



Medium Term Plan

Energy - Sound



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P levels

Performance attainment targets (P scales) and performance descriptors are used for pupils aged 5 to 16 with special educational needs (SEN) who are working below the standard of the national curriculum tests and assessments. PSTT recognises that the national curriculum levels used in this document are no longer current. We have had so many requests to return these materials to the website that they remain in the documents as a guide for those who have used them in the past. The written statements may be useful to others as an indication of children's development. For further information about P levels see:

<https://www.gov.uk/government/publications/p-scales-attainment-targets-for-pupils-with-sen>

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Primary Science Teaching Trust recommends that a full risk assessment is carried out before undertaking in the classroom any of the practical investigations contained in the plans.

Safety Note

PSTT advises teachers to refer to either CLEAPSS website or SSERC website for up to date health and safety information when planning practical activities for children.

Big Questions

- What sort of sounds can we not hear?
- Can some animals hear better than us?
- Why is it harder to hear when our head is under water?
- Are sounds and noise the same?
- Why can nobody hear you scream in space?
- Can you see and feel sound?

Learning Objectives

Pupils will have opportunities:

- To explore making sounds
- To explore how sound travels

Quick review activities

- Play guess the sound
- How many different sounds can you make with your body? A particular instrument/ everyday objects?
- How many quiet / loud sounds can you make?
- Play 'Pass the Instrument/ object ' and each pupil has to make a different sound on it

Answers

- We hear sounds at frequencies 20-20,000 Hz. We cannot hear sounds lower (infrasonic) or higher than this (ultrasound).
- Yes, bats can hear ultrasonic sounds with frequencies of 110,000Hz and elephants can hear sounds lower than humans.
- When you are under water sound bypasses the bones of your middle ear and travels through the mastoid bone (behind your ear) to get to the inner ear.
- When the wave form of the vibrations traveling through air/water repeats itself regularly, a sound is heard. When the waveform is unrepeatable and irregular we hear noise.
- In space there is a vacuum so no particles to transfer the vibration to the ear.
- You can see the effects of sound but cannot see a sound wave. You can feel a sound wave because they travel through whatever they encounter, including your body.

Vocabulary relevant to this topic

- Sound- a longitudinal wave transmitted through a medium such as a gas, liquid or solid (particles vibrating in same direction as the traveling wave).
- Emit- to give off
- Vibration- a movement back and forth which is sometimes too fast to see or regular shaking movement
- Db- Short for decibels. Unit of loudness.
- Db meter- a device used to measure the number of decibels when a sound is made.
- Loudness- how loud / volume.
- Sound wave- how sound travels.
- Pitch- how squeaky. High pitch=very squeaky sounds.
- Wavelength- the distance between one sound wave and the next.
- Speaker- an electrical device which produces sound waves by vibrating back and forth.
- Collide- to bang together
- Echo – heard when sound bounces back
- Distance, loud, quiet, squeaky, ears, noise

Background information about this topic

- Sounds are only produced when material vibrates. The object which is vibrating and producing the sound wave is called the source. When the object vibrates, we say that a sound has been emitted. Sound travels as a wave. The vibration of the source causes air particles to move back a forth and collide with each other. One particle hits another and then the second particle hits another (like a chain of dominoes) and this is how sound travels from the source to our ears. Sound waves radiate out from the

source in all directions, getting softer because the vibrations are smaller.

