How does sound travel?

Learners may be aware that sound is produced by vibrations. Opportunities should be given to investigate a variety of instruments and explore their sound-making capabilities. Learners can identify how each instrument makes sound.

Sound travels through gases, liquids and solids via longitudinal waves. These are **not** the same as the waves most learners will be familiar with e.g. waves on the sea. Longitudinal waves can be demonstrated in the classroom using cotton-reels, thin wire and springs. By threading the thin wire through the cotton-reels and attaching them to the springs, (Figure 1) a model to demonstrate how sound travels can be set up. Stretch the model fairly tautly between two points (Figure 2) and start to move the first cotton-reel backwards and forwards repeatedly. Each cotton-reel will oscillate in turn, transferring the energy through the line (Figure 3). This will demonstrate that the particles in the solid, liquid or gas transfer the energy to each other and this is how the sound travels to our ears.

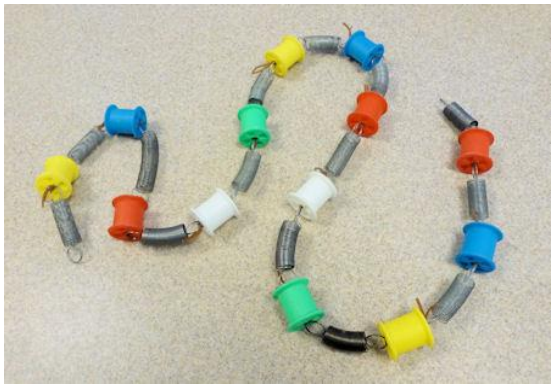

Figure 1

Figure 2

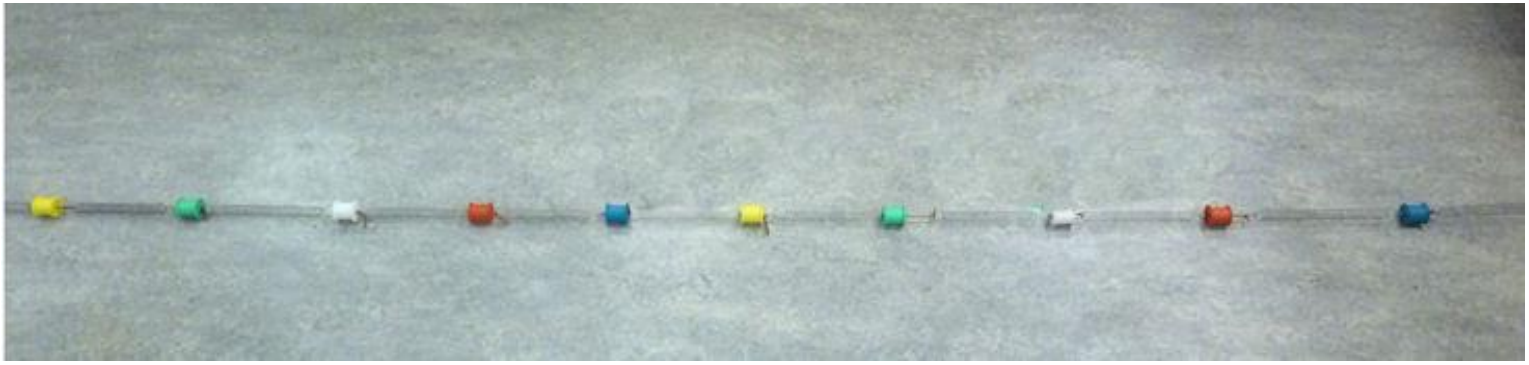

Figure 3

Communication through sound

Learners could think about how we make sounds. Learners could stretch a thick elastic band over a cup and, using a straw, blow air at the band. The band vibrates, making a sound, learners could relate this to how our vocal chords make sounds.

- Make your own vocal chord model by placing an elastic band around a plastic cup as shown.
- Blow out quite hard through the straw – what happens?
- Remember: Don't allow learners to blow out for too long or they may feel faint. Blow through individual straws and don't share straws with anyone else.

Learners may be able to explain how sound is detected by the ear and should be given the opportunity to research the importance of sound as a means of communication between animals.
Learners could research how dolphins and other marine animals communicate and start to understand that sound must travel through water for the dolphins to be able to communicate.

Learners may be able to discover that sound can travel through solids. Learners could tie one end of a piece of string round a spoon and place the other end of the string over the ear and listen to the sound produced when the spoon is struck with another metal object. Learners could then explain how the sound travelled to their ear. Don't allow learners to strike the object too hard.

Pitch

Each sound has a particular pitch. The number of waves produced per second is less for a low pitch and more for a high pitch. The number of waves produced each second is called frequency.

Learners may play an instrument and could demonstrate the different pitches produced and how the pitch can be changed. If the pitch is altered, the sound will either become lower or higher. Different pitches can be heard when the small drum is played, compared to the larger drum when using the same force.

Learners may be able to describe sounds as being loud or quiet. Learners could investigate what affects the loudness of a sound. Loudness depends on the amplitude (size) of the vibration. Use the drum and compare the sound when the drum is hit with increasing force. Amplitude can easily be demonstrated using technology. A freely downloadable app called Hertz (put in: freqcounter and Hz comes up Tang Peng Lab FreqCounter). Whistle loudly and softly and look at the height (amplitude) of the waves.

A fun demonstration of vibrations using cornflour and a loudspeaker can be seen on SSERC website.

STEM Central learning materials for the context of sound.