TEACHING NOTES

BREAKING IT DOWN
with Dr. Michelle Dickinson

SCIENCE OF SOUND

Welcome to Breaking It Down with Dr Michelle Dickinson.

This worksheet is to help support your teaching after your students have watched the 'Science of Sound' episode. It contains a summary of the science knowledge, experiment instructions, topics for further inquiry, and links to the NZ curriculum at levels 3-4.

Use this sheet alongside the video for the Science of Sound episode of "Breaking It Down with Dr Michelle Dickinson" to help with your teaching around the science of sound and sound waves. During the episode, Dr Michelle Dickinson will cover how sound is made and some properties of sound waves, talk to marine scientist Dr Craig Radford from the University of Auckland about underwater sounds, and conduct an experiment which students can follow along with.

For this session, your students will each need:

- **Elastic band**
- **Piece of card**
- **Sheet of thin plastic or baking paper**
- **String**
- **2 x metal spoons**
- **Tape**
- **Small, light particles e.g. salt, pepper, sugar etc.**
- **Bluetooth speaker or mobile phone**
- **Notebook and pen to write down their observations**

Achievement Aims	Learning Outcomes
NZ Curriculum Strand: Physical World **Physical inquiry and physics concepts:** Explore, describe and represent patterns and trends for everyday examples of physical phenomena, such as movement, forces, electricity and magnetism, light, sound, waves and heat.	• Understand that sound is a form of energy generated by a vibration • Understand that sound travels as a wave to reach our ears, and that this wave is made of vibrating molecules • Understand some properties of sound including wavelength and frequency • Conduct an experiment to visualise sound waves as vibrations • Conduct an experiment to demonstrate that the properties of sound differ depending on the medium through which the wave travels.

BREAKING IT DOWN:
Science of Sound

Sound is a form of energy produced by a vibration. Sound vibrations travel from their source as waves of vibrating molecules, eventually reaching our ears. The speed of the sound wave changes depending on the material the wave is travelling through. The speed of sound in air is 343 m/s whereas the speed of sound in water can be up to 1480m/s.

Human outer ears are designed to funnel sound waves into the ear canal and eventually to the eardrum, which vibrates. The vibration pattern is converted to nerve impulses in the cochlea inside the inner ear, and from there the auditory nerves take the impulses to our brain, where they are processed as 'sounds.' Human ears can only hear certain frequencies of sound, in the range 20 - 20,000 Hz, but other animals can hear sounds either side of this range.

Just like other wave-forms, sound waves have properties including:

Frequency: number of waves arriving per unit of time

Wavelength: distance between wave peaks

Amplitude: the maximum 'height' (displacement from neutral) of a soundwave.

Different combinations of frequency and amplitude give sound its pitch and volume.

EXPERIMENT INSTRUCTIONS

Experiment 1: Seeing Sound

- Roll your card into a cylinder around a portable speaker or phone and tape the ends in place.
- Cut a square of plastic or baking paper large enough to fit over one end of the cylinder. Place it over one end and hold in place with the elastic band. Pull the corners to remove creases.
- Sprinkle the small, light particles over the top covering.
- Choose a song with a good drum beat and play through the speaker/phone. Watch your particles and how they move depending on the volume of your song.

Experiment 2: Ringing String

- Tap two metal spoons together and listen to the sound it produces through the air.
- Cut a piece of string about 30cm long and tie one spoon onto the end of the string.
- Wrap the other end of the string around your first finger three times.
- Place your string-wrapped finger into your ear, making sure the spoon dangles freely.
- Tap your other spoon to the dangling spoon and listen to the sound produced.

EXPLORE FURTHER

(Use these prompts to start a discussion or further inquiry on the topic of sound)

- Which waves are faster, sound waves or light waves?
- Other than for hearing things, what else can we use sound waves for?
- How are echoes created?
- Why do different musical instruments sound different?
- What equipment can be used to detect sound?

FURTHER EXPERIMENTS & INFORMATION

Visit The Wonder Project for more STEM learning projects.

Make a xylophone with water glasses. Demonstrate frequency with a skipping rope

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