- Sound travels through solids, liquids and gases. Sound has to have something to travel through so in outer space sound cannot be heard because there are no particles to carry the sound. Sound travels faster through a solid because the particles are close together. Sonar equipment was able to be invented because sound travels through liquids.
- The squeakiness of a sound is called the pitch. High pitched sounds are very squeaky. When a sound is so high pitched that we can no longer hear it, we call this ultrasound. The pitch at which we can still hear a sound generally decreases with age. The pitch (frequency of a sound wave) is the rate at which the sound waves go back and forth. Small or short instruments vibrate quickly and give a high note but large or long instruments vibrate slowly and give a low note. Some instruments have vibrating strings and others have vibrating air. Bottles with lots of water in only have a small amount of air to vibrate and so make a higher note than bottles with less water.
- We can use a device called a Db meter to measure how loud a sound is in Decibels. Sounds which are over 85Db can cause permanent damage to the ears. The number of Dbs decreases as we move further away from the source.
- Sound can also be reflected and sometimes produce a discernible echo. Hard, solid surfaces are best for reflecting sound waves and soft surfaces for absorbing sounds. Sound waves would be of no use unless animals could detect them. Some animals like bats use echolocation to hunt with. Our ears detect vibrations and process them so we can hear. The outer ear collects the sounds and directs them to the ear drum which is a thin, stretched membrane. The eardrum vibrates causing small bones in the ear to also vibrate and then finally fluid in the cochlea. The vibrations in the cochlea are picked up by nerves which transmit a message to the brain and the brain interprets it. Humans hear frequencies of 20-20,000Hz.
- A device called a signal generator can be attached to a speaker and an oscilloscope. The signal generator will tell the speaker what sort of sound to make. Adjusting the knobs of the signal generator can make the loudness louder / quieter and higher/ lower pitched. The oscilloscope produces a picture on its screen showing what the sound wave would look like. The wave will have more vibrations (up and downs) if the sound is a higher pitched one.

Energy - sound P1-3

Objective 1: To explore making sounds

Descriptions of intended outcomes at different levels of attainment

- Is present during the experience but shows no or just reflex response (P1i)
- Shows a random fleeting response to the experience (P1ii)
- Shows a more consistent response to the experience (P2i)
- Shows more consistent and differentiated response to the same experience (P2ii)
- Begins to communicate intentionally e.g. shows likes or dislikes of sounds (P3i)
- Actively explores using all sense with support (P3ii)

Energy - sound P1-3

Objective 1: To explore making sounds

<p>Possible Activities:</p>	<p>Resources:</p>
<p>Experience a variety of sounds using appropriate sound effects from familiar objects in the classroom Using talking tins to record and playback vocal sounds Experience auditory activities in the sensory room Experience making sounds with parts of the body as a story or poem is read e.g. We're Going on a Bear Hunt by Michael Rosen and Helen Oxenbury</p>	<p>Familiar objects that make noises in classroom. Talking tins: Sensory room</p>
<p>Optional activities you might like to try include:</p>	<p>Resources:</p>
<p>Experience sounds made by musical instruments – vary the loudness. Use TACPAC activities to link touch and hearing Experience sensory toys/ objects that make sounds</p>	<p>Musical instruments TACPAC: https://tacpac.co.uk/</p>
<p>Experience a variety of sounds using appropriate sound effects from familiar everyday sounds e.g. car revving: door closing Use additional TACPAC activities</p>	

Points to Note:

Some pupils are intolerant of some sounds

Energy - sound P1-3

Objective 2: To explore how sound travels

Descriptions of intended outcomes at different levels of attainment

- Encounters a range of sensory evidence e.g. vibration and changes in sound with distance (P1i)
- Allows themselves to be involved in the sound activities (P1ii)
- Changes body language in a more sustained way in response to sound experiences (P2i)
- Communicates consistent preferences for certain sounds or vibrations (P2ii)
- Anticipates the sound event positively or negatively e.g. covers ears before sound happens (P3i)
- Chooses the equipment they want to use e.g. what to put in the tin to roll or activity they want to do e.g. which vibration they want to experience first (P3ii)

Energy - sound P1-3

Objective 2: To explore how sound travels

<p>Possible Activities:</p>	<p>Resources:</p>
<p>Experience being moved away from and then moved towards a sound</p> <p>Experience sounds made by rolling different objects inside cylindrical containers. Try on different surfaces and rolling towards and away</p>	<p>Object to make a continuous sound e.g. alarm clock, CD player, large tins with lids (e.g. catering coffee size), coins, beans, marbles,</p>
<p>Optional activities you might like to try include:</p>	<p>Resources:</p>
<p>Experience sounds when ears are covered with hands or other materials</p> <p>Experience covering a noisy toy or similar with different materials</p>	<p>Ear muffs, hats that cover ears, cotton wool, bubble wrap, blankets, coats, noisy toy</p>
<p>Explore vibrations e.g. using a drum or speaker with rice etc on, hands on throat when making noise, resonance boards, humming through a balloon, toys, tuning forks</p>	

Points to Note:

