



## UNIT

The 5 Senses  
Elementary 3-5

## TIMEFRAME

20 - 25 minutes

## MATERIALS

Large bowl or  
pot  
Plastic wrap  
Uncooked rice  
Online sound  
meter

# Hearing: Healthy Volumes

## Synopsis

In this activity students will experiment with different sound volumes to better understand healthy limits.

## Learning Outcomes

Students will understand that sound travels in waves and our sense of hearing is delicate. They will be able to identify ways to protect their hearing.

## Background for Teachers

Sound is a vibration that propagates as a wave of pressure transmitted through a solid, liquid or gas. We typically hear sound when the vibrations pass through the ear and are perceived by the brain. The ear has three main parts. The outer ear (the part you can see) opens into the ear canal. The **eardrum** separates the ear canal from the middle ear. Small bones in the middle ear help transfer sound vibrations to the inner ear and **cochlea**, where the vibrations activate small hair cells called **cilia**. The activation of the cilia, causes the release of electrical nerve impulses passed along the auditory nerve. These travel through the brainstem and thalamus to the brain's **auditory cortex** within the **temporal lobe** which interprets those impulses as laughter, music, voice, shattering glass etc. Humans can perceive sound vibrating at frequencies between 20 **hertz (Hz)** and 20,000 Hz. Low pitch e.g. deep voice or tuba, corresponds to low sound frequency vs. a high voice or violin. **Decibels (dB)** measure the intensity of sound. Prolonged exposure to more than 85 dB can cause damage to the cilia and therefore be dangerous to hearing..

## TEACHING TIPS

Some students (especially those on the autistic spectrum) may be sensitive to loud sounds – keep this in mind when deciding which sounds to measure.

## ARIZONA LEARNING STANDARDS

3.P2U1.1

3.P4U1.3

## Activity Instructions

### EarDRUM

- Stretch plastic wrap tightly around a large bowl or pot, place grains of uncooked rice on top of the plastic wrap.
- Use a noisemaker to create a loud "bang" noise near the plastic wrap (hitting a cookie sheet or tray works well)
- The big bang sound causes sound waves that will cause the plastic wrap to vibrate and the rice grains to move, similar to how the ear drum works

### Healthy Decibels

- Use an online sound meter, there are several applications available. We've used <https://youlean.co/online-loudness-meter/> for easy access. (The CDC has also developed a mobile app - NIOSH sound level meter, which allows you to measure and save sound information anywhere!)
- Measure the decibels of several sounds (ie: bang the cookie sheet again, students talking, the whole class being quiet, ect). Try to find a sound that correlates with each decibel level and complete the Healthy Decibels worksheet.
- Review the healthy decibels chart and compare the decibel levels you recorded with the sound meter.

## Extensions & Discussion

- Lead a discussion about healthy noise levels; what might be too loud, how to protect your hearing, ect.

## Key Terms & Concepts

**Ear Drum:** Part of the middle ear that vibrates in response to sound waves; also called the tympanic membrane.

**Cochlea:** spiral part of the inner ear containing the cilia

**Cilia:** Hair-like sensory receptors of both the auditory system and the vestibular system in the ears

**Temporal Lobe:** The lobes located near the temples; primarily responsible for hearing but also some has some memory functions and the language centers

**Auditory Cortex:** Located in the temporal lobe, the auditory complex is the part that receives information from the ears

**Hertz:** The standard unit of measurement used for measuring frequency (the frequency of sound waves in this case).

**Decibels:** The standard unit used to measure the intensity of a sound.

## Resources

Online Sound meter

<https://youlean.co/online-loudness-meter/>

HealthlinkBC

<https://www.healthlinkbc.ca/health-topics/tf4173>

Auditory Neuroscience

<https://auditoryneuroscience.com/vocalizations-speech>