Sound

Can teaching SOUND be this exciting !!!

Humans need energy for various activities, and the need to find alternative sources of energy has pushed the human imagination to new levels. We as a race have started harnessing energy from the sun, wind and even from an atom! Hence studying energy as a topic is an indispensable part of the school curriculum. How energy is transferred and how it interacts with matter has fascinated scientists for a very long time, the objective of studying sound is to make children understand a new form of energy 'sound' and the way it propagates in the form of wave and its influence in our lives. Learning about sound energy helps us harness the energy and open new avenues of energy production.

World without Sound

Children were asked to visualize a world with no sound. After allowing a minute or two, students came up with varied interesting responses.

"We will not have air around us"

"There won't be life around us; no animals or birds"

"It would be like we are living in a desert!"

It was evident from the responses that children have a certain understanding of the concept of sound from their daily lives.. A child seemed to have heard, read or made his own connections with air and sound. However, he was not sure whether sound depended on air or vice versa. This was a good opportunity to build upon his understanding and help him construct the knowledge. Helping children translate their understanding into formal concepts of science would make learning science more enjoyable.

When children were asked how sound is produced, they responded that it is by banging on the bench, or playing an instrument or blowing into a whistle etc. It was from this that the idea 'sound is produced through vibrations' was generated.

Sound needs a medium to travel – This was introduced using a video of the bell jar experiment. The video has three parts. After each part, the video was paused and the children were asked to share what they had observed. The discussion was based on their interpretations. Students observed that:

"Sound of the bell decreases as we close the jar, since there is limited air inside"

"Using a pump, air is being injected inside the jar. So the sound is increasing"

"When the valve is removed, the air is more and the sound increases"

The video helped the children conclude that sound requires a medium to travel. In the absence of a medium, it does not propagate. However, is air the only medium? Does sound travel in water?

"NO! We can't hear any sound under water because there is no air"

Another student said "No but there is air underwater or else how do fishes survive?"

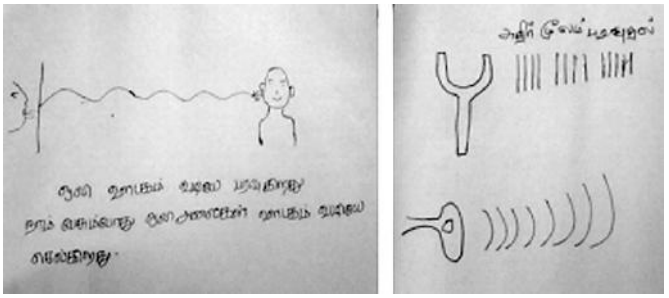

Fig 03 : Student responses on sound propagation

The conversation got heated and there were multiple views going back and forth. As none had experienced or tried it, they were unsure if sound could travel under water. It was later conveyed that just like air, water is another medium and therefore sound travels in water as well. Any medium that has molecules, which vibrate, helps sound propagate.

"Sound" in the Ground

Children were taken to the playground and divided into two groups. They were asked to enact how sound propagates according to their understanding. Children stood in a line, joined their hands and moved their hands like a sea wave as shown in Fig 1. Through this, they were able to learn the characteristics of transverse

Fig 02 : Children simulating sound as longitudinal waves

waves such as amplitude, time-period, frequency and wavelength by making the wave bigger or smaller and slower or faster. However, their understanding of longitudinal waves remained incomplete. Therefore, children were asked to stand in a straight line (Fig 2) and push the person next to them and come back to their original position (without moving from their location) starting from first student to the last student.

Fig 01 : Children enacting Transverse waves

By this, they understood that how longitudinal waves are and it was reinforced that sound propagates as longitudinal waves. Compression and rarefaction in longitudinal waves were demonstrated by changing the distance between the students. This was real fun for the students and they could easily grasp the idea. Learning by doing is more effective This also reinforced the idea that students are much more engaged in the learning process when they are involved in the activity than when they are passive listeners in a lecture method.

After the activity in the ground, children returned to the classroom and were asked to draw the sound wave on a piece of paper. Most of the children were able to draw it and identify the characteristics of the wave.

Funny Sound - While discussing the concept of Echo, it was clear that children were familiar with the phenomenon. To explain how echoes are formed, the example of light rays reflecting from a mirror was used. It was further demonstrated using a plastic slinky. When the slinky is pushed on one side it moves till the end and gets reflected. Echo was defined as reflected sound wave. A numerical problem related to echo was given to the children, which was relatively easy.

The concept of Doppler Effect was demonstrated using a Bluetooth speaker. A single frequency sound was played on it and it was moved to and fro, whirled around using a tag. Children were asked to close their eyes and experience the nature of the sound. When asked what they experienced,

"The sound is changing its loudness, when it is near its loudness is increasing and when it is away from us, the sound decreases" replied a student. This activity helped them visualize the phenomenon and had a great impact on their learning experience.

My reflections :

While reflecting on the classes, it became apparent that students have many different notions regarding 'sound' because there is not a single minute that we live without experiencing it. 'Dialogue' is a vital component in the classroom transaction process to elicit these notions. Students responded that they had thought of sound as just noise, but did not know that there is so much to it until they were made to think on those lines. As a teacher, how do we continuously create such experiences for students to delve deeper into the concept and view it through the lens of science? This is what we need to focus on.

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