Some pupils may be hyper sensitive to sounds especially some continuous sounds

Energy - sound P4-6

Objective 1: To explore making sounds

Descriptions of intended outcomes at different levels of attainment

- Imitates actions to make sounds (P4i)
- Explores the objects provided using all senses especially hearing and touch (P4ii)
- Completes a simple task with guidance (P5i)
- Matches sounds and objects (P5ii)
- Responds to simple scientific questions that require a more detailed response e.g. can you find some things that make a loud noise? (P6i)
- Begins to make simple generalisations and connections e.g. reacting appropriately to a warning sound (P6ii)

Energy - sound P4-6

Objective 1: To explore making sounds

<p>Possible Activities:</p>	<p>Resources:</p>
<p>Let children explore making sounds using different musical instruments</p>	<p>Sound producing devices e.g. guitar, harmonica, pan pipes, recorder, noisy children’s toys, bike bells, triangle, egg timer, drum etc. IWB, speakers and access to the internet.</p>
<p>Optional activities you might like to try include:</p>	<p>Resources:</p>
<p>Pupils could attempt to make their own musical instruments using everyday objects. E.g. like the cup girl song from pitch perfect: http://www.youtube.com/watch?v=weqDCGg0GYs</p> <p>Pupils could watch other examples of sound effects such as Larvelle Jones on police academy</p>	<p>IWB, speakers and access to the internet, material / objects to turn into musical instruments (e.g plastic cups, pans, wooden spoons etc.)</p>
<p>Make different sounds behind a screen and ask pupils to select the object that has made the sound from the selection given – vary the number of objects given</p> <p>Match sounds to pictures of animals or household noises or pupils in class http://www.findsounds.com/types.html</p>	

Points to Note:

Some pupils may think that sound is ‘released’ because of human action

Be aware of potential choking hazards

Energy - sound P4-6

Objective 2: To explore how sound travels

Descriptions of intended outcomes at different levels of attainment

- Follows a simple step by step procedure e.g. outing padding in box with clock (P4i)
- Communicates awareness of some obvious changes e.g. to sound or vibration (P4ii)
- Responds to a simple scientific question e.g. Is this shaking (vibrating)? (P5i)
- Tries resources with increasing independence e.g. making vibrations (P5ii)
- Begins to show an awareness of treating things in the same way e.g. filling the box with whichever material (P6i)
- Makes sensory based comparisons e.g. by bouncing to show different levels of vibration (P6ii)

Possible Activities:	Resources:
<p>Pupils play statues where they only move when music is being played.</p> <p>Pupils explore how distance affects what they hear e.g. go outside and listen to far away and near to sounds OR move away from a sound being made in the hall and stop when they can't hear it</p> <p>Demonstrate how objects vibrate when making a noise and let pupils try for themselves e.g. loud speaker (with netting removed) and ping pong balls/ rice or simply a drum with dried peas/ rice on it. If a microphone is attached to the loudspeaker then pupils can make different noises and see how this affects the movement of the ping pong balls.</p>	<p>Music, object to make sound, access to hall or large space</p> <p>Loudspeaker attached to a microphone if possible, ping pong balls, rice, drum, drum stick ,dried peas,</p>

Energy - sound P4-6

Objective 2: To explore how sound travels

Optional activities you might like to try include:	Resources:
<p>Pupils listen to sound effects from: http://www.findsounds.com/types.html They then mimic the sound and where possible have a body movement to match with the sound. The 'people' section would be good for this.</p> <p>Explore how to stop / reduce sound e.g. clock ticking by padding in different materials in a box. Use strips of tape to measure how far away from the box they are when they can no longer hear clock. Then try padding and measure the lengths again. Display and compare the tapes</p>	<p>Boxes, clocks, tape to use for measuring, materials to pad with such as cotton wool, bubble wrap, fabrics, 'peanut' packaging, vermiculite</p>
<p>Pupils try to sneak up on the teacher but they can only move when the music is playing and the teacher is not looking.</p> <p>Demonstrate vibrations again using a speaker and rice as music is played to see what happens. Pupils could role play and pretend that they are the 'rice' when the music is played. Extend by bouncing higher when the volume is louder and bouncing less when volume is turned down.</p> <p>Experience vibrations in different situations e.g. objects like resonance boards and wind chimes. Try tuning forks on different surfaces and put ears to surface. Touch tip to water or bring close to a suspended ping pong ball. Hum against a balloon and another pupil touches the other side. Try when filled with water and see the difference.</p>	



Energy - sound P4-6



Objective 2: To explore how sound travels

Points to Note:

Pupils often think that sound moves in one direction to the ears or that sound travels through gaps in doors and windows

Pupils need to be careful not to collide too hard and hurt each other.

