Captioned Media Program
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#10701
LEARNING ABOUT SOUND

AIMS MULTIMEDIA, 2004
Grade Level: 3-6
15 Minutes

CAPTIONED MEDIA PROGRAM RELATED RESOURCE

#1857 EARS HEAR

Funding for the Captioned Media Program is provided by the U.S. Department of Education

Program Summary

Learning About Sound introduces students to how sound is made; how sound travels; the terms 'pitch'; 'volume' and 'compression waves'; how our ears detect sounds; and the way our vocal cords work. Students will also view the parts of the ear and learn how they work together to allow us to hear various sound waves.

Pre-screening Preparation*:

- Preview the program before screening it for the students; this allows you to establish any pause points for discussion
- A pre-screening activity has been included for students to prepare them, and give you an understanding of their prior knowledge in order to build upon it.
- The post-screening science activities further extend students' understanding.
- These activities could also be used as an assessment tool. Background information is also provided to assist with explanations if required.

**Note: Activities should be practiced prior to using with students*

Pre-screening Activity

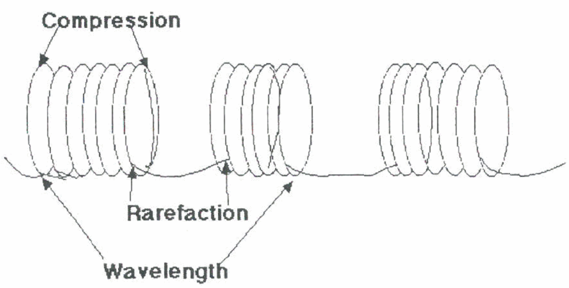
What do your students already know about the subject of sound? Determining students' current level of understanding will guide how you present the program and post-screening activities. Ask students to write down everything they know about sound or any questions they may have. Have students work in teams to refine their lists; afterwards have the teams work in small groups to further refine their lists. The groups should then report back to you. You can use their data to create a class list of statements and questions regarding sound. By discussing students' responses you can build on their existing conceptual ideas.

Post-screening Activities

1. **Sound waves** (compressional waves)

Use a toy slinky. Stretch it out between two students. One student should grab several coils on the slinky. Then let go.
What do the students observe? They will see the group of coils move across to the other student. Then come back to the starting student.
Discuss how the coils stay together (this is what sound waves do).

Have students could possibly sketch the slinky's action as it moves after being released. Ask the to label their drawings as shown here.



2. Vibrating objects

Materials:
Tuning fork; glass of water; bobby pin (hairpin); empty soup can; soda bottle

Procedures
a) Strike a tuning fork. While it is still humming put it into a glass of water.
b) Straighten a bobby pin. Hold it against an inverted empty can while you strum the end of the bobby pin.
c) Touch your Adam's apple. Then hum a low note.

Discuss with the class their observations of these three simple exercises. What do the students understand in regards to the vibrations and sound waves?

3. Travelling Sounds

Materials
Shoe box, battery, battery-operated buzzer, wires, pieces of various absorption materials e.g. carpet, cotton fabric, bubble wrap, foil, cotton balls, a measuring tape/stick.

Procedure
Explain to students that sound travels through objects to reach our ears. The vibrations are transmitted through air and other materials. How can we muffle sounds? Why do we need to absorb sounds?

Have students work in small groups to choose different material to wrap around the activated buzzer. After they have wrapped the buzzer in one of the materials, a group member should walk away from the box until the buzzer cannot be heard. They will then measure and record the distance.

Have each group look at which materials were the most effective/ineffective in absorbing sounds. Are those materials being used in everyday situations to assist with noise pollution?

Note: Before you begin this activity have students predict the materials that will be the most absorbent to least absorbent. This can be done on a simple table.
When the activity is finished, the students can see how close they were to the correct answer. Can students explain why they chose the materials in the order they did?

Materials-Prediction	Distance until sound is no heard	Most absorbent materials t least absorbent

4. Terrific telephones

Materials
1 icepick or knitting needle
2 paper cups
2 paper clips
1 long string

Procedure
1. Punch a small hole in the base of each paper cup using the icepick or similar instrument.
2. Put one end of the string through each cup and tie one paper clip to the end of the string in the each of the cups.
3. You hold one cup by your mouth and your partner holds the other by his/her ear. Move apart until the string is tight.
4. Try talking to your partner by speaking into the telephone. Is it easier or harder for your partner to hear you with the telephone?
Discuss with students the concept of sound waves travelling better through solid materials than through air. (Refer to program)

5. Sound Waves – What do they look like?

Materials
- overhead projector
- large glass bowl
- eye dropper
- water
- food coloring
- liquid bleach
- tuning fork
- dominoes

Background Information for Teachers:

This activity is designed to show how sound waves would look and behave if we could see them. Rehearse this demonstration before doing it for your students. It requires practice! The water model of sound waves is not the same as sound waves themselves. Help your students understand ways in which this model is accurate, and ways in which it is inaccurate. Note: As a safety consideration, do not allow students to handle the bleach container.

Procedures:

Fill the bowl half full of water and place on the overhead projector. Wait for the water to become still. Turn on the overhead and focus the image of the surface of the water onto the screen.

