

# ACET Junior Academies'

## Scheme of Work for Science

### Big Idea – Electricity, Sound & Light

#### Year 4 – Sound



#### **About this unit:**

##### **PoS – Sound**

This topic introduces students to sound. They will be learning about what sound is, and how it behaves. This is the only place that sound appears on the Primary Programme of Study. It is not a stand alone unit, as it ties in with many of the scientific concepts the students have been learning. Students will be grouping objects and sounds, and using key terms to justify their choices in the same way that they have done in most of their Y4 units.

Some potential issues to be aware of when teaching sound include mention of particles, and of waves. Sound 'waves' are longitudinal waves, which have different characteristics to the transverse waves of light and water. Most diagrams/images of sound waves that you will see are actually representations of them on a screen. It is best to avoid mention of waves unless a student has a particularly good understanding of particles and their properties – and even then care should be taken not to imply that they are like waves in water and light. Students can have a good understanding of sound, and explore its properties in depth, without any mention of waves.

Challenge – by the end of this term you need to make a class/group orchestra/band that can actually play a tune together, on instruments you have made yourselves.

#### **Unit structure**

This unit is structured around six science enquiries:

1. What are good vibrations?
2. How do we hear?
3. High or low?
4. How far away can sound be heard?
5. What music did the Vikings make?
6. Can you make music?

#### **Links to previous and future National Curriculum units**

Y1 – Human body & senses

Most of the Y4 units involve classifying and using key terms, which is again the focus here

Music

KS3 & 4 Physics

<b>Enquiry 1: What are good vibrations?</b>			
<b>Links to previous learning</b>	<b>Scientific skills</b>	<b>Assessment criteria</b>	<b>Curricular links</b>
Y4 – grouping and classifying. Using key terms	EA – Identifying, grouping & classifying	<b>Can your children:</b> <ul style="list-style-type: none"> <li>- Describe how to make three different sounds</li> <li>- Justify their choices for grouping objects</li> </ul>	<b>Horizontal:</b> Music  <b>Vertical:</b> KS3 & 4 Physics
	Asking questions		
	Making predictions		
	<b>Observing</b> and measuring		
	<b>Key concepts:</b>		
	Sounds can be made in different ways.		
	We have to be able to give reasons for putting things into groups.		
<b>Key terms</b>		<b>Common misconceptions</b>	
Sound, vibration, high, low, loud, quiet			
<b>Suggested activities</b>		<b>Resources</b>	<b>Useful links</b>
<p>Make some sounds! Find objects that make sounds – think of as many as you can – they don't have to be musical</p> <p>GROUP them – how would the students group the objects (not the sounds) – review Autumn 1 and think of reasons for grouping them.</p> <p>Illustrate that sound is linked to vibrations – take a video of guitar strings being plucked, and slow it down. Show rice on the surface of a drum moving when the drum is hit. Get a large tank of water/sink and get a student to clap their hands under the surface – it causes significant vibrations. Explain that the same thing happens to air when we clap our hands.</p> <p>Students can explain what part of an object vibrates when different sounds are made – do you hit it and make it vibrate? Pull it and let it go? If you blow through it, what is vibrating?</p>			