Energy-sound P7-8

Objective 1: To explore making sounds

Descriptions of intended outcomes at different levels of attainment

- Begins to respond to encouragement to repeat or modify tasks (P7i)
- Indicates their best result e.g. best filling for shaker (P7ii)
- Suggests a way to improve their approach e.g. try a different material, shake it a different way (P8i)
- Begins to arrange objects in order e.g. from loudest to softest (P8ii)

Possible Activities:	Resources:
<p>Pupils take part in a 'making a storm activity' [insert link to resource] Each student has a role and uses their voice / body to make noises. The roles all put together make the noise of a fierce storm; a narrator tells the story to match with the sound effects. The sketch can be recorded and played back to the class.</p> <p>Investigate which filling makes the best shaker.</p> <p>Explore what happens to the sound when</p> <ol style="list-style-type: none"> different bottles have different amounts of water in and you blow across the neck of the bottle different lengths of rulers are twanged by altering the amount overhanging the table. Adult to hold in place blowing down cardboard tubes of different lengths 	<p>The storm roles document, video cameras.</p> <p>Small container, fillings like rice, sand, lentils, beads, coins, etc. Identical bottles, water, rulers – various, cardboard tubes</p>

Energy-sound P7-8

Objective 1: To explore making sounds

Optional activities you might like to try include:	Resources:
<p>Go on a sound walk round school. Close eyes to really listen to sounds. Ask questions like: Can you hear sounds made by people? Not made by people? From a road? Quiet sounds? Loud sounds? Unusual sounds?</p> <p>Make different sizes of ear trumpets and explore what they do to hearing. Link to animals with big ears.</p> <p>Look at words that imitate the sounds(onomatopoeia) hiss, rustle, chirp, growl, buzz, glug and practice saying words and exaggerating the sounds.</p>	<p>Card, sellotape,</p>
<p>Play sound lotto – vary the number/ types of sounds</p> <p>Explore the percussion sounds made by kitchen objects – metal, wooden, plastic. Hang them from a horizontal piece of dowel and hit them. Ask questions as appropriate e.g. which make loudest sound? Highest sound? Lowest sound?</p> <p>Pupils can try different ‘drumsticks’ to see if it makes a difference.</p>	

Points to Note:

pupils may think that we can only hear one sound at a time.

Energy-sound P7-8

Objective 2: To explore how sound travels

Descriptions of intended outcomes at different levels of attainment

- Matches pictures of sound waves to picture on screen (P7i)
- Makes a simple recording of their findings e.g. photos of cornflour on speaker (P7ii)
- Describes changes seen in sound activities when asked (P8i)
- Records results simply on prepared chart (P8ii)

Energy-sound P7-8

Objective 2: To explore how sound travels

Possible Activities:	Resources:
<p>Teacher uses a USB microphone and makes noises which produce a sound wave picture on the computer screen. Try humming from high to low pitched sound to a high pitched one so that pupils can see how the picture changes. Teacher can describe wavelength as the number of times the wave goes up and down. Pupils can clasp their fingers together so that their arms form a 'u' shape. When they lift their arms up, they will form an 'n'. Pupils move their arms up and down to mimic the peaks and troughs of a sound wave. They move to mimic a sound made by the teacher e.g. teacher makes a really high pitched sound and the pupils move their arms up and down really fast.</p> <p>Also see video clip of Amazing sound and water http://www.youtube.com/watch?v=uENITui5_jU</p> <p>Take pupils into the hall and blindfold them. Make sounds all round the hall and ask if they can hear it. Next make a noise in the middle of the hall and get them to move to different parts of the hall – can they still hear it. Make the point that sound travels in all directions.</p> <p>Investigate the best material to stop sound travelling e.g. a ticking clock or musical box or phone ring tone.</p>	<p>USB microphone and the frequency program installed onto the teacher computer. Blindfolds, materials e.g. bubble wrap, cotton wool, packaging 'peanuts', fabrics, container to put object in, ticking clock or musical box or phone or similar</p>

