Science - Year 4

Sound – Block 4S

Listen Up!

Session 2

Resource Pack

Challenge: Make Your Own String Telephone

1. Make a small hole in the bottom of two paper cups or yoghurt pots.

2. Thread one end of a long piece of string through the hole in one cup and tie a knot in the end (with the knot inside the cup).

3. Thread the other end through the hole in the second cup and tie a knot in the end of the string.

4. Give your partner one cup and hold the other cup securely.

5. Walk away from each other until the string is quite taut.

6. Speak (don't shout) into your cup while your partner holds his/her cup to their ear and listens. Finish your message with the word 'Over!'

7. Swap over so that you now hold your cup to your ear, while your partner speaks into their cup, finishing with the word 'Over!'

8. Work through the following questions.

Try repeating your conversation at the same distance apart without the telephone. Is it easier to hear with or without the string telephone?

Can you make your telephone work around a corner?

What happens if you tie a knot in the middle of your piece of string? Why do you think this is?

Jot down the difference in the sound when the string is tight compared to when it is loose.

Undo one knot, cut the string in half, then reattach the second cup. What difference does the shorter string make to the sound?

On the next sheet, draw a labelled diagram of your string telephone and write a short explanation about how it works.

Date:

Focus: I understand that sounds are made when objects vibrate and I can explain that sounds travel through gases, liquids and solids.

String Telephone

Notes for Guided Task

Give chn an opportunity to begin making their string telephones (independent task) before selecting groups of 6-8 to work through the guided task.

Demonstrate sound vibrations using some visible evidence, e.g. a drum skin with rice grains scattered on it, a plucked elastic band, the tip of a vibrating tuning fork placed in water, a ruler clamped to a table and tapped at one end. What do all these sources of sounds have in common? *They are visibly vibrating.* Explain that all sounds are made when objects vibrate.
Ask children to use their fingers to feel some vibrations that they cannot see, e.g. their larynx as they talk, a speaker for a stereo system, a cymbal or triangle that has been hit.

Explain that we are hearing these sounds through the air around us (a gas). Ask whether or not children think sounds also travel through liquids and solids. Everyone put your ear to your desk and scratch the surface with your fingernail. Now sit up and again scratch the desk surface. Is there a difference? Take feedback from the group. Make sure they recognize that the sounds are louder with their ears to the desks.

If you can hear a sound through your desk, does that mean your desk is moving? Take one minute to discuss with the people around you what is happening. Yes, tiny parts (particles) of the desk are moving with the sound wave.

So when sound travels through a solid, it travels the same way as it does through air: in a sound wave. The sound wave actually moves the tiny particles, or molecules, that make up the solid. We now know from experience that these sound waves sound louder when we hear them through solids. Can you think why? Remind chn of the 'States of Matter' science block. Liquids are not packed as tightly as solids. And gases are very loosely packed. The spacing of the particles allows sound to travel much faster through a solid than a gas. Sound travels about four times faster and farther in water than it does in air. The results can be explained as follows. Sound travels as a wave of vibrations through a medium. Particles in solids are closer to each other compared to liquid, so the sound vibration (wave) can transfer from one molecule to the next more easily. The same way, as liquid particles are closer to each other compared to gas, sound travels better through liquid than through gas.

Listen to sounds they can hear from outside the classroom (or arrange for a loud sound to be deliberately made outside the classroom) – what have those sounds travelled through? *Bricks, windows, doors and of course the air!* Listen to whale or dolphin sounds (*see website list*). The sounds they make travel through the water so that they can communicate with each other. Ask children to listen to sounds under water next time they are at the swimming pool!

Compare light and sound. Light travels at about 300 000 000 (300 million) metres per second. Sound travels at about 330 metres per second through air (approx. million times slower). Soundwaves travel from the source– think of it like the ever expanding circular ripples that occur when you drop a stone into water. Sounds cannot travel through a vacuum, e.g. in space, no air so no air molecules to vibrate. Sound can travel through solids and liquids that are opaque, transparent or translucent, but a shadow is caused because light cannot shine through opaque objects. In air, sound travels at 1,160 km per hour, but speeds up in water to 5,400km per hour and is even faster through solids. Things that travel faster than sound are called supersonic. Concorde could travel faster than sound.

Mini Plenary

Can they explain how the string telephone works?

How does the telephone work? (Example answer: When you speak into the cup, the back of the cup vibrates; the vibration extends into the string, like a push on a slinky; the sound waves, or vibrations, move through the string.)

Which works better: taut or loose? Why? (Answer: Taut; when the string is loose, it is softer than when it is taut. Soft materials tend to absorb more sound than solid ones; when more sound is being absorbed, your friend on the other end of the line cannot hear as well.)

What happens when the vibrations (sound waves) reach the other end of the cup? (Answer: It is the reverse of what happened on the other side: the waves in the string vibrate the cup; the vibrations from the cup disturb the air, like a pebble being thrown into still water; the vibrations in the air, otherwise known as sound waves, travel toward our ears.)

Plenary

At the end of the playground, chn stand together, close to but with their backs turned towards the teacher. Play a very simple beat/pattern on the drum (fairly softly) and the chn repeat it back in claps. As a group, the chn take 10 steps away from the teacher. Play a different pattern (but at the same volume), chn listen carefully and repeat it back – could they all still hear it? Chn take another 10 steps away and repeat again. Can it be heard? Do you notice if any chn are turning their heads towards the sound to hear better, or cupping their hand around their ear to make a funnel shape? Point out that these strategies we all naturally use if we are struggling to hear something, we also rely on our eyes to help us understand some of the sounds. Explain that people who have poor or no vision often have much better hearing because they use their hearing more to help them navigate their surroundings safely. Keep repeating until there is no playground left or the chn can no longer hear the sound. Bring the class back together.