

SOUND - SOURCES OF SOUND

SENSOR(S) - Internal Sound

INVESTIGATE

- How the same type of sound source can produce different levels of sound
- People's perception of sound differs
- That there are many kinds of sound and sources of sound



INTRODUCTION TO THE INVESTIGATION

This investigation enables the pupils to compare the sounds produced by the same type of sound source e.g. look at wind, stringed and percussion instruments. It can also be used to re-enforce work being carried out by pupils looking at the kinds and sources of sounds.

A good starting point is to discuss the types of sounds we hear and go on a listening tour of the school to try and find different sounds and describe them e.g. loud or quiet and then compare them to other sounds e.g. quieter, louder. Also look at different ways of making sound e.g. shake, pluck, bang and blow of instruments and objects – sort a range of instruments or objects by the way you can create sound with them. If possible the pupils can listen to an audio tape of different sounds and try to work out what the sounds are and describe them.

The investigation can also be used to look at how people's perception of how loud a sound is can be highly subjective.

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 treated 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.

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RESOURCES

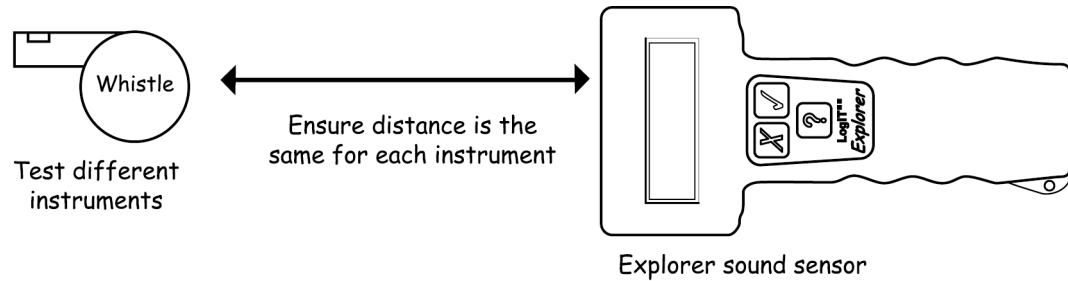
- Explorer datalogger , datalogging software, computer, LogIT computer link cable.
- A range of different containers e.g. plastic drinks bottle, a coffee tin, a jar, a cardboard tube with the ends sealed.
- Some dried rice or similar to put in the containers to create a range of different shakers.
- An alternative to the shakers is to use a range of different musical instruments such as wind instruments e.g. whistle, recorder, harmonica (try to keep the type of instrument the same to ensure fair testing).

WHAT TO DO

- Connect the Explorer to the computer and run the datalogging software.
- Set up the logging facility of the software (if necessary set the logging time span to slightly more than the time it will take to test the chosen instruments).
- Look at the chosen range of sound sources (either shakers or wind instruments)
- Decide which is likely to produce the highest sound level and which is likely to produce the lowest – explain the reasoning.
- Discuss how to make it a fair test – keep each instrument the same distance from the sensor, keep quiet between instrument tests, decide how you play the instrument e.g. how hard to shake, blow or strike.
- Ensure that everything is ready and instruments are easily at hand (make a note of the order that the instruments will be tested).
- Start the software logging.
- Take an instrument and make a single sound as loud as possible e.g. blow, shake or strike hard .
- Repeat for each of the instruments.
- Stop the software logging.
- 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 the same investigation can be carried out using the Explorer's remote logging facility which is selected by using the blue button. Results can then be downloaded to a computer.

DIAGRAM



SAFETY



- Prolonged exposure to high noise levels (e.g. of 90dB or more) can result in permanent damage to your hearing.
- Care should be taken when making or using instruments. Select instruments suitable for the age and abilities of the pupils.

ABOUT THE RESULTS

- Which instrument produced the highest level ?
- Which instrument produced the lowest level ?
- Did this match your prediction ?
- Does it matter how close the instrument is to the sound sensor (fair test) ?
- How does the graph display high levels and low levels – discuss the interpretation of graphs
- Does the graph show the sound as being a quick rise and fall or did the graph peak quickly and then the level slowly drop ? (i.e. was it a fast attack and decay or a fast attack and slow decay or something different ?).

EXTENSION ACTIVITIES

- Change the way the instrument is played i.e. how you pluck the string on a guitar.
- Compare different types of instruments (pluck, blow, strike) and the type of graph they produce.
- Study the difference between noise in the school, by roads and in rural areas.
- Monitor and analyse classroom noise for a day.