Energy-sound P7-8

Objective 2: To explore how sound travels

Optional activities you might like to try include:	Resources:
<p>Teacher uses a USB microphone and makes noises which produce a sound wave picture on the computer screen. Try humming from high to low pitched sound to a high pitched one so that pupils can see how the picture changes. Pupils select a card to match the image on the screen. Also pupils could make a sound to match the card.</p> <p>Find out if sound travels through materials e.g. tie string to a metal coat hanger and hold string to ear whilst coat hanger is tapped or hits the wall: put ear to ground or desk with or without a tuning fork: hold a watch onto a balloon: ring a bell under water with pupils under water too or fill balloon with water and hold watch onto it.</p> <p>Try humming and touch body to see where vibrations are strongest e.g. face, head, lips, throat, chest</p>	<p>USB microphone and the frequency program installed onto the teacher computer. Prepared pictures of sound waves for the pupils to match / act out, metal coat hanger, string, balloon, tuning fork, watch.</p>
<p>Pupils can watch the clip from bang goes the theory where the corn flour mixture is placed on a speaker and made to 'dance': http://www.youtube.com/watch?v=2CJJ6FrfuGU Or better still try for yourself! Pupils can record what happens at different volumes using photos.</p> <p>Pupils investigate the circus of equipment which makes noises and try to point to which part of the equipment they think is moving. We want the pupils to grasp that sounds are only made when there is a movement (vibration).</p>	

Points to Note:

Pupils may not make any connection between sounds and what is on the screen
 Some pupils will not wear blindfolds

Energy-sound L1-3

Objective 1: To explore making sounds

Descriptions of intended outcomes at different levels of attainment

- Uses digital meters to take measurement with help (L1i)
- Observes increases or decreases in sound levels (L1ii)
- Presents evidence in simple provided templates (L1iii)
- Spots when a test is unfair (L2i)
- Presents evidence in an ordered way (L2ii)
- Uses simple scientific vocabulary to describe observations (L2iii)
- Says what they are keeping the same or changing to make a fair test (L3i)
- Makes accurate whole number measurement (L3ii)
- Constructs tables that have quantitative units and appropriate headings (L3iii)

Energy-sound L1-3

Objective 1: To explore making sounds

<p>Possible Activities:</p>	<p>Resources:</p>
<p>Pupils use Db meters or data loggers to measure how loud various areas around the school are. Can they find the noisiest place? Quietest place? Anywhere with no noise? Pupils use Db meters to measure the loudness of a sound e.g. air horn / bike bell.</p> <p>Adult sounds an air horn and pupils measure how loud it is. Then repeats at different distances e.g. 5m, 10m, 15m, 20m and so on. Pupils should write down the distance and the loudness of the sound.</p> <p>Investigate which containers make the loudest drum. This can be used to construct a fair test by changing the type of container, material they stretch across, tautness of material.</p>	<p>Db meters or data loggers, pre-prepared table for pupils to write their results into (L1), air horn. Range of containers and lids e.g. ice cream tubs, margarine tubs, biscuit tins shoe boxes Materials to make drum skin e.g. balloons, plastic bags, tracing paper,cling film, elastic bands, sellotape</p>
<p>Optional activities you might like to try include:</p>	<p>Resources:</p>
<p>Pupils could use the Db meters to record the loudness of headphones attached to an MP3 / phone at different volume levels. Pupils should be told that anything over 85Db could cause permanent hearing loss and levels below this can damage the ears.</p> <p>Investigate if the tightness of an elastic band makes a difference to the sound. Use different sized pencils to increase the tightness of the band</p>	<p>MP3 / phone, headphones, Db meters/ data loggers. Rigid containerse.g. baking tins, solid plastic cubes, elastic bands, pencils</p>

Energy-sound L1-3

Objective 1: To explore making sounds

Investigate which materials make the best ear defenders. Put materials into 2 plastic beakers which are held over the ears and pupils walk away from a sound till they can no longer hear it. Distances are recorded and compared.

Or pupils measure a sound and then measure it again with a material over the probe of the Db meter.

Find out about jobs where ear defenders have to be worn

Points to Note:

Pupils may think that it is easier to hear loud noises.

