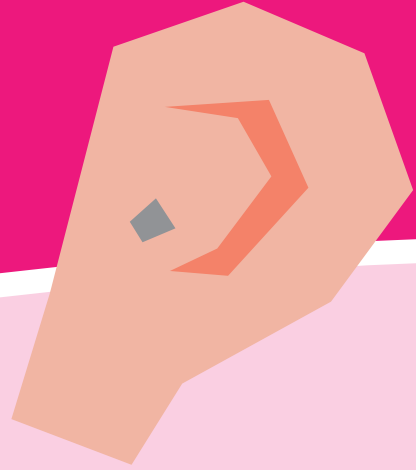




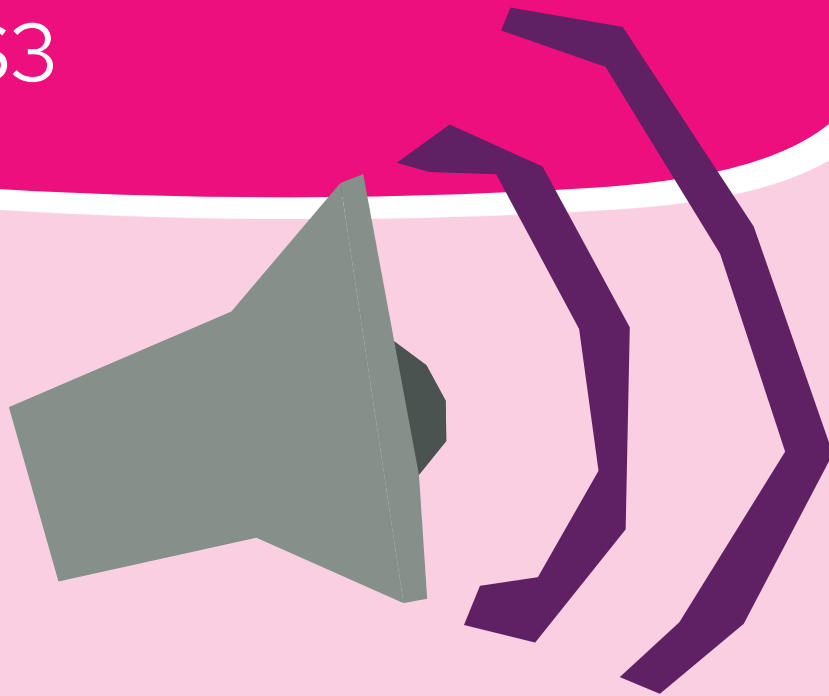
Winchester
Science Centre

By Wonderseekers



Soundscape Studio

Pre-visit resources
for KS3



Soundscape Studios KS3 Pre-visit Activities

These activities are designed to be completed before you visit for your Soundscape Studio workshop. We recommend working through the activities from 1 to 4 but you are welcome to pick and choose depending on your group's prior knowledge.

Through these activities we will be exploring how sound travels through the world in waves and how the volume of the sound relates to the energy of the sound. We will then explore how different species use sound to hunt and how we respond to different sounds.

Learning Objective

- To understand how sound travels in longitudinal waves.
- To explore how different species use sound waves.
- To explore how we experience sound and how it impacts humans.



Key Science

There are sources of sound all around us in the world and we experience lots of different sounds every day. Sound is a form of energy that travels through the world via vibrations. Sounds are created by an object vibrating which causes the air molecules around it to start vibrating. This vibration is then passed along in a sound wave. The amount of energy determines how loud the sound is going to be. The louder the sound is, the more energy it carries. Sound waves move through particles in our world, which means they can travel in solids, liquids and gases. Sound energy will travel out until the energy is lost as heat energy or absorbed into solids, liquid and gases. Sound waves can interact with each other causing interference. This is when two or more sound waves combine with each other. This can be constructive, where the waves match up and amplify each other, or destructive, where the waves don't align and cancel each other out.

Many different species use sound waves. Dolphins and Bats use sound waves for echolocation. Different animal species can hear different ranges of sound. Humans can hear sound waves with a frequency of 20-20,000 hertz, whereas dolphins and bats can hear up to 200,000 hertz, which allows them to hear much higher pitched sounds. Echolocation is where the animal sends out a high pitch sound wave into the air or water. This sound wave then bounces off different objects and other animals back towards the first animal. The animal receives the reflected wave and creates a sound picture in its head depending on the received wave. This tells the animal what their wave has reflected off and allows them to find food when it's otherwise difficult to find it.

