**ACTIVITY: Hearing sounds**

**Activity idea**

In this set of activities, students are introduced to basic Physical World concepts about movement, vibrations and hearing sounds through the use of play and exploration.

This activity provides opportunities for students to investigate:

* personal experiences of hearing sounds
* vibrations (movement) and sound
* the connection between the size of vibrations and the loudness of the sound produced.

# For teachers

## Pedagogical information

Sound is a very accessible topic for young learners. This activity encourages students to make the connection between movement and sound. The suggested experiences in this resource are designed for curriculum levels 1 and 2. They are underpinned by the NZC Nature of Science ‘Investigating in science’ aim: Students will extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

***Background information about how telephones work***

The simple model in this activity is a string telephone. A string telephone operates differently to landline and cell phones. Keep the following information in mind to prevent misconceptions about how actual telephones work:

* String telephones are acoustic (non-electrical) speech-transmitting devices. Speaking into the container, the voice sends sound waves inside the container, vibrating the bottom of the container. The vibrations are transferred to the string, travelling across the string and into the bottom of the connected container. The sound waves become vibrations inside the container, transferring the sound of the voice.
* Landline telephones work by carrying sound waves to a thin metal disk inside the phone. The sound waves are converted into electrical energy, which travels over wires to another phone and is converted from electrical energy to sound waves again.
* With a cell phone, the phone’s microphone turns voice/sound into electrical signals and uses radio waves to connect with cell towers.

***Recognising students’ alternative conceptions***

Children naturally and instinctively develop their own ideas about how things work. These self-developed concepts make sense to the individual but may be scientifically inaccurate. It is helpful to know some of the alternative conceptions students may hold. Awareness helps educators to identify them when they surface in discussions and provides an opportunity to scaffold change. An alternative conception to be aware of while doing this activity is that students may think sound can only travel through the air and not through solids and liquids. Additional alternative conceptions children may hold about sound are listed at the end of the article [Building Science Concepts: Exploring sound](https://www.sciencelearn.org.nz/resources/3068-building-science-concepts-exploring-sound) and in this [resource from Deakin University](https://blogs.deakin.edu.au/sci-enviro-ed/years-5-10/sound/).

***Engaging discussion and deepening understanding***

While students are exploring and playing with string telephones and sound, use the opportunities to ask questions and engage in discussion to:

* check prior knowledge about sound – how it moves from one place to another
* check for (and challenge) alternative conceptions, such as the ability of sound to move through liquids and solids, as well as through the air
* develop content vocabulary
* develop, consolidate or extend thinking
* encourage communication, comparison and analysis between individuals and groups
* look for opportunities for students to design simple investigations to answer questions.

***Building science knowledge requires multiple experiences over time***

Students will build their science understanding about sound from year to year. Concepts often build sequentially. The New Zealand Ministry of Education resource Building Science Concepts Book 18 [*Exploring Sound: Using Sound-makers and Musical Instruments*](https://scienceonline.tki.org.nz/Resources-and-teacher-support-material/Building-Science-Concepts/Titles-and-concept-overviews/Exploring-Sound) lists the likely sequence:

* Our ears can hear differences in sounds.
* For sounds to be produced, something needs to move.
* The larger the vibration, the louder the sound.

## Ideas for teaching key science concepts about sound

**Concepts:**

* **Our ears can hear differences in sounds.**
* **Sounds can be louder or softer, higher or lower.**

Find a quiet space where students can spread out and work in pairs.

Investigate how we hear:

* Invite students to whisper a sentence to each other.
* Ask what happens to the sound. (It travels from the speaker to the listener’s ear.)
* Ask what does the sound travel through. (The air.)
* Discuss the differences between the whispers between students and the discussions between yourself and the students.
* Make comparisons about loudness, softness/quietness of sounds.
* Discuss/compare how quiet and loud sounds travel and what they travel through.

What to look for:

* Does the students’ discussion show an understanding that sound must physically reach our ears in order for us to hear?

**Concepts:**

* **Sound travels as a wave, producing vibration.**
* **The larger the vibration, the louder the sound.**

*What you need*

* Empty tins, paper cups or yoghurt containers
* 5 m lengths of cotton string
* Paper clips

*What to do*

**Note:** To prevent misconceptions about how modern phones work, ensure students are aware that the string telephones are models that demonstrate how sound/vibrations travel along a string rather than how real telephones work.

Connect a pair of tins or containers to each other:

* Poke a hole in the bottom of each item.
* Thread a piece of string through the hole.
* Tie the string onto a paper clip to hold it in place.

For the following activities, it is important to keep the string taut.

1. Begin with a pair of students listening at each end of the string telephone. Ask the students who are holding the containers what they hear. (No sounds coming from the container, but they might hear sounds coming from the classroom.)
2. Focus the group’s attention on the connecting string and ask a student to pluck the string. Ask the students who are holding the containers:

* What did the string do when it was plucked? (It moved up and down – vibrated.)
* What did you hear when it was plucked? (A sound.)
* How do you think the sound travelled from the point where the string was plucked? (The sound travelled as a vibration/movement along the string.)

1. Have groups of three students try the activity. Ask:

* What do you need to make the vibration larger? (Pluck harder.)
* Is there a connection between the size of the vibration – how much the string moves up and down – and the loudness/volume of the sound? (A larger vibration means a louder sound.)

1. Have the students predict, with reasons, what would happen if one student whispered into one end of the telephone while another student listened at the other end. They could record their predictions.
2. Have groups test their predictions, comparing their results with what they predicted. Ask:

* Can you hear the whispered message? Why?
* How is the sound getting from one end of the string telephone to the other? (As vibrations along the string.)

What to look for:

* Do students recognise the link between vibration and the means of producing the sound?
* Can they link the size of the vibration to the loudness of the sound?
* Are they making links between this activity and the concepts of hearing already explored?

## Extension ideas

* What happens when students allow the line to go slack?
* How far apart students are able to stand while still hearing each other?
* How do other materials such as fishing line, polyester string, wire or wool affect how far the sound travels or affect the quality of the sound.
* Investigate how sound moves through other media, such as water in the school pool.