Pupils may confuse high and low sounds with soft and loud

Safety awareness:

Extremely loud noises (>85Db) could cause damage to the ears.

Energy-sound L1-3

Objective 2: To explore how sound travels

Descriptions of intended outcomes at different levels of attainment

- Experiences different ways to answer questions e.g. fair test, observations, looking for patterns (L1i)
- Uses senses or simple equipment to make observations (L1ii)
- Identifies links in science to everyday context e.g. the mosquito or sound pollution (L1iii)
- Draws on their observations and ideas to offer answers to questions about how sound might travel (L2i)
- Makes comparisons between features of objects that make sound or prevent sound travelling e.g. materials with air in stop sound best (L2ii)
- Ranks results in order e.g. for best materials to reduce sound pollution or lets sound travel through (L2iii)
- Considers different ways to find the answer to the question e.g. can you hear round corners (L3i)
- Selects equipment from that provided to carry out an investigation (L3ii)
- Presents data / findings in tables and then in a bar chart (L3iii)

Energy-sound L1-3

Objective 2: To explore how sound travels

Possible Activities:	Resources:
<p>Pupils listen to a signal generator attached to a loudspeaker. The oscilloscope can be used so that the wave is visible to the pupils. All pupils and staff take part. Participants all stand up. The teacher gradually increases the pitch of the sound and participants sit down when they can no longer hear the sound. Who sits down first? Younger pupils should be able to hear higher pitches for longer. It might help for pupils to have ages written on mini white boards and teachers perhaps to give an age range. Pupils sequence their mini white boards so that the participant's results are lined up in order of age. The results can then be transferred into a table.</p> <p>Pupils need to know that sound travels as a wave. The teacher and a student can mimic the movement of a sound wave by both of them holding onto and flicking up and down a piece of rope.</p> <p>Pupils watch the video clip about how sound travels: https://www.bbc.com/bitesize/clips/ztwkjxs</p> <p>Pupils can then role play where they pretend to be particles colliding with each other as the sound moves from the source to an ear (the teacher's) Investigate what makes the best string telephone e.g. type of 'cup', type of string, length of string, thickness of string.</p>	<p>Signal generator, oscilloscope, loud speaker, some pupils and staff from other classes, mini- white boards and pens, plastic cups and/or clean safe tins, various types of string, scissors</p>

Energy-sound L1-3

Objective 2: To explore how sound travels

Optional activities you might like to try include:	Resources:
<p>Pupils can watch a clip from bang goes the theory where a sound wave produced by a vortex is strong enough to knock over a brick house: http://www.youtube.com/watch?v=lyAyd4WnvhU</p> <p>Find out if sound travels through materials e.g. tie string to a metal coat hanger and hold string to ear whilst coat hanger is tapped or hits the wall: put ear to ground or desk with or without a tuning fork: hold a watch onto a balloon: ring a bell under water with pupils under water too or fill balloon with water and hold watch onto it. Extend by trying other objects on the end of the string</p> <p>Investigate if you can hear round corners</p> <p>Investigate if the type/ note of the tuning fork or the material it is placed on makes a difference to the distance you can hear it from.</p>	<p>IWB, speakers and access to the metal coat hanger, other objects e.g. different types of spoons, string, balloon, tuning fork, watch. Tuning forks, different surfaces e.g. sole of shoe, carpet, hard table, cushion, tape measures or tape to record length as non standard measure</p>
<p>Pupils watch: http://www.youtube.com/watch?v=K0Ps01yzG08 about the use of ‘mosquitos’ to stop antisocial behaviour. Organise a visit from a guest speaker such as a police man / shop keeper to talk about the use of a ‘mosquito’ to deter antisocial behaviour.</p> <p>Investigate the best way to cut down sound pollution from a buzzer. How do they think they could do this? Ask them how to make it a fair test? How can they measure the loudness? (e.g. sound sensor or could make a scale of noise to compare to)</p>	



Energy-sound L1-3



Objective 2: To explore how sound travels

Points to Note:

Pupils can think that if we can't hear a sound then the sound is not there and also that adults can hear more than children.

Safety awareness:

Ensure electrical equipment is PAT tested.

Be sensitive to those pupils who may have hearing impairment.