

Common Student Ideas about Sound



Common Student Idea	Scientific Explanation
<p>Sound is contained in the device that is producing the sound and released by human action.</p>	<p>This idea implies that the students believe sound is a type of matter—a substance that can be released from an object. Sound is not matter but a phenomenon that results from a pressure wave. These pressure waves are created by vibrations. Your ear and brain transform the vibrations in the ear drum to the sound that you hear.</p>
<p>Pitch and loudness are the same characteristic sound.</p>	<p>Pitch and loudness are two different properties of sound. Loudness is a human perception of the loudness or quietness of sound. It is related to the amplitude or the “tallness” of the wave. In a pressure wave, louder sounds will have compressions that are more dense (higher pressure) than the compressions in a quieter sound. When we measure the loudness of sound we have to be less subjective so we call it measuring the intensity of the sound. Sounds with greater intensity, transfer more energy. Pitch is not related to the loudness of sound. It is the highness or lowness of sound and is measured as the frequency of sound. Frequency tells us the rate that waves are travelling through matter. Humans can hear sounds with a pitch (or frequency) of 20 waves per second to 20,000 waves per second. Waves per second is often given in the unit, Hertz (Hz). High frequency sound has higher pitch and low frequency sound has lower pitch.</p>
<p>Sound travels only to the intended listener.</p>	<p>Sound waves are often depicted from the source to the listener. However sound waves travel in 3 dimensions as a sphere from the source.</p>
<p>Sound moves between particles of matter (in empty space).</p>	<p>Sound waves only move when matter moves—or rather when the tiny particles of matter move. Atoms and molecules of matter vibrate and create areas of compressed matter (compressions) and areas of uncompressed matter (rarefactions). These pressure waves are the way sound moves through matter. If there is no matter (a vacuum) then sound cannot travel.</p>
<p>As waves move, matter moves along with them.</p>	<p>In a sound wave (a pressure wave), particles of matter move, but only in a defined area. The particles move parallel to the motion of the wave but they move only a short distance and then return to their rest position to move again past the rest position and then come back. In other words, they vibrate. They do not move the full distance that the wave travels.</p>

References:

Making Sense of Secondary Science. Rosalind Driver, 2000.

Children's Misconceptions about Science. A list compiled by the Operation Physics Elementary/middle school physics education outreach project of the American Institute of Physics. Author/editor unknown.