



SOUND INSULATION - INVESTIGATING WHICH MATERIALS ARE GOOD INSULATORS



Equipment:	<p><i>Activities 1 and 2:</i> Variety of materials for testing (e.g. cotton wool, shredded paper, tissue, bubblewrap, polystyrene, plasticine, etc.), sound source (e.g. ticking clock, keyboard, buzzer), along with:</p> <p><i>Activity 1:</i> plastic or polystyrene beakers</p> <p><i>Activity 2:</i> box – shoebox or similar</p>	
Suggested Class Level:	Senior	
Preparation:	<p>Gathering of materials</p> <p>It would be helpful if the DPS Activities ‘Strange Sounds’ and ‘String Telephone’ had been carried out prior to this activity.</p>	
Background information:	<p>Sound is a vibration – it needs something to pass on these vibrations (unlike light which can pass through a vacuum). Some materials allow sound pass through them very easily, especially hard rigid ones like metals. Other materials, especially soft ones like cotton wool, absorb sound. Ears are delicate and need to be looked after. They can easily be damaged in various ways: by very loud sounds especially if over a long time; by poking things in them; through old age or some disease. Most pop stars wear ear plugs.</p>	
Trigger questions:	<p>What was one of the main things that you noticed about the World Cup in South Africa, apart from the football? <i>(The sound of the vuvuzelas! These are plastic horns.)</i></p> <p>Some people may have enjoyed this sound, but can you think of any sounds that really annoy you? <i>(Neighbours using electric drill in the night!...)</i></p> <p>How do you think you could block out loud sounds? <i>(Put hands over ears, wear ear protection...)</i></p> <p>In what sort of jobs should people protect their ears? <i>(People using power tools, miners using explosives, rock bands ..)</i></p> <p>Is it always good to block out all sound? <i>(No, you cannot hear traffic or other possible dangers if you completely close off to the outside world).</i></p> <p>Where are insulators used to reduce noise (i.e. sound-proofing)? <i>(e.g. newsroom in RTE; some floors if sounds of footsteps are not desirable).</i></p> <p>What sort of stuff do you think would block out (or absorb) sound the best?</p> <p>LET’S INVESTIGATE!</p>	

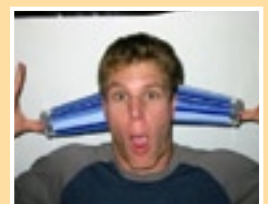




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Content:	<p>SCIENCE: Energy and Forces: Sound Materials: Properties and Characteristics Living Things: Human Life</p> <p>MATHS: Number: Ordering, operations (averages) Measures: Length, Area Data: Represent data</p>
Skills:	Predicting, Investigating, Observing, Analysing
Cross - curricular links:	SPHE - Health and Safety Noise pollution
Science Activities:	<p>Introduction: Before doing the sound insulation activities the children should investigate (<i>or be reminded</i>) how sound travels differently through different things – better through solids than through the air - e.g. :</p> <p>(i) by one person tapping the desk and their partner listening to the loudness, firstly just normally and then with his/her ear up against the desk. What do they notice? (<i>Sound travels better through wood than through air</i>).</p> <p>(ii) ask the children to put their right index finger about 5 cms. from their right ear, and then scratch that finger with their left index finger. Note the sound it makes. Then ask them to put their right index finger onto their right ear and scratch again with the left finger. What happened to the sound? (<i>It got louder</i>). (<i>See also DPS Activity booklet 'Strange Sounds' and 'String Telephone'</i>).</p> <p>Activities: The children are asked to devise ways of reducing the loudness of the sounds using different materials. Firstly they should predict which of the available materials will absorb sound the best, by looking at, feeling them, etc. Giving reasons for their predictions should be encouraged.</p> <p>The following are suggested methods:</p> <p>Activity 1: Making simple ear protectors: The children put the available materials inside the beakers to make simple ear protectors; then place them carefully beside their ears (CARE!: nothing should go into the ears).</p> <p>The children should be helped to appreciate the need for fair testing (e.g. the same amount of filling in each beaker); then perhaps walk away from the sound in each case until they cannot hear the sound any more. The distances could be measured and recorded.</p> <p>Which materials did they think kept out sound the best? How would they describe the materials which absorbed sound the best?</p>





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Activity 2: Wrapping up the sound source in different materials:

Place the sound source (e.g. ticking clock) inside a box and measure how far away they go until they do not hear it any more. Measure this distance and record it. Repeat and take the average. They then repeat this, packing different materials round it in turn, and recording the distance each time.

Remember fair testing:

“What will we keep the same?” (*The loudness of the sound source*); “what will we change?” (*The material*); “what will we measure” (*the distance*).

Children are then asked which material they felt would absorb sound best. They can then be asked to describe these materials and why they think they might be good absorbers.

More Maths:

1. Cost of ear plugs:

A company called ‘Sshush’ sells 5 pairs of earplugs for €5, and 15 pairs for €9.

- (a) How much would you save on each pair by buying the larger quantity?
- (b) If there is a 10% reduction in the January sales, how much would you pay then for (i) 5 pairs (ii) 15 pairs?



2. Speed of sound:

Sound travels at a speed of 341 metres per second in air.

- (a) It travels 4.3 times faster in water. At what speed does it travel in water?
- (b) If there is loud blasting in a quarry, how long would it take for the sound to be heard in a village 5 kilometres away? (*There are no mountains in-between to block out the sound – just flat land.*)



Safety:

CARE WITH EARS – NOTHING SHOULD BE PUT INTO THE EARS.

Follow-up activities:

- 1. The children could bring in various materials from home, (e.g. J-cloths, socks, leaves) and compare their own “stuffed plastic cups” with those of their friends.
- 2. Design and make a simple pair of ear muffs to insulate against noise.

Children Can:

Compare having a conversation with a friend through an ordinary window and through a double-glazed one. Can they predict and then explain why it might be different? (*It is harder to converse through a double-glazed window because there is no air between the two panes of glass to pass on the vibrations*).



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Find out what they use on the floors and walls of TV newsrooms to absorb sounds that are not wanted.

Explore the floor surfaces in school or at home (e.g. wood, carpet, tiles...) to see which of them are good insulators of sound. This can be done by walking in noisy shoes or dropping something small (e.g. a pencil) on the different surfaces and compare the loudness of the sounds.

Did You Know?

Rabbits and dogs hear well because they have large ears which collect up sounds very well. We can hear better if we give ourselves 'bigger ears' by cupping our hands over our ears or by using a funnel to listen through.

The vuvuzela was originally used in South Africa to summon distant villagers to attend community gatherings.

Loudness of sound is measured in decibels. Listening to sounds of 90 decibels (like the sound of a train) or more can damage your ears if you do it often. *(You will learn more about this at second level).* Jet aircraft, thunder and walkmans or maybe ipods at mid-volume are all above this level.

Astronauts communicated with each other on the moon using radio waves. There is no air to pass on the sound vibrations in the normal way.

Foam rubber blocks are often used for sound-proofing because they contain many empty spaces in them, so sound does not pass through them easily. Household items such as egg boxes and popcorn are quite good for soundproofing also!

Useful reference:

Primary Curriculum: SESE: Science Teacher Guidelines, p. 95
(Sound Insulators)

