

Sound and Hearing

5E Lesson

The 5E model is a scientifically proven method to improve student engagement and learning in your classroom

- ✓ Engagement
- ✓ Exploration
- ✓ Explanation
- ✓ Elaborate
- ✓ Evaluate



Complete Teacher Instructions

Sound and Hearing 5E Lesson

Grades 7-10	Sound and Hearing
Lesson Objective: Students will learn about: • Sound, creating sound, moving sound, speed of • Noise-cancelling headphones • Hearing: frequencies, loss • Earbuds • Teen hearing stats • Hearing loss prevention • Sound intensity • The human ear • Hearing aids	
Possible Student Misconceptions: • You can see and hear a distant event at the same time • Hitting an object harder changes its pitch. • Vapor cones are planes visibly breaking the sound barrier • The sound barrier is something an object crosses	
Materials: • 1 device (smartphone, Chromebook, laptop, tablet) • A means of projecting a PowerPoint presentation • Internet access • General classroom objects	
Teacher Notes: ➢ All videos can be accessed directly from the PowerPoint. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If they don't open, right-click the image and select Edit Hyperlink or something similar. ➢ I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCikIP9SaDQ ➢ I don't believe in long lessons. If you feel your students need more time, stop the PowerPoint and give them a 5-minute break. I recommend my video collection here - http://www.youtube.com/watch?v=Ude8pPiawKI are tons of brain-break videos to choose from at any time.	

Sound and Hearing – 5E Lesson

Engagement Phase Your students will watch the video 'The Coolest Things Sound Waves Do' and complete the following. 1. Watch the video 2. Answer the questions The video can be found here - https://www.youtube.com/watch?v=Ude8pPiawKI Teacher Notes: - The video is about three minutes long - You may need to show the video more than once or pause after some demonstrations	Duration: 2 Teacher Role: learning and understanding ☐ Connect to experience ☐ Create interest ☐ Ask question ☐ Understand the lesson
Exploration Phase Exploration – Lab Station Activity • In groups of 2-3, have your students complete <i>Exploration – Lab Station Activity</i>. Once they're done, they will submit their passport to you. Teacher Notes: • The complete instructions for my Lab Station activity can be found in the <i>START HERE – Instructions</i> file.	Duration: 1 Teacher Role: learning and understanding ☐ Students experience ☐ Students creative thinking ☐ Students observational results, and connections
Explanation Phase PowerPoint Lessons • There are two lessons found in the folder – <i>Explanation – Lessons</i> • These lessons are designed to be completed over two-three days • There are multiple embedded videos and plenty of opportunity to engage, interact, and check for your students' understanding throughout the lessons. • The lessons cover the following topics: ➢ Sound, Sound Energy, and Speed ➢ Hearing and the Human Ear ➢ Applications ➢ Practice Problems	Duration: 1 Teacher Role: concepts by material four presentation

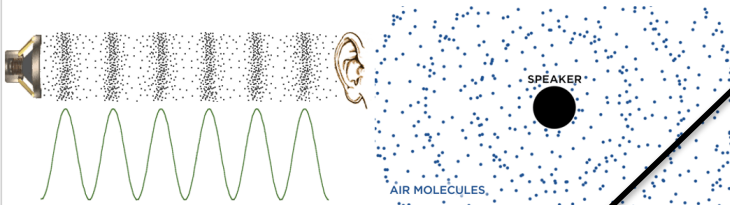
Teacher Notes: • All videos can be accessed directly from the PowerPoint. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If they don't open, right-click the image and select Edit Hyperlink or something similar. • I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCikIP9SaDQ • I have also enclