

ACTIVITY 3: MEASURE THE SPEED OF SOUND IN AIR

In this activity, students will conduct an experiment to estimate the speed of sound in air. Depending on the space available, this could be done as a whole-class

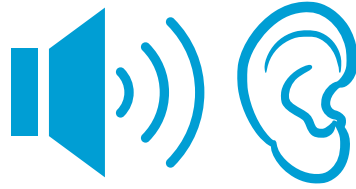


Image Credit: Gary Abud, Jr.

activity or completed in small groups. Begin by asking students if they know the speed of sound in room temperature air. Some may know this fact while others do not. If no one knows, have someone do a quick web search and look it up. Once everyone knows the value (about 343m/s, or roughly 1 mi / 4.7s), ask students to turn and talk with a partner about what this value means. Elicit a few responses from the class. Guide them to focus on the fact that it is a speed of how much distance is traveled for every one second. Explain to them that they will be conducting an experiment to estimate the speed of sound in air today.

Show the QUEST video entitled [Speed of Sound from PBS LearningMedia](#) to the class and ask them to turn again afterward to their partner and summarize what they learned. After eliciting a few summary statements, explain that similarly to how the video showed a comparison between light and sound to estimate the speed of sound, they will perform a similar procedure.

Materials & Setup ([See the setup here!](#))

- wooden blocks
- a stopwatch
- measuring tape or meter stick(s)

First, have one student take the wooden blocks and clap them together for everyone to hear. Ask a student how long did it take between the sound happening and them hearing the sound. (Basically no time at all.)

Ask the class what would happen if the sound were far away. (More time in between making the sound and hearing it.) Ask them what would it mean if there were a 1 second delay between seeing the blocks clapped together and hearing the sound it produced. (That would be the distance the sound traveled in 1 second.) Ask the same question about a 0.5 second delay. (Half the distance sound travels in 1 second.)

Next demonstrate for the class with the student who is clapping the blocks that if they strike the blocks once every second, then you would know something specific about the sound based on where the blocks were in their hands. (Make sure they move their arms far apart between every clap.) Point out that with a frequency of every second, when the blocks are together the sound occurs, when the blocks are far apart that is 0.5 seconds and when the blocks return back together 1 second has passed.

Then, engage them in a discussion of a procedure that would allow the class to measure how far sound travels in 0.5 seconds and then have them extend their thinking to how they could use that to estimate the distance sound travels in air in 1 second. Once a procedure is established, have the class conduct the experiment (at least 5 trials so they can average their measurements) and collect the data to estimate an approximate value for the speed of sound in air.

Last, have them compare their estimated value to the known value of the speed of sound in air. Engage the whole group in a discussion of what made the estimate closer to, or farther away from, the accepted value. How did temperature play a role? How could the procedure be improved for better accuracy in measurement?



distance at 0.5s is used to calculate distance traveled in 1s

Student with stopwatch tells partner to clap the blocks every second on the second as they move away from the observer

They continue moving away until the observer hears the sound when the blocks are seen are farthest apart. That notes the distance the sound travels in 0.5s.