Suggestions for teaching sound Y1-10

NZASE resource

Teaching focus	Years 1-4	Years 5-8	Years 9-10
Elicit prior knowledge Do students understand that sound needs vibrations, and the concepts of volume and pitch?	• Teacher makes a sound with several items, one at a time. Ask students to compare sounds – loud/soft, high/low • Ask students to suggest ways to make voluntary (appropriate!) body sounds. List, noting what makes the sound and how the sound is made. Ask students, *what do they all have in common*? Each student demos one body sound, softly, then loudly. Compare different sounds – *are they higher or lower?*	• Find things that make sound. *What do they have in common? Which ones make loud/soft, low/high sounds?* • Sit quietly for three minutes and record all the sounds you hear. *Take two/three and explain how the sound was made.* • Teacher records different sounds. Students listen, observe and then infer the source. Discuss, developing the vocab needed to describe sounds	• Complete the first two columns of a KWL table – *what do I Know about sound, what do I Want to know?* Once complete, share with neighbours. • Challenge students to find something that makes sound and show how the volume and pitch can be varied. *Describe what makes the sound. Explain how you varied volume and pitch.* • Start to add what you have Learned to KWL table
Sound travels Big ideas: Sounds are made by vibrations, which need a medium to travel.	• Sit rice on a balloon stretched over a plastic container. Tap. *What happens to the rice? Why? How to make vibration bigger? What happens to loudness?* • Make a string telephone. With a student listening at each end, twang the string. *What happened? Why? How to make vibration bigger? What happens to loudness?* Predict what will happen if one student speaks into the cup and another listens, keeping string taut. Try. *Explain what happens* • Listen to sounds through a coat hanger.	• Hold a ruler on table so some hangs over edge, pluck free end. *What makes the sound? How could you vary loudness (volume) and high/low (pitch)?* Try it, *explain how it works* • Listen to an alarm clock or child's toy ring on the table. Predict how sound will differ then listen to alarm/toy sitting in an empty bucket. Set the alarm/toy then seal in a plastic bag/box, and submerge in a bucket of water. Predict, then listen again. *How does the sound differ for each?*	• Ruler pluck – *what affects the sound, how?* • Set an alarm clock in a belljar (or tiny bell in bunged syringe). Evacuate air (e.g. vacuum pump). *What happens to the sound? Why?* • Explore tuning forks (p1-5) of different frequency with different objects. • Get a stop watch and long measuring tape. Calculate speed of sound in air with a starter gun, and then along a long metal tube (fence?) with a hammer. Can also use a wall (stand 100m way, hit two wooden blocks, time echo over 200m). Design an expt to measure the speed of sound in water.

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Making music Big ideas: Musical instruments make vibrations. The larger the vibration the louder the sound; the faster the vibrations the higher the pitch.	• Students make noise with a musical instrument. *What vibrates? How do you know? What happens if you prevent the vibration? How can you change loudness, high/low pitch? What are the other parts for?* • Explore these ideas of vibration and pitch with lunch-wrap paper and comb, or a blade of grass between thumbs. • Make an instrument (see below); strings and drums work well for this age. Or make wind chimes. • Look at drums of different sizes and shapes. *Predict which will make loud, low sounds and which softer, high sounds.* Slap each drum with a hand. Feel the vibration, listen to the sound, compare to prediction. • Explore some Māori instruments – listen to some. What pūrākau (stories) include instruments?	• Watch and listen to a keyboard, string and wind instrument. [If any students play, they could show the class how it makes sound.] *What part of the instrument vibrates? Explain how to vary the pitch and volume.* • Make an instrument (see below) – wind instruments work well at this age. Or in groups of four, each make a different instrument – percussion, brass, wind, strings. Describe how each makes sound and varies volume, pitch. Learn about string properties. • Make pan flutes with straws or a set of water-filled bottles (no labels) to blow over or strike. *How does changing water volume alter pitch? What is the difference in the vibrations when blowing over and striking?* • Make some Māori instruments. Explain how pitch and volume can be changed.	• Introduce the idea of sound as a wave. Compare to Mexican wave – wave moves, people stay in one spot. Demonstrate with a slinky or rope moving side to side. Show peak, trough, wavelength. Model frequency (Hertz), amplitude (decibels) – discuss with respect to pitch, volume. This is a model. • Try a signal generator (or Tone Generator app) and then different instruments or student voices, with an oscilloscope (or Sound Oscilloscope app) to see the waves and show the effect of varying volume, pitch. Test student's hearing range. Soundcard Scope is a free app with a signal generator and frequency analyser • Make an instrument that can vary in pitch and volume. Compare the waves. • Explore using straws to make sounds like a reed instrument. • Experiment with a silent dog whistle. • Explore different types of Māori instruments. Test sounds with an oscilloscope.