1. Have the students predict what will happen when you tap the water with your finger at slow, even intervals. Watch what happens. Discuss. Note how the waves spread in the bowl.
2. Predict what will happen if you tap the water harder. Watch and discuss what happen to the waves.
3. With an eyedropper, slowly drop clear water into the middle of the bowl. Watch what happens as the water drop hits the surface of the water.
4. Have the students document the pattern with drawings in their science journals.
5. Experiment with different speeds of drops. Also experiment with dropping the water from different heights.
6. Discuss or draw what happens in the different experiments.
7. Add a drop of food coloring to the water and observe what happens. If you want to repeat this experiment after the water becomes colored, just add a few drops of chlorine bleach to the water and it will clear to a light color. Did the food coloring act differently than the water?
8. Strike the tuning fork on a rubber surface (never a hard surface) and place its base on the screen of the overhead projector. Observe the waves in the water.
9. Strike the tuning fork and place its base in the water and observe the waves produced.
10. Discuss with students ways in which this model is an accurate and inaccurate depiction of actual sound waves.
11. Accurate:
    - Sound waves move out from their source.
    - Sound waves are vibrations of molecules – which is similar to how the water vibrates.
12. Inaccurate:
    - Instead of moving up and down like these water waves, sound waves travel in a horizontal motion. Demonstrate the horizontal motion of sound waves by setting up a line of dominoes and pushing over the first in the line.
    - The second shortcoming of the water model for sound waves involves the plane of motion. Unlike the water waves in which waves travel only on plane of motion, sound waves move out in all directions from the source.
13. Have the students summarise how sound moves in their science journals. Students could also summarise the information, complete diagrams related to sound waves and create a PowerPoint presentation.

6. Wonderful waves

When you start a vibration, it moves out in all directions like the ripples in a puddle. This is called a sound wave.

Materials

1 flat pan
Paper towel or material to soak up water
1 toothpick
Water

Procedure

1. Fill the pan half way with water.
2. Break the toothpick into 3 or 4 pieces. Put these pieces on top of the water. Be sure they are not touching the pan or each other. They will represent water molecules.
3. Get the paper towel very wet but not dripping. When the water in the pan is still, gently squeeze the paper towel so one drop falls in the middle of the pan. You should see ripples.

Questions to Ask Students:

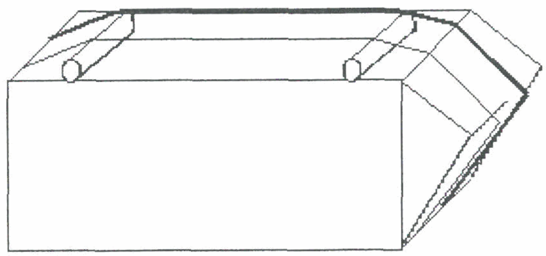
Which way do the ripples go?
Do the toothpicks move as fast as the ripples?
The ripples move across the water but the toothpicks do not move with them. Just like the toothpicks, the molecules in the water do not move with the ripples.
What is moving?

7. Groovy guitars

Vibrations that are fast produce a sound with a higher pitch. Slower vibrations produce sounds with a lower pitch. The size of an object helps to determine if it will vibrate fast or slow and therefore also determines its pitch.

Materials
Rubber bands of different sizes and widths (have 4 or five connected)
1 milk carton
2 pencils

Procedure
1. Stretch the rubber bands over the carton lengthways
2. Put one pencil under the rubber bands near each end of the carton.



3. Pluck the strings of the guitar and listen.
4. Have students predict how they can lower or raise the pitch.
   - They could move the pencils
   - They could place a piece of cardboard in the center to tighten the rubber bands.
   - Students must come up with 4 methods.

Is the new sound higher or lower in pitch?
____ Higher
____ Lower

Look at your results and have students write their explanations. A key to students' understanding will be the terminology being used.

Background Information

Sounds are created when something vibrates. Sounds are transmitted through air and other objects or materials. The vibrating object makes the air or material next to it vibrate as well. We hear sounds when the vibrations reach our ears.
A longitudinal wave vibrates parallel to (in the same direction of) wave travel (sound waves are a good example). A transverse wave vibrates perpendicular (at right angles) to the wave travel (water waves are a good example).

Unlike light waves, sound waves do not travel through a vacuum (there is nothing to vibrate). They need matter to travel. That is why sound can travel through a wall.

Longitudinal waves can be composed of *compressions*, where the parts of the medium (coils like those in the slinky) are closer together than normal, or *rarefactions*, where the parts of the medium are farther apart than normal. (In activity 1 the students create compressional longitudinal waves). A rarefactional longitudinal wave can be produced by stretching a segment of the slinky and then releasing it.

The bigger the vibration, the louder the sound that is produced. The harder you hit, strum or blow an instrument or object, the louder it sounds.

Pitch describes how low or high the sound is. The difference between high and low sounds is the rate (frequency) of the vibration. High-pitched sounds are made by rapid vibrations and low-pitched sounds are made by slower vibrations. The less space there is for the sound waves to travel through, the more rapid the waves and the higher the sound.

Vocabulary
compression, energy, frequency, longitudinal, molecules, parallel, perpendicular, pitch (high/low), rapid, rarefaction, ripples, transmitted, vibrate, waves

Useful Websites

Sound and our ears
http://www.fi.edu/fellows/fellow2/apr99/musictoourear.html

Sound is a form of energy
http://www.fi.edu/fellows/fellow2/apr99/soundsci.html

Magic School Bus
http://www.scholastic.com/magicschoolbus/games/sound/index.htm

Sound, vibration speed and pitch
http://www.uen.org/Lessonplan/preview.cgi?LPid=2340

Schemes of Work- Various sound activities
http://www.standards.dfes.gov.uk/schemes2/science/sci5f/?view=list&column=objective

Operation Physical Science
http://www.phys.lsu.edu/dept/opps/new_page_10.htm

Length
15 Minutes

Audience level
Grades 5 – 8

Subject Area
Science

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