When It Comes to Sound, I'm All Ears!

Summary

This lesson will help the students discover how sound is produced and how sound travels. Through inquiry, problem solving and hands-on activities students will explore high and low sounds and the mediums in which sound travels best.

Time Frame

1 class periods of 60 minutes each

Group Size

Small Groups

Materials

For the Teacher:
- xylophone

For Each Student:
- balloon

For Groups of 2 Students:
- 10 foot length of string
- 2 cups
- 2 toothpicks

For Groups of 4 Student:
- 6 marbles
- ruler with center groove
- bag of water
- bag of air
- bag of sand (or other solid material)

Background for Teachers

All sounds are produced by vibrating matter. Plucking a stretched rubber band makes the rubber band vibrate. Air molecules around the rubber band move, pushing other air molecules. As the rubber band continues to vibrate, it sends waves of sound through the air - a lot like the ripples created when a rock is dropped into a pond. You hear sound when the rippling air pushes the bones and skin in your ear. Nerves in your ears send a message to your brain about the sound you're hearing.
Sound can be high or low. We refer to the difference between highness or lowness of sound as pitch. Pitch is determined by the speed of the vibrating object. If the speed at which an object vibrates is fast, the pitch will be high. If the speed at which an object vibrates is slow, the pitch will be low. Scientists use instruments called oscilloscopes to see the waves that sound makes. Tall waves are made by loud sound, while short waves are made by soft sounds. Low-pitched sounds have big gaps between waves, while high-pitched sounds have waves that are bunched together.
Sound will travel through solids, liquids and gases, however it travels faster through solids and liquids than gases.

Intended Learning Outcomes

- Compare things, processes, and events.
- Describe or explain observations carefully and report with pictures, sentences, and models.
- Observe simple objects, patterns, and events, and report their observations.

Instructional Procedures

Activity #1:

Pass a balloon out to each student. Have them blow up the balloons. Ask them to grasp the mouth of their balloon and allow the air to slowly escape. What happens as the mouth of the balloon vibrates? (a sound is made) Have students stretch the mouth of the balloon tighter - what happens? (higher sound). Tell the students to hypothesize the reason why sound is produced when air is allowed to escape the balloon. Have them write this hypothesis in their Science Journal. Allow several volunteers to share their hypothesis.

Activity #2:

Explain that sound is produced by vibration. Have class members lightly put their fingertips to their throat and recite the alphabet to feel for themselves the movement of their vocal cords. Record observations in a science journal. Remind them that you have to have vibrations, or you can't have sound.

Activity #3:

Try putting a few grains of rice on top of a drum. When you tap the drum, the sound makes the drum shake and the rice jumps up in the air. When the drum skin is stretched tighter, does the rice jump higher in the air? Record observations in a science journal.

Activity #4:

Instruct students to place 5 marbles along the groove of a 12 inch ruler. Take a sixth marble and flick it against the end of the row. Observe what happens. Help students conclude that the energy of the first moving marble is transferred through the other marbles to the last one. In this way, the energy wave travels in one direction, but the individual marbles do not. Have the students summarize in their Science Journals how sound travels.

Activity #5:

After completing the above activities, ask the students if they think a string could transmit sound.
Pass out one 10 foot string for each pair of students.
Have the students stretch out the string and test to see if the string will conduct sound.
Pass out two cups and two toothpicks to each pair of students.
Direct the students to poke a hole in the bottom of each of their cups with the toothpick or pencil.
Next, the students should push the string through the end of the first cup and tie the string to the toothpick. The toothpick should now be inside the cup to keep the string from coming out.
Repeat these steps with the second cup.
Explain to the students that in order for their talking cups to work they must keep the string between the two cups tight. One person should speak directly into the cup and the other should place his or her ear directly into the cup.
After giving time for students to experiment, ask these questions:

Did the cup make your partner's voice louder?
Did changing how tight you pull the string effect the sound?
Do you think using thread, instead of string, will effect the sound?

Activity #6:

Next, get out the xylophone. Ask the students if they think each key will make the same sound when struck. Why or why not? Have them predict which sizes will make the highest sounds and which will make the lowest sound. They should be able to explain and support their predictions. Hit the keys and have the students listen for the differences in sound.
Describe pitch as the highness or lowness of a sound. Explain that the smaller key vibrates faster than the larger key or the column of air inside the key vibrates a greater amount of times per second.
Ask the students if sound can travel through different states of matter (liquid, gas & solid). Have them write a response in their science journal with an explanation of their thinking.

Activity #7:

Explain that they are going to do an activity to explore this idea.
Pass out the bags filled with water, air and sand to every four students.
Instruct the students to place one of the bags on the desktop. Have one member from each group tap on the desk with his or her hand while the other three students place their ears to one of the bags.
Students will rotate the bags among the group and take turns tapping on the desk to see if the sound is traveling through the different matrials. Allow time for each member of the team to listen for the tapping sound.
Encourage students to discuss the following questions among themselves:
Did the sound travel through the solid, liquid and gases?
Were the students able to hear the sound clearer through the solid, liquid or gas?
Allow time for each group to share their findings with the class. Have the students write in their science journals examples of when they would hear sounds through solids, liquids and gases.

Conclusion:

Conclude by summarizing the day's experiments and what students have learned about sound. Have them make a final entry in their science journals.

Assessment Plan

Assess student science journals using the rubric below.

Rubrics

Science Journal Rubric

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