# Activity 1.2 Sound Teacher Notes

## Introduction

In this activity students will learn how sound travels over distances and is heard by humans. Students will also explore the relationship between sound and vibration by analyzing a variety of ways to generate sound.

## Equipment

- Per pair or small group
  - iPad® tablet with Canvas app
  - 2 Plastic cups
  - 4 Feet of string
  - 3 Rubber bands, variable sizes
- 6 Metal water bottles
- Stethoscope
- Alcohol wipes
- 2 Tuning forks
- 30 Plastic cups
- String
- Rubber bands, variable sizes
- 1 Metal Slinky® coil
- Launch Log for each student
- 1 Plastic cup with water

## Procedure

### Exploring Sound

1. In pairs or small groups, students access the *Exploring Sound* link on the Light and Sound Activity 1.2 page.
2. Students work through Exploring Sound and draw a picture demonstrating how we hear sounds in their Launch Logs.

### Sound Stations

3. In pairs or small groups, the students visit three different stations and use the equipment to create sound at each station. Stations 1 and 2 can be set up twice to spread the students out around the room if desired. Alternately, the stations may be completed as whole class activities where the teacher demonstrates and

students mimic. The above equipment list provides enough materials for two sets of stations 1 and 2 and one set for station 3.

4. The teacher explains and demonstrates each of the stations to the class before the rotations begin. The students should have 10 – 15 minutes to explore each station and answer the related question in their Launch Logs. The teacher will guide students to either draw a picture to answer the question or write their response in their Launch Logs on pages 4 – 6.
    - Station 1
        - Equipment: 2 plastic cups, 6 rubber bands (2 sets of 3 different sizes)
        - Prepare one cup with 3 different rubber bands wrapped around the cup vertically so students can pluck the rubber bands at the top opening of the cup.
        - Prepare one cup with 3 different rubber bands wrapped around the cup horizontally so when plucked the rubber band snaps against the side of the cup.
        - Note: The rubber bands may be secured with tape if they slip off the cups.
        - Related question: What did you do to get a sound from the rubber bands?
    - Station 2:
        - Equipment: 3 metal water bottles
        - Students can experiment with water bottles to determine how to make sound. Students may attempt to tap the side of the bottles with their fingers, tap bottles on the table, or tap bottles against each other.
        - Related question: What did you do to get a sound from the metal water bottles?
    - Station 3:
        - Equipment: Stethoscope and alcohol wipes
        - Students will take turns listening to their own hearts with the stethoscope. An adult will assist students with cleaning the ear pieces between each student use. If the students cannot hear their heartbeat, they may need to jog in place or complete another activity to raise their heart rate so it may be heard through the stethoscope.
        - Note: Depending on the classroom space the stethoscope station may need to be run in a quieter space or at a separate time from stations 1 and 2.
        - Related questions: What did you hear when you held the stethoscope to your chest? How did the sound travel to your ear?
5. Students record their responses in their Light and Sound Launch Logs.
6. If desired, the students can explore the stations and answer the questions in Part 2 as a class in their Launch Logs instead of responding during their exploration.

**Sound and Vibration**

7. Demonstrate sound and vibration with tuning forks by following the steps below:
    - Holding the tuning fork by the handle, strike the tines against a solid surface such as the palm of your hand.
        - This will cause the fork to begin vibrating and create sound.
        - Discuss with the students the timing of when they heard the sound. Could they hear the sound before the tuning fork began vibrating? Why not?
        - Demonstrate that sound is only created when the fork is vibrating after being struck.
    - Strike the tuning fork again and hold the tines on top of the water in the cup.
        - Students should observe the splashing and movement of the water as evidence that the tines are vibrating.
    - Strike the tuning fork again and hold it next to, but not touching, another tuning fork that is the same pitch. This fork will begin vibrating and generating sound.
        - Discuss this with the students. They should infer that the sound from the first tuning fork caused the second one to begin vibrating and creating sound.
    - (Optional) Allow the students to experiment with the tuning forks as they pass them around. They may hold the fork to their skin gently to feel the vibrations, hold the fork close to their ear, and try the water demonstration on their own. Remind students that to hear the sound from the tuning fork they will need to tap the fork, wait, and listen.
8. Demonstrate how sound travels using a metal Slinky coil.
    - Have a student volunteer hold one end of the coil and stretch across a table.
    - Quickly push the end of the Slinky coil while holding it to show the pulse moving from one end of the coil to the other.
    - Discuss with students how this is similar to or different from:
        - The way the vibration traveled from the tuning fork to the students' ears.
        - The way the vibration traveled from one tuning fork to the other.
9. Lead the students through the following steps to build and test a cup phone with a partner.
10. Build:
    - Equipment per pair: 2 plastic cups, 4 feet of string, 2 paper clips

- The teacher may wish to punch a hole in the bottom of each cup with a paper clip or pen. The hole should be just large enough for the string to fit through.
- Students tie a knot at the end of the string. Students may wish to tie the string to a paperclip to adequately hold the knot.
- Thread the string through the hole in the bottom of one of the cups so the knot is on the inside of the cup.
- Thread the end of the string through the bottom of the second cup and tie another knot inside the second cup.

11. Test:
    - To test phones, one student will speak into one cup while their partner holds the other cup to his or her ear.
    - Students will test their phone by pulling the string tight and speaking. Next students will allow the string to hang loose while they speak. Guide them through the remaining questions in their Launch Logs:
        - Does your phone work better when the string is pulled tight or when it hangs loose?

          *The phone will work better when the string is pulled tight because it is easier for the string to vibrate and carry sound when pulled tight.*
        - Hold the string when you talk. Is it easier or more difficult to hear? Why?

          *It is more difficult to hear. In fact, sound may not be heard at all because holding the string causes the vibration to stop and sound cannot travel. This is similar to the tuning fork demonstration: when the tines were touched, the sound stopped.*

## Conclusion Questions for Discussion

1. What other objects make sound similar to plucking the rubber bands?

   *Some possible answers include a guitar or violin.*
2. Sound traveled through the stethoscope from your heart to your ears. What else can sound travel through?

   *Some possible answers include water or air.*
3. How is sound used to communicate over distances?

   *Some possible answers include sirens on emergency vehicles, phones, intercoms, etc.*