answer the questions below.



1. Do you think that the students can hear each other?
2. If you said yes, how is that possible? If you said no, why is it impossible?
3. Are there any clues in this picture to let you know if sound is being transferred?



Exploration Time

Pitch is a measure of how high or low something sounds and is related to the speed of the vibrations that produce the sound.

Volume is a measure of how loud or soft something sounds and is related to the strength of the vibrations.

Sound is caused by vibrations (back and forth movements that occur very quickly)

Sound vibrations can be transferred from one material to another.

Frequency measures how fast sound waves are vibrating.



Exploration Time

Sound waves are mechanical waves that transfer energy via the propagation of vibrations through matter.

Big Ideas

Sound waves cannot move through empty space (vacuum) where there is no matter to vibrate and pass the energy along.

When sound waves move through matter, the matter undergoes compression (the molecules get closer to each other), followed by expansion (molecules move apart).

Sound waves can move through gases, liquids, and solids.

Using Sound

Key Words • communication • engineer • solution



Getting the Idea

Engineers use the ideas from science and mathematics to develop solutions to problems. Often engineers develop new products to solve these problems, such as how to help us hear sounds better.

Solving Problems Involving Sound

Sound travels through air and other materials. Think about how you can hear a friend talking next to you. Consider how you can hear music across the room. In this way, sound helps us communicate. **Communication** is the way we share information.

Communication becomes more difficult over long distances. One reason is that the volume of sound decreases with distance. When the distance becomes too large, you cannot hear a sound at all. The clarity of a sound also changes with distance. Clarity is how clearly we hear something. As the source of a sound moves farther away, a sound becomes less clear. So you may still be able to hear something, but you will not be able to hear details, such as words.

An **engineer** is a person who uses science to solve practical problems. A **solution** to an engineering problem can be a process, or a way of doing something. It can also be an object or device that performs a task. In the case of sound, a solution might be a device or material that makes it possible to hear sound clearly over longer distances.

Exploration Time

Directions: Read all essential information from lesson 15 on sound and answer all questions.

1. _____ is the way that we share information.
2. What is one reason that communication becomes difficult over long distances?
3. A solution to sound problems involving distance could be what?

Engineers follow a process when they solve problems. It is called the engineering design process. This process most often includes certain steps.

- Define the problem.
- Do research to learn more about the problem.
- Brainstorm solutions and choose the best option.
- Make a plan for a prototype, or trial product.
- Build the prototype.
- Test the prototype.
- Make changes to the prototype based on the test results.

Think about some problems related to sound over distance. For example, consider a movie theater. You want to be able to hear the movie just as well from the back row as from the front row. Engineers design materials for covering the walls of theaters that help carry the sounds throughout the theater. They also think about how the shapes of the walls affect sound.

As another example, consider your school. Suppose your teacher wants to call everyone in from recess. If the teacher yells, the sound might not be loud enough for all students to hear. Engineers have developed devices to help make sounds louder. The megaphone shown below is such a device.



Another challenge with sound is that sometimes sounds travel too well over distance. For example, your brother or sister might play annoying music in another room. Engineers have designed materials that prevent sounds from traveling into other rooms.

Exploration Time

Directions: Read all essential information from lesson 15 on sound and answer all questions.

1. Engineers use the _____
to solve problems.
2. What solution was created to assist teachers with communicating with their students during recess?
3. In addition to sound being difficult to hear over long distances, what other problems can we experience with sound?





Engineers often design new technology to solve a problem. Technology describes anything used for a certain task. It might be a machine, tool, or material. Technology can be as simple as a pencil sharpener. It can also be complicated, such as a computer. Engineers also use technology to solve problems. They might use tools to make measurements or observations. They might use a computer to keep track of their measurements.

Think of a problem that involves sharing information over a long distance. You can use something from your daily life. For example, it might be difficult to hear a teacher across the lunchroom. Or maybe you cannot hear a coach across the soccer field.

State the problem.

Identify a device or solution that has been designed to solve the problem.

Describe one way the device or solution could be improved. Draw a picture to support your description if needed.

Exploration Time

Directions: Read all essential information from lesson 15 on sound and answer all questions.



Lesson Review

1. What happens to the volume of a sound as a distance increases?
 - A. The sound stays the same.
 - B. The sound gets louder.
 - C. The sound gets softer.
2. Which term describes how easy it is to understand a sound?
 - A. clarity
 - B. volume
 - C. pitch
 - D. distance
3. How might an engineer test a possible solution to a problem involving sound?
 - A. by looking for other problems to solve
 - B. by learning more about the problem
 - C. by finding out what sound is
 - D. by finding out if the solution works as planned

Exploration Time

Directions: Read all essential information from lesson 15 on sound and answer all questions.



You Did it!

You have learned about some of the problems associated with sound and some of the solutions to those problems. In the space below, please illustrate a problem that you have read about and the solution that was offered. Be sure to label the problem and the solution. Additionally, you have the option to illustrate a different sound related problem and its solution.

A large empty rectangular box with a black border, intended for the student to draw and illustrate their answer to the prompt.