Useful videos

Scientific Eye (UK): Hearing the sound (20m)
Scientific Eye: Hearing and sound (20m)
Nigel Latta blows stuff up: Episode 7, Sound; available on ClickView.

Making instruments

K12 Learning Liftoff – (Six instruments)
FeltMagnet: (52 instruments)
Making a straw woodwind
TEDx Sydney: Make a carrot clarinet (5m video)
PSTT: Science fun at home PDF (Four instruments)
Chrome Music Lab: 13 sound experiments

PLD for teachers

- Denis Burchill's SciCon 2018 workshop (*click on Request access*): Easy-to-use sound investigations, musical instruments for students to make, links to sites showing sound and music being made.
- Sounds of Aotearoa webinar, Greta Dromgool and NZAPSE educators.

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Hearing Big idea: We hear when sound energy reaches our ears.	• Explore the sounds of different animals. [Some teachers may have a Countdown animal sound reader.] Elephant, p6-8. *What vibrates when they make their sound?* • Find pictures of animal ears. *Why do animals need to hear sounds?* Observe your pets. *How do their ears respond to sound?* • Use paper cones on ears to see how this helps us hear. Vary size or shape and see if there is a difference.	• Learn about the parts of the ear simply (outer ear collects vibrations, middle ear passes the vibes on, inner ear converts them to a signal to the brain). • *How can we damage/protect our ears?* • Use phone apps to measure volume of different sounds in decibels. Record everyday noises and compare to the dangerous levels.	• To see how effective their hearing is, blindfold students and ask them to identify different sounds. Try attaching giant paper ears. • Learn about the parts of an ear and what they do with vibrations. Find out how this changes with age. *What ages of people can't hear the mosquito ring tone on cell phones? Why?* • Explore the function of hearing aids and cochlear implants.

Also for Y7-10

Many teachers will also include:

- Waves in the context of energy – explore kinetic, transformations, amplitude and uses.
- Type of wave is longitudinal – explore compression and rarefaction, particle movement, frequency, amplitude and wavelength.

A more student-led approach

Ask students to research and investigate whether they could harm their hearing if they don't wear ear muffs in the technology room. Set the parameters to include some of the ideas in the formally structured unit – vibrations, frequency, amplitude, and hearing.

Research ideas

Ask students to start with at least three questions they want to answer and include the vocabulary they have learnt in the unit in their findings –

Artificial ears; Artificial voice boxes; Avalanches and sound; Cochlear implants; Comparing human and animal hearing; Doppler effect; Earthquake waves; Echo-location; Equalising air pressure in our ears; Hearing aids; Helen Keller; How a musical instrument is made or works; Sign language; SONAR; Sound barrier; Sound insulation; Sound recording technology; Thunder; Tsunami waves; Types of drums; Ultrasound; Vocal cords.

Ngā Kupu

Auau o te ngaru oro – Frequency of sound waves
Hauoro – Pitch
Hopunga puoro – Sound recording
Kahaoro – Volume
Puoro taketake – Indigenous music
Pūtātara – Trumpet
Rongonga – Hearing
Taonga puoro – Musical instrument
Taringa – Ear
Teitei – Amplitude
Tōiriiri – Vibration.

From Te Aka Maori Dictionary and Paekupu

By NZASE Science Communicator Mike Stone, with many thanks to Sandy Jackson, Dave Corner, Catherine Hunter and Jude Hancock for their input.