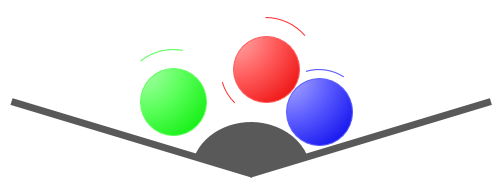
**Speaker vibration**

A loudspeaker vibrates to make a sound.

The ping-pong balls on the speaker jiggle up and down.





**Predict**

What do you think will happen if a louder note is played?

What do you think will happen if a higher note is played?

**Explain**

Explain why you think this will happen.

|  |
| --- |
| **Now watch the demonstration** |

**Observe**

Describe what happens.

**Explain**

Were your predictions and explanations correct?

If not, can you explain what you observed?

*Physics > Big idea PSL: Sound, light and waves > Topic PSL1: Sound and light > Key concept PSL1.1: Production and transmission of sound*

|  |
| --- |
| **Response activity** |
| **Speaker vibration** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Objects and materials can be made to vibrate to produce a sound that becomes louder as the size of vibration increases and higher pitched as the rate of vibration increases |
| Observable learning outcome: | Describe the effect of larger vibrations on a sound  Describe the effect of faster or slower vibrations on a sound |
| Activity type: | Predict, explain, observe, explain - demonstration |
| Key words: | Vibrate, vibration, loud, loudness |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic questions:

* Diagnostic question: Drum beat
* Diagnostic question: High or loud?

**What does the research say?**

In a study of two-hundred-and-sixty 4-16 year old students Asoko, Leach and Scott (1991) it was found that students use of vibrations to explain the source of sound increased with age, but this was also dependent on the context with 80% of students aged 11-16 using vibrations to explain sound when the vibrations were obvious (for example in a string).

There has been relatively little research that has focused on students’ understanding of pitch and loudness. Students however, often confuse the terms high and loud (or low and soft) when describing sounds.

This activity demonstrates to students the link between vibrations and the types of sound that they make and gives them the opportunity to explain these patterns in their own terms. Tear (2011) suggests the students are encouraged to generalise their findings in order to explain new examples more readily.

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on the discussions. It is through the discussions that students can check their understanding and rehearse their explanations.

To begin, each group should discuss the activity and use their scientific understanding, firstly to predict *what* they think will happen, and then to explain *why* they think they are going to be right. If students in any group cannot agree, you may be able to direct them with some careful questioning.

Students now watch a demonstration, and afterwards each group should be given the opportunity to change, or improve their explanation. A good way to review your students’ thinking might be through a structured class discussion. You could ask several groups for their *explanations* and put these on the whiteboard. Then ask other groups to suggest which explanation is the most accurate and the most clearly expressed, and through careful questioning work up a clear ‘class explanation’.

A useful follow up is for individual students to then write down explanations in their own words – without reference to the class explanation on the board (i.e. cover it up).

*Differentiation*

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in the each group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

**Equipment**

For the class:

* Loudspeaker
* Signal generator
* Connecting wires
* Several ping-pong balls

**Technician notes**

* The loudspeaker needs to have a large cone that can fit several ping-pong balls.
* Small pieces of screwed up paper will work, although their jiggling is not as obvious as ping-pong balls.
* The volume should not be turned up so loud that the ping-pong balls fly off, as this supports the misunderstanding that sound is a material substance that moves through air.

**Health and safety**

Mains connections need a visual check before plugging in.

Practical work should be carried out in accordance with local health and safety requirements, guidance from manufacturers and suppliers, and guidance available from CLEAPSS.

**Expected answers**

The bigger the vibration, the louder the sound. Or the smaller the vibration the softer the sound.

The faster the vibration, the higher the sound. Or the slower the vibration, the lower the sound.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: UYSEG

**References**

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