Exploring Sound

This document provides more detailed guidance for how to conduct the "explore" phase of the inquiry lesson on sound.

Materials

- ❑ rubber bands
- ❑ magnifying lenses
- ❑ tuning forks (at least 2)
- ❑ mallets
- ❑ 3 shallow but wide pans filled with water
- ❑ clear plastic cups
- ❑ water
- ❑ drinking straws (more than enough for entire class)
- ❑ guitar (or another string instrument such as a lap harp)

Advance Preparation

Gather all of the materials and select five areas across the classroom to place the stations. To make logistics easier, we create and place signs at each location (i.e., Station 1, Station 2, etc.). Put out rubber bands and magnifying lenses at Station 1. Long rubber bands work well but different sizes can be included in the assortment. For Station 2, put out tuning forks and mallets. (We borrowed mallets from the music teacher.). Also, fill each of the pans half-full with water. Rulers should be placed at Station 3. For Station 4, place clear plastic cups on a counter near the sink. We use an extra cup to hold the clean drinking straws, and place a trash bin nearby for students to easily discard used cups and straws. Set the guitar on a table at Station 5. At each station, we place worksheets with the directions and questions to guide student explorations (See below).

Safety Considerations

- ❑ Station 1: Rubber Bands
  - Show students how to pluck the rubber bands. You may want to have students wear goggles for eye protection.
- ❑ Station 2: Tuning Forks in Water
  - Show students how to strike the tuning fork with the mallet. Direct students to only place the tip of the tuning fork in the pan of water.
- ❑ Station 3: Ruler at the Edge of a Desk
  - Show students how to pluck the ruler at the edge of a desk. You may want to have students wear goggles for eye protection.
- ❑ Station 4: Blowing Bubbles in a Cup of Water with Straw
  - Have each student use a separate plastic cup and straw. Direct students to fill their cups half way with water from the sink. After completing the station, students should pour out water and discard cup and straw into the trash.
- ❑ Station 5: Plucking Guitar Strings
  - Show students how to pluck strings with adequate force.

Guidance for the Teacher

The goal of this "explore" phase is for students to observe various phenomena of sound using multiple senses, record observations in their journals, and consider ideas, patterns, and questions about their observations.

Tell students that there are five stations with sounds for them to observe. At each station, there will be a worksheet with directions and questions for them to explore. Establish a purpose by telling students: *As you explore, use your ears, eyes, and sense of touch to observe. There are a lot of things to see, hear, and feel. I find that sometimes it hard to remember everything. Does anyone have an idea of what you could do to make sure that you don't forget what you observed?* [Usually a student will suggest writing in a journal.] Point out that scientists record things too. *You can record what you do and observe in your journal. As you go from station to station, consider what is similar about all of your observations.*

Briefly orient the students by going around to each station and demonstrating what they will be doing. Be sure to explain how to use certain items and discuss safety concerns (e.g., tuning fork should be struck with a mallet and not against a desk, be careful not to pluck the rulers with too much force).

We suggest that students work together during their explorations. We found that by having students work on pairs or small groups, they discuss observations and suggest ways to further explore the phenomena. As students work, encourage them to talk with their partners. It doesn't matter in which order student groups go through the stations. We monitor the time so we can indicate when students need to move onto the next station.

Encourage children to use their ears, eyes, and sense of touch to observe what happens and consider what they think causes sounds. It is essential to direct students' attention to the questions that are on the instruction card. Also ask questions to encourage students to connect what they might currently be doing to previous experiences/prior knowledge. (e.g. *How does this relate to the station before? What do you notice that is similar?*) Model the recording of observations in your own journal so that students will also have this evidence to refer to in the discussion. If students complete the stations early, they can return to a station that particularly interested them. If students have come up with questions during their exploration, have them write these down as well.

Directions for Students

These directions and questions serve as a guide for student explorations.

Station 1: Rubber Bands

This activity works best if you work with a partner. One student should stretch a rubber between his/her right and left index fingers. Then the partner should pluck the rubber band. Observe carefully by looking, feeling, and hearing. You can use a magnifying glass to help you!

What can you hear?
What do you feel?
What do you see happening to the rubber band?

Switch places so that your partner gets a chance to hold and feel the rubber band and you get to pluck it. Try stretching the rubber band more or less while your partner plucks it again.

Do you notice any difference in what you hear, see, or feel?
Why do you think this changed the sound?

Look carefully at the rubber band as you listen to the sound it makes.

When does the sound stop?
How would you know when the sound stopped if you didn't have ears?

Station 2: Tuning Forks in Water

Strike a tuning fork with a mallet and listen.

What can you hear?
What do you feel?
How might you make the sound stop? Try out your ideas.

Strike the tuning fork again and then carefully touch the surface of the water with the tip of the tuning fork.

What do you see happens to the surface of the water?
Does it matter how hard you hit the tuning fork?
Does it matter where you hold the tuning fork?
Why do you think this changed the sound?

While the fork is sounding and touching the water, have your partner try to stop the sound. *What do you see happens to the surface of the water?*

Station 3: Ruler at the Edge of a Desk

Place the ruler so it is flat on a desk. Firmly press the palm of your hand on one end of the ruler so it is firmly on the desk as the other end of the ruler hangs over the edge of the desk. With your other hand, pluck the end of the ruler downwards and release. (To do this with a partner, one student can hold down the ruler as the other student plucks.)

What do you notice is happening with the ruler?
When do you hear a sound?
What do you think might be causing the sound?
What do you notice if you increase how much the ruler hangs over the edge of the table?
What do you notice if you decrease how much the ruler hangs over the edge of the table?
What happens if you pluck the end of the ruler gently or harder? What differences do you notice?
Why do you think the sound changed?

Station 4: Blowing Bubbles in a Cup of Water with Straw

Get a new plastic cup and fill it half way up with water. Get a new straw, place it in the water, and try blowing air through it to make bubbles in the water.

What do you notice? Can you hear anything?

What do you notice if you hold the cup?

Is it possible to blow bubbles without making a sound? Try it and see.

What can you do to make the sound louder or softer?

What do you think might be causing the sound?

When you're done, pour the water into the sink and then throw away your cup and straw.

Station 5: Plucking Guitar Strings

Pluck a string of the guitar.

What happens?

Pluck the strings again to look at what the strings are doing. You can use a magnifying glass to help you!

What do you see happening to the strings when they make a sound?

As the string is sounding, press a finger firmly against it.

What do you feel?

What do you think is causing what you feel?

What happens to the sound?

What do you think will happen if you press down on a string while someone else plucks it? Try it out and see! *What differences do you notice about the sound?*