Science Year 4 Autumn 2 (LTP) **Sound**

Domains
Energy

Animals Including Humans	
Prior Learning	**Future Learning** Children do not need to be taught this year
Year 1 Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)	KS3 • Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. (KS3) • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. (KS3) • Sound needs a medium to travel, the speed of sound in air, in water, in solids. (KS3) • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. (KS3) • Auditory range of humans and animals. (KS3) • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. (KS3) • Waves transferring information for conversion to electrical signals by microphone. (KS3)
In Year 4 NC Objectives	
• Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Recognise that sounds get fainter as the distance from the sound source increases.	
Key Learning	**Possible Evidence of Secure** (Shows understanding of a concept using scientific vocabulary correctly)

A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively. Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.	• Can name sound sources and state that sounds are produced by the vibration of the object • Can state that sounds travel through different mediums such as air, water, metal • Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it • Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder • Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases
Common Misconceptions	**Vocabulary**
Some children may think: Pitch and volume are frequently confused, as both can be described as high or low. Some children may think: • • sound is only heard by the listener • • sound only travels in one direction from the source • • sound can't travel through solids and liquids • • high sounds are loud and low sounds are quiet.	Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation Enquiry vocabulary: question, answer, explore, prediction, equipment, biology, chemistry, physics, enquiry, comparative, fair tests, relevant questions, scientific enquiry, differences, similarities, changes, careful observation gather, record, classify, present, systematic, accurate measurements construct, interpret, evidence, conclusion improve
Sticky Knowledge	**Key Questions**
• Sound travels from its source in all directions and we hear it when it travels to our ears. • Sound travel can be blocked. • Sound spreads out as it travels.	• How can you change the volume of a sound? • How does the size of an ear trumpet affect the volume of sound detected? • How does the type of material affect how well is blocks a sound?

• Changing the shape, size and material of an object will change the sound it produces. • Sound is produced when an object vibrates. • Sound moves through all materials by making them vibrate. • Changing the way an object vibrates changes it's sound. • Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. • Faster vibrations (higher frequencies) produce higher pitched sounds	• How does thickness of material affect how well it blocks a sound? • Which materials vibrate better and produce louder sounds? Can we identify any patterns? • Which materials make the best string telephone components? (tin cans, paper cups, plastic cups, wire, cable, string, plastic or elastic – predict and test) • How does length of the tube (when making a straw oboe) affect the pitch and volume? • Can you predict the relative pitch of tuning forks from the patterns of ripples they make in the water?

Pre-Topic Assessment Resources

Explorify – filter for y3-4 and Forces - *Odd one Out, What's Going on?*
Explore, Engage, Extend (EEE) by PSTT:
– Copy of activity instructions
-Cards downloaded from website https://www.pstt.org.uk/eee-resources
-Copy of Challenging Misconceptions

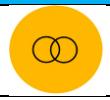
Working Scientifically (Apply knowledge in familiar related contexts, including a range of enquiries)	**Possible Evidence of Secure**
• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions	• Can explain what happens when you strike a drum or pluck a string and use a diagram to show how sounds travel from an object to the ear • Can demonstrate how to increase or decrease pitch and volume using musical instruments or other objects • Can use data to identify patterns in pitch and volume

- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

Highlighted yellow = main focus during this topic

Pupils could work scientifically by:

- Classify sound sources.
- Explore making sounds with a range of objects, such as musical instruments and other household objects.
- Explore how string telephones or ear gongs work.
- Explore altering the pitch or volume of objects, such as the length of a guitar string, amount of water in bottles, size of tuning forks.
- Measure sounds over different distances.
- Measure sounds through different insulation materials.

Fair/Comparative testing-	Identify & Classify	Observation over time	Pattern Seeking	Research
				
Which material is best to use for muffling sound in ear defenders? Are two ears better than one? How does the volume of a drum change as you move further away from it? How does the length of a guitar string/tuning fork affect the pitch of the sound?		When is our classroom the quietest?	Is there a link between how loud it is in school and the time of day? If there is a pattern, is it the same in every area of the school?	How does the volume of a drum change as you move further away from it? How does the length of a guitar string/tuning fork affect the pitch of the sound?

How Science Ideas Have Changed Over Time

How has our understanding and use of ultrasound changed over time?
Since the 1800s, how has science helped people who are deaf?

Assessments	Key Scientists
TAPS • Investigating Pitch • String Telephones **Concept Cartoons** See document and choose relevant cartoons	**SOTSOG** **Aristotle** (Sound Waves) **Alexander Graham Bell** (Invented the Telephone)

Linked Texts	Science Capital	Maths
Horrid Henry Rocks *(Francesca Simon)* ***Moonbird*** *(Joyce Dunbar)* ***The Pied Piper of Hamelin*** *(Natalia Vasquez)*	JH will speak to the classes about how our ears hear sound- linked to SSC and children with impaired hearing in our school.	Frequency chart, counting Venn diagrams, labels, simple tables Tally charts, picture graphs, pictograms, Carroll diagrams, bar graphs Introduce time graphs, classification keys, line graphs

Planning Resources

PSTT
ASE
Standing on The shoulders of Giants SOTSOG (PSTT)
Hamilton Trust
Ogden Trust
Explorify

Lesson Plans

Session 1: Identify how sounds are made, associating some of them with something vibrating.