Enquiry 2: How do we hear?			
Links to previous learning	Scientific skills	Assessment criteria	Curricular links
Y4 – grouping and classifying. Using key terms	EA – Comparative/fair testing	<b>Can your children:</b> <ul style="list-style-type: none"> <li>- State that sound can travel through a solid, liquid and air</li> <li>- Explain why they should plot a line graph of their results to the scratching investigation</li> </ul>	<b>Horizontal:</b> Music Maths – continuous data <b>Vertical:</b> KS3 & 4 Physics
	Asking questions Making predictions Observing and measuring <b>Interpreting and communicating data</b>		
	<b>Key concepts:</b> Sound can travel through solids and liquids as well as through air. ‘Changing distance’ is continuous data, and should be displayed as a line graph.		
Key terms		Common misconceptions	
Sound, vibration, solid, liquid, gas, air, vibrating, distance, further, closer, fair, constant, the same		<i>Sound travels in ‘waves’ – it does, but in longitudinal waves that don’t look/act like ‘typical’ waves. Unless a student has an excellent understanding of particles (and often when they do) this can be confusing to them. It’s important that they understand that an object causes the air to vibrate, and that this vibration is felt in our ears.</i> <i>Sound travels <b>fastest</b> through solids, then liquids, then air – students often think that sound can’t travel through solids and liquids. The vibrations in air are quite small, so they don’t get passed to liquids and solids very well – no need to teach this, but it may help to correct a misconception.</i>	
Suggested activities		Resources	Useful links
<p>Get the students to cover their ears, and make a soft noise by using something they can see vibrating – a guitar string or a drum. They can’t hear you because they have blocked the vibrations in the air from reaching their ears (remind them that the air vibrates like water does when you clap it). <i>They don’t need to be aware of particles to understand this.</i></p> <p>Can you hear underwater? <i>See misconceptions.</i> It would be ideal if this is the term for swimming lessons – get them to experiment, or ask them to do it when they’re swimming or in the bath – you may not be able to hear a voice underwater, but you CAN hear lots of other things. Discuss whales and dolphins, and how they communicate over long distances.</p> <p>Can you hear through a solid? <i>Review states of matter, and the properties of substances in different states.</i></p> <p>Stand at the opposite end of a desk from a student. Scratch the surface very softly, and ask whether they can hear it. Then ask them to put their ear flat against the surface – they should now be able to hear it very clearly.</p>		Guitar, drum, other vibrating instruments. Inside a piano if possible  Yoghurt pots or similar String	<a href="http://images.scholastic.co.uk/assets/a/7b/9a/activity-sheets-victorians-2-578219.pdf">http://images.scholastic.co.uk/assets/a/7b/9a/activity-sheets-victorians-2-578219.pdf</a> Yoghurt pot telephone

Students can investigate this in pairs – how far away from each other can they be before they can't hear the scratching? Point for discussion – is it possible to make the 'scratching' the same volume each time? Opportunity for measuring and recording.

Maths – continuous data

Or students can make yoghurt pot walkie talkies. They should understand that sound travels down the string. They can 'troubleshoot' their own constructions if they don't work (they often don't – but it's good science to work out why) – is there enough contact between the pot and the string?

Does the string have to be tight? Does it work around corners?



Enquiry 3: High or low?			
Links to previous learning	Scientific skills	Assessment criteria	Curricular links
Y4 – grouping and classifying. Using key terms	EA - Pattern seeking  Asking questions Making predictions Observing and measuring <b>Interpreting and communicating data</b>	<b>Can your children:</b> <ul style="list-style-type: none"> <li>- Recognise the difference between a high pitched sound and a low pitch</li> <li>- Link the difference in pitch to the size of an instrument</li> </ul> <i>GD – link pitch with speed of vibration</i>	<b>Horizontal:</b> Music  <b>Vertical:</b> KS3 & 4 Physics
	<b>Key concepts:</b>		
	Larger instruments tend to make deeper/lower sounds. Slower vibrations of an object lead to deeper/lower sounds		
Key terms		Common misconceptions	
Sound, high, squeaky, low, deep, vibrations, fast, slow, big, small			
Suggested activities		Resources	Useful links
<p>Operation Ouch – this clip illustrates how our vocal cords produce sound, and it also introduces the concept of different vibrations with high/low pitch.</p> <p>Students should look at pictures of different instruments, and listen to the sounds they make:</p> <p>Double bass, cello, viola, violin; Flute, piccolo; Tuba, cornet; Different guitar strings.</p> <p>They should identify the properties of instruments that make deep sounds, and those that make high sounds.</p> <p>Explore how they can make high and low pitched sounds with their voices, and with a rubber band 'guitar'. Explain what it is they do to raise and lower the pitch.</p> <p><i>Greater depth can relate this to our vocal cords and how we use them. What are the differences between the vocal cords of different people?</i></p>		<p>Instruments of different sizes – real examples if possible, video clips if not</p> <p>Guitar or other instrument where the strings are visible vibrating</p>	<p><a href="https://www.youtube.com/watch?v=GDzclZDdxqs">https://www.youtube.com/watch?v=GDzclZDdxqs</a> – operation ouch</p>