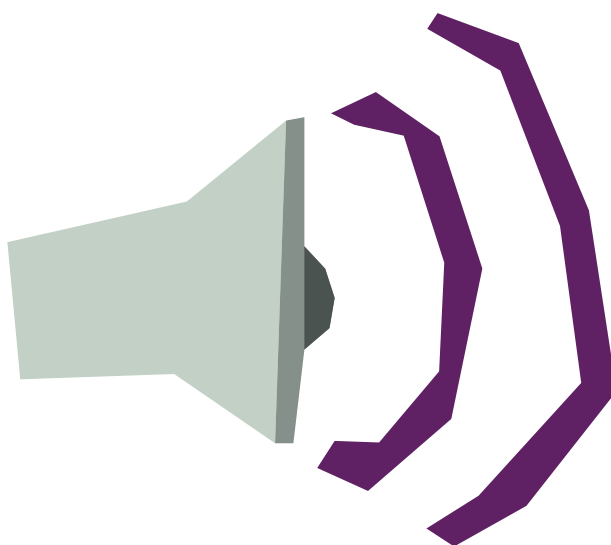
Humans decode sound using our ears. The sound wave travels through the air and into our ears which then communicate with our brain to decode the sound. Different sounds affect humans differently, we may find some sounds pleasant or unpleasant, but they also impact our health. High pitch sounds are linked to increases in stress and can increase our heart rate. We often find sudden loud noises anxiety making also increasing stress. Sounds don't just affect us negatively as pleasant sounds can lower our heart rate and help us relax. Music has a whole range of positive impacts and can make us feel a wide range of emotions.

Curriculum Links

- Identify how sounds are made, associating some of them with something vibrating
- Recognise that vibrations from sounds travel through a medium to the ear
- Recognise that sounds get fainter as the distance from the sound source increases

Key definitions

- **Vibrating** – Something that moves back and forth.
- **Sound Wave** – The way sound travels. A wave of squeezing and spreading out of particles.
- **Pitch** – The pitch of a sound is how high or low the sound is. This corresponds to how “much they vibrate” or “little they vibrate” the vibrations are. Lots of vibration = high pitch.
- **Volume** – How loud or quiet a sound is. The louder something is, the more energy the sound has.
- **Cacophony** – A lot of sounds together.
- **Particle** – A small building block that makes up everything in our world.
- **Frequency** – How many waves occur within 1 second.
- **Decibel** – Measurement of sound loudness (energy).



Activity 1 – How do sound waves move? (5 minutes)

Overview

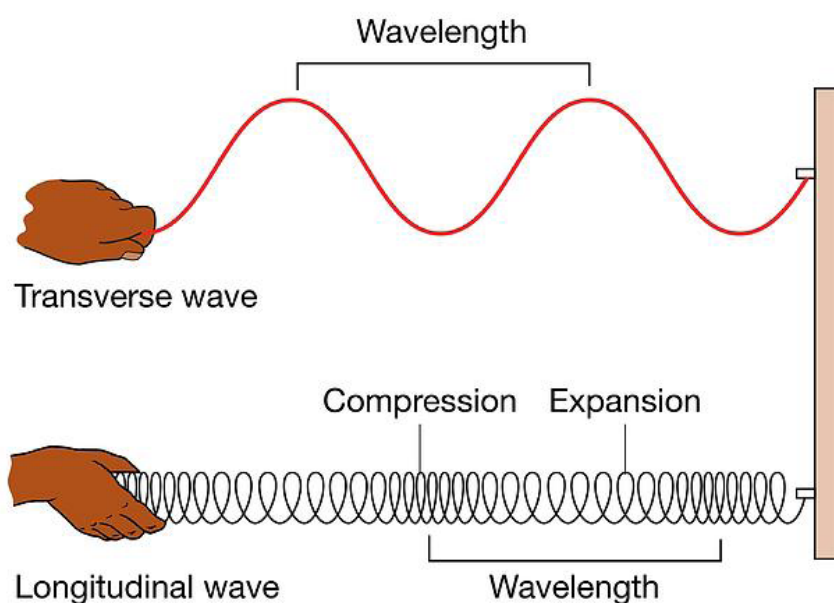
Use a slinky to introduce different kinds of waves! You can wiggle them up and down, side to side, for transverse, or back and forth for longitudinal waves. Sound waves are longitudinal, but are often represented as transverse waves, which can be confusing. The teacher could draw a longitudinal wave and show how they can be drawn as a transverse wave.

You will need (per group)

- At least one slinky.

Instructions

1. Introduce the class to the idea that sound travels in waves. These waves won't travel like the waves on the sea, instead moving as vibrations through the air. These waves are called longitudinal waves, whereas waves that go up and down are called transverse waves.
2. This can be shown using a slinky. Using two volunteers, or breaking the class into groups. Have two students hold each end of the slinky and stretch it out across a table. Make sure the slinky still has some give to it; otherwise you won't be able to see the wave.
3. Once they've stretched out the slinky, have the students push their end of the slinky one at a time. With each push sent across they should see the coils of the slinky bunch together as the push move along the slinky. This is how the vibration travels through particles.