Retrieval activity	Recall- what are the 5 senses? What parts of our bodies do we use? https://www.bbc.co.uk/cbeebies/watch/super-senses-song
Lesson	Think about the sounds we might hear around the school. Which places might be the noisiest? Which places might be the quietest? (see ppt) Go on a sound walk around the school and make a note of all the sounds we can hear. Are they loud? Soft? What is the source? Return to the classroom and, in groups, look at various different instruments. Can they explain how their instrument makes noise? Does it need to be hit, shaken, blown, scraped, plucked? Each child should play their instrument one at a time so the rest of the class can hear them. Can they help them out in explaining how it makes noise? Ask for feedback about which sound they like the most – why? Is it because it's loud, soft, interesting? Look out for any chn already using terms such as pitch or volume. Chn to write down in their books what they find out about each instrument.
Key vocabulary	Sound, source, vibrate, vibration, travel, volume, faint, loud
Differentiation	SEN- use picture prompts and vocabulary to help them record Display key vocab.
Assessment	Can you describe the sound you hear? How do you think the sound is made?
Session 2:	
Retrieval activity	Play a game. Children sit silently, head resting on their desk, eyes shut. Explain that if they are tapped on the shoulder they should knock gently on the table. The rest of the class should then, without looking, point in the direction of the source of the knocking sound. Chn hold their 'points' and open their eyes, are they all pointing in the same direction? Repeat a couple of times. How did we know where the sound was coming from? JP (SSC) to bang the tables.
Lesson	**Draw me a picture on your books to show me how you think the sound got from the tapping to your ears**. (Do in books to support assessment) Demonstrate putting a tuning fork in a bowl of water- what do chn notice? How could we investigate how sound travels using these pieces of equipment? On different tables, set up various investigations to explore how sound travels.(see separate sheet) Make a whole class explanation about how sound is made. Use a piece of string to support explanation. 1 child to play an instrument / make a sound. Use a piece of string to show the sound wave. When they make the sound, wiggle the string to model the sound travelling to the children. When they make a quieter sound, wriggle the string less. When the sound is louder, wriggle the string more. Record explanations in pictures and put on topic board.
Key vocabulary	Sound, source, vibrate, vibration, travel, volume, faint, loud
Differentiation	SEN- pictures to help children record their ideas

Assessment	Can you describe how the sound is made? How do you think the sound reaches your ears?
Session 3: **Recognise that vibrations from sounds travel through a medium to the ear.**	
Retrieval activity	https://www.bbc.co.uk/bitesize/topics/zgffr82/articles/zstr2nb#z84xb82 https://explorify.uk/en/activities/whats-going-on/rice-and-rhythm Recall that sound is made by vibrations travelling through the air to our ears.
Lesson	Discuss whether sounds can travel through solids, liquids and gases. Children go outside into the playground and investigate tapping different materials (wood, metal etc.) and seeing if they can hear the sounds when they put their ear to the end. Make wire telephones with cups and string to investigate how the sound travels along the string/ wire (see Hamilton Trust planning) Select 1 child from each table to strike the tuning fork against the side of the desk and gently place the vibrating end on the water in the centre of the bowl. The others around the table should watch and explain what they could see. Repeat until each child has had a turn with the tuning fork. Explain that the tuning fork is vibrating and the ripples move outwards from the sound source (the fork). This is how sound travels, by causing the particles around the vibrating source to vibrate, which in turn vibrate other particles, sending a ripple away from the vibrating sound source (more details in Teacher Notes). We usually hear sound that has travelled through the medium of air, but it can also travel through solids and liquids HOMEWORK: Bath experiment
Key vocabulary	Sound, source, vibrate, vibration, travel, volume, faint, loud, medium, metal, water, string, wood etc.
Differentiation	SEN- T to support SEN with investigation
Assessment	How does the medium affect the sound?
Session 4: **begin to understand how sounds change in pitch and volume.**	
Retrieval activity	Concept cartoon: pipes- does travelling through different mediums (e.g.water, metal) affect sound?
Lesson	Alexander Graham Bell- https://www.bbc.co.uk/bitesize/topics/zxwxvcw/articles/z4vp7nb Watch the video and discuss what AGB discovered. Link to our investigation with string telephones from last week. All children to take an instrument from a selection (see Allow 1 minutes to 'play' to get it out of their system. make a quiet noise with their instrument. Stop