Enquiry 4: How far away can sound be heard?			
Links to previous learning	Scientific skills	Assessment criteria	Curricular links
Y4 – grouping and classifying. Using key terms	EA – Pattern seeking  Asking questions Making predictions <b>Observing and measuring</b>	<b>Can your children:</b> <ul style="list-style-type: none"> <li>- Describe the relationship between distance and sound</li> <li>- Choose cm, m and km appropriately when estimating distances</li> </ul>	<b>Horizontal:</b> Geography – local mapping Maths – estimating distances Music  <b>Vertical:</b> KS3 & 4 Physics
	<b>Key concepts:</b>		
	The further away a sound is made, the more difficult it is to hear. When we estimate a distances, we need to decide which unit is the best to use.		
Key terms		Common misconceptions	
Sound, distance, far, close, km, m, cm			
Suggested activities		Resources	Useful links
<p>How far away can a sound be heard? Go outside and sit silently for 30 seconds/1 minute. Make a note of all the sounds you heard. Estimate how far away each sound you heard was, and put them in distance order. You should find that you heard more sounds closer to you than further away. Discuss how any sounds you heard from outside the school grounds would have been loud sounds, in order for you to reach them.</p> <p>How far away can we hear things? Discuss whales again – show how far loud sounds can travel in water.</p> <p>Make (or find) a map of the local area around the school. If you stood outside the school gates and shouted, how far would the sound travel? What about if you clapped? How far away can you hear the school bell? What about a police siren outside the school gates? Ice cream van?</p> <p>The students should be encouraged to estimate distances in m and km.</p> <p>They could go outside and investigate a reasonable distance away that you can hear a shout, or someone talking.</p>		A map of the area around the school (1-2km radius)	

Enquiry 5: What music did the Vikings make?			
Links to previous learning	Scientific skills	Assessment criteria	Curricular links
Y4 – grouping and classifying. Using key terms	EA – Research	<b>Can your children:</b> <ul style="list-style-type: none"> <li>- Describe how and why the Vikings made music</li> <li>- Suggest what sort of sound an instrument would make, and explain why</li> </ul>	<b>Horizontal:</b> History Music  <b>Vertical:</b> KS3 & 4 Physics
	<b>Asking questions</b> Making predictions Interpreting and communicating data		
	<b>Key concepts:</b> The Vikings made music in a variety of ways, and for different reasons. Predict what sort of sound an instrument would make, and give reasons.		
Key terms		Common misconceptions	
Sound, vibrations, big, small, loud, soft, quiet, high, low, pitch			
Suggested activities		Resources	Useful links
Investigate the music of the Vikings, the instruments they used, and what they were used for/when they were used.  Can the students tell by looking at the instruments what sort of sound they made?			

Enquiry 6: Can you make music?			
Links to previous learning	Scientific skills	Assessment criteria	Curricular links
Y4 – grouping and classifying. Using key terms	EA – Problem solving  Asking questions Making predictions <b>Evaluating</b>	<b>Can your children:</b> <ul style="list-style-type: none"> <li>- Describe how their object makes sound, in terms of vibrations.</li> <li>- Was their instrument perfect for the task? What changes could they make <b>and why?</b></li> </ul>	<b>Horizontal:</b> Music  <b>Vertical:</b> KS3 & 4 Physics
	<b>Key concepts:</b>		
	All sounds are made by an object, or part of it, vibrating. When we have used science to solve a problem, or design something, we should evaluate it.		
Key terms		Common misconceptions	
Sound, vibrations, big, small, loud, soft, quiet, high, low, pitch			
Suggested activities		Resources	Useful links
<p>Students need to design an instrument of their own – they need to be able to explain what vibrates to make the sound. Before they begin, they should decide whether their instrument is going to make high pitched sounds, or low pitched sounds. <i>GD students could be told that their instruments need to sound a certain way –e.g. your instrument has to be quiet and high pitched.</i></p> <p>Students should draw their instruments, and show how they make sound, and why the sound is high or low.</p> <p>Try and make a band – they don't have to play a melodic tune, but the class could make a band that you can 'conduct'. They can work together to plan what order different instruments will be played in.</p>			