Activity 2 – How sound changes as it moves through our world

Overview

This activity will explore how we experience different sounds in our world, focusing on how they can be louder and quieter or even interrupted by other sounds. The leader will use the speakers to play different sounds, and the students will have to identify where these sounds are loudest and quietest.

You will need

- 2 speakers.
- Tape/stickers of different colours.

Instructions

1. Set up two speakers at the front of the class. Explain to the class that you'll be playing some sounds at different volumes. You want the class to explore the sounds and tell you where they sound loudest and quietest. Give the students each a piece of tape that they will use to mark locations.
2. First, using only one speaker, play a louder sound – which has a higher energy. Ask the students to stand and mark where they think the sound is quietest. This should be the furthest place away from the sound as the sound will have spread out and been absorbed by other things in the classroom.
3. Then, play a quieter sound. Again ask the students to find where it is quietest but they can still hear it. This should be closer to the speaker, as the sound has less energy it will spread out and be absorbed faster. Ask them where it will be loudest – this will be as close as possible to the speaker.
4. Have the children collect all the tape/stickers. We can tell how close the source of a sound is often by how loud it is, however this can be more difficult when there are multiple sounds, especially if they are quite similar.
5. This time, using both speakers (placed a couple of metres apart), play the same low note. Have the children move around the room – half looking for the loudest spots and half looking for the quietest spots.
6. The class should find spots where it is much quieter or much louder. This is caused by wave interference. Where the waves intersect they either amplify each other (constructive interference) or cancel each other causing very little or no sound (destructive interference).

Take it further

Using the tape, see if you can map out all the different points where the sounds are louder. Does it form a pattern?

Activity 3 – Echo-Locations and Bats

Overview

This activity will be exploring how bats use echolocation and sound waves to hunt. Through playing a game where one person acts as a bat and other students are moths, the students will see how sound can be used by a different species to hunt.

Game Rules

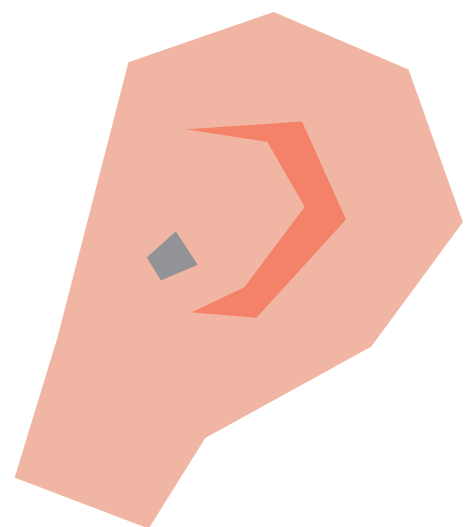
In this game, one student will be the bat, while the rest of the group will be moths. The bat player will put on the blindfold to simulate flying around at night. Every turn in the game, the bat player will shout “Bat” to simulate the sound wave being sent out, and the moth players will shout moth to simulate the sound wave bouncing back. Both bat and moth players can then take one step. The game goes on until the bat has caught one moth and then they swap roles.

You will need

- Blindfolds.
- Cones.

Instructions

1. Mark out areas for the students to play in using the cones.
2. Get the students in groups of five and give each group a blindfold.
3. Explain to the rules of the game to the class and give them a go.
4. If you want to make it more challenging you can increase the number of bats or have the some of the moths whispering back.



Activity 4 – Sound survey

Overview

In this activity, the students will be exploring the school site to see what different sounds they can find. The sounds we are exposed to have a huge effect on our emotions, our cognition and how much stress we experience. The students will be exploring how the sounds in their school affect them.

You will need

- Sound survey proforma.
- Pencils.
- Paper.
- Timer.

Instructions

1. Get the students into groups, and give every student a copy of the sound survey.
2. Have the students visit selected areas around the school site. This is up to the leader, but we would recommend the classroom, the library and the outdoor space.
3. As they fill out each site they should fill in a survey card for it. Once they have visited each site bring the class back together in the classroom.
4. Ask the students to share what they like about the sounds and what they didn't. Do they like the level of noise in each space? Did they one they preferred over others?
5. See if you can come up with a ranking of the different spaces in the school.



Activity 4: Sound survey

Location:

How loud is it?

Very loud

☐

A little loud

☐

A little quiet

☐

Very quiet

☐

What noises can you hear?

Do you like the sounds here?

Yes

☐

No

☐