

SOUND - SOUND PROOFING (Absorbing/Reflecting)

SENSOR(S) - Internal Sound

- INVESTIGATE**
- Sound can travel through or be absorbed by a variety of materials and this effects the loudness
 - Investigate properties of materials and their uses



INTRODUCTION TO THE INVESTIGATION

The loudness of a sound can depend on how far we are away from it. If we find ourselves in a loud environment we could always move away from the source so that it does not effect us; this is not always practical though since you cannot move a house away from a noisy road or a person operating machinery often needs to be next to it e.g. road drill. This is where special materials can come in useful to help ABSORB or REFLECT the noise.

We are going to use the Explorer and its in built sound sensor to test a range of different materials to see which help reduce or stop noise from a source reaching the sound sensor. Using our data we then need to decide which would be best to sound proof a room and which could be used to help protect a workers ears from machinery noise.

The loudness of a sound is the amount of sensation produced when sound waves reach the ear – the loudness of a sound is therefore subjective as it depends on the sensitivity of the ear. The loudness of a sound is most commonly measured in DECIBELS (dB) however it can also be measured in phons which take into account that the ear is not equally sensitive to sounds at all frequencies (the optimum frequency for the human ear is around 1kHz – the frequency at which most babies cry).

The Explorer sound level sensor uses a special measurement which more closely mimics the way your ears interpret sound (this measurement is often referred to as dBA - 50dBA = a quiet talk, 100 dBA = loud band). If you double the level of sound it only shows a 3 dB increase so that a 100 watt stereo system is only 3dB louder than a 50 watt system. When using the sound sensor in the Explorer it should be treat in the same way that you would a microphone, in that you avoid excessive movement or knocking of the unit as this handling noise could be recorded. If using Explorer's built in snapshot facility make sure you operate the green button gently rather than tapping it heavily as the button sound could affect the results - wait for the display to return to showing the sensor values before making changes to the experiment.

SOUND - SOUND PROOFING (Absorbing/Reflecting)

RESOURCES

- Explorer datalogger, datalogging software, computer, LogIT computer link cable
- Constant sound source e.g. electronic keyboard, radio not tuned to a station (i.e. 'hiss'), battery & buzzer
- A range of different materials to place in front of the sound source or sensor. A good mix of materials should include soft/hard, light/heavy, thick and thin. This is particularly important when trying to decide which materials to use for different tasks e.g. sound proofing a room or making ear defenders.

WHAT TO DO

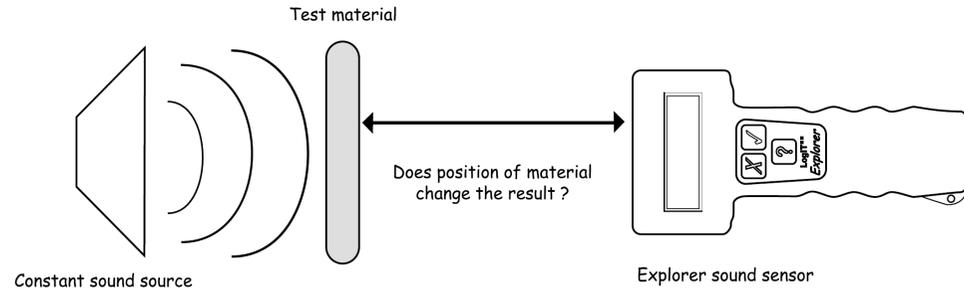
- Connect the Explorer to the computer and run the datalogging software. Set up the snapshot facility of the software (if available). **
- Think about which materials to try out. Discuss which materials the pupils think will block the most sound and which will let the most pass ?
- Place the Explorer at a fixed distance from the sound source (remember fair testing). ++
- Turn on the sound source.
- Press the snapshot button for the software and note down the first reading was without material
- Choose a piece of material and write down its description so that when you come to view the graph you know which point on the graph refers to which piece of material.
- Place the material between the sound source and sensor at a predefined place (remember fair testing).
- Press the snapshot button for the software
- Repeat this for each piece of material to be tested.
- When finished print and save the results - decide on the best way to show the results.
- Discuss and/or write up the findings and whether they matched the predictions.

** If computers are limited, or if your software does not support snapshot, the same investigation can be carried out using the Explorer's remote snapshot facility which is selected by using the blue button. Results can then be downloaded to a computer.

++ You will need to find a sound source that will not change too much - perhaps use an electronic keyboard and play the same note with the same volume setting or tune a radio to background hiss. If there are other groups in the classroom doing the same investigation care must be taken that they do not pick up each others sounds. You will have to decide at what distance to place the material from both the sound source & sensor.

SOUND - SOUND PROOFING (Absorbing/Reflecting)

DIAGRAM



SAFETY



- Prolonged exposure to high noise levels (e.g. of 90dB or more) can result in permanent damage to your hearing.
- If used outside shield sensor from wind and ensure that no liquid contacts any of the datalogging equipment or cables.

ABOUT THE RESULTS

- Did placing material in the between the sound source and Explorer sound sensor change the level ?
- Did it matter how close the material was to the source (fair test) ?
- Was it a fair test ? - think about other sources that sound could have come from.
- How could it be made a fair test - design a way of blocking background noise, check distances.
- Did hard material effect the sound differently from soft ?
- Was care needed in 'aiming' the sound sensor at the sound source ?

EXTENSION ACTIVITIES

- Investigate whether it matters how close the blocking material is placed to the sound source or sensor.
- Which material would be best to sound proof the classroom ? - make a model and test it by using the Explorer.
- Think about noise pollution.
- Study the difference between noise in the school, by roads and in rural areas.
- Monitor and analyse classroom noise for a day
- Monitor traffic noise - do certain vehicles make more noise than others ? Did the noise level change during the day ?