	make a loud noise with their instrument What did they have to do differently to make a louder noise? Hit it harder, blow it harder, pluck it more firmly? Compare two similar instruments: A large drum and a small drum. What do you notice about the sound they both produce? What do you notice about the size of the drum? Introduce the idea of pitch (link to Ukulele). Has anyone heard of it before? The size, length and tightness of the object that is vibrating will affect the pitch of the sound it produces **Plenary:** **https://www.bbc.co.uk/bitesize/clips/zsqw2hv** **Bottle blowing:** • A collection of bottles with different amounts of water in them. • Blow across the neck of the bottles and discuss the pitch of the note produced. Children to draw / write an explanation of how to change pitch.
Key vocabulary	Pitch (High, low)
Differentiation	Does the size of the instrument affect the pitch? GD: Use a concept cartoon about pitch to explain their ideas. SEN: Put instrument pictures in order of pitch, low to high
Assessment	
Session 5: **understand how we hear sounds, link with hearing impaired children**	
Retrieval activity	Show different bottles (ppt)- can they put the pictures in order of pitch high to low. Why did they choose to do that? https://www.bing.com/videos/search?q=musical+bottles&&view=detail&mid=28FCA58B48B3758CE7C628FCA58B48B3758CE7C6&&FORM=VRDGAR&ru=%2Fvideos%2Fsearch%3Fq%3Dmusical%2Bbottles%26FORM%3DHDRSC4
Lesson	Ear demonstration with JH (science capital) Watch https://www.youtube.com/watch?v=mptjEoHF2aI Dr Binocs How Your Ear Works? Twice Pupils create ear and describe how it works- link to knowledge so far about sound as vibrations travelling through the air.
Key vocabulary	Ear drum, cochlear, anvil, ear canal, auditory nerve, vibrations, travel
Differentiation	SEN- oral explanation- T to write on post-its/

Assessment	How does our ear hear sounds? Can you describe what happens in people who are hearing impaired?
Session 6: **Consider how sounds change in pitch and volume.**	
Retrieval activity	https://www.youtube.com/watch?v=3v5Bdd398LY
Lesson	Assessment- TAPS pitch investigation (see folder)
Key vocabulary	Pitch, sound, vibration, volume
Differentiation	Adult to scribe pupil voice for LA
Assessment	Can you tell me how the sound changed? What did you do to change the sound? How did you make the sound?

Session 7: **Consider how sounds change in pitch and volume.**	
Retrieval activity	https://www.youtube.com/watch?v=3v5Bdd398LY - watch video again. Did anyone have an explanation to explain why when you blow in the bottle and when you tap the bottle the pitch changes? Quiz (see ppt in folder)
Lesson	Odd one out- assessment activity. Children explain which is the odd one out using key vocabulary. How is the sound made? Can the pitch be changed? How? Can the volume be changed? How? https://explorify.uk/en/activities/odd-one-out/sounds-like-science
Key vocabulary	Pitch, vibration, volume
Differentiation	Adult to scribe for LA- pupil voice

Assessment	Can you tell me which instrument is the odd one out and why.
Session 8: **Find patterns between the volume of a sound and the strength of the vibrations that produced it.**	
Retrieval activity	Quiz
Lesson	https://explorify.uk/en/activities/whats-going-on/the-sound-of-silence- discuss the different volumes of the different birds in flight. https://www.bbc.co.uk/bitesize/topics/zgffr82/articles/zqtdpbk https://explorify.uk/en/activities/problem-solvers/make-sound-louder - in groups, children use different equipment to try and make their voices louder. They need to consider how they will test their equipment. In books- draw a picture of their amplifier and explain how it works
Key vocabulary	Volume, amplify, vibration, amplify, sound waves (energy), travel
Differentiation	Working in mixed-ability pairs Adult to support SEN
Assessment	Can you explain how your device works to amplify sound? How did you test it? Was it a fair test?
Session 9: **Use data loggers to measure sound**	
Retrieval activity	Drum concept cartoon
Lesson	In groups, children go to different parts of the school and measure the sound there using the data loggers.
Key vocabulary	Volume, amplify, vibration, amplify, sound waves (energy), travel
Differentiation	Working in mixed-ability pairs Adult to support SEN
Assessment	
Session 10: **To understand that sound travel can be blocked. To design a fair test to compare the insulating propeties of different materials (linked to DT & ICT)**	
Retrieval activity	

Lesson	In groups- children design a way to test different materials for their sound insulating properties using the data loggers.
Key vocabulary	Volume, insulate, vibration, sound waves (energy), travel, block Resources: sound source (stereo), red data loggers, ipads, egg boxes, curtain material, felt, card, paper, foil, polystyrene
Differentiation	Working in mixed-ability pairs Adult to support SEN
Assessment	Can you explain how you made sure your test was fair? Which material worked best? Which didn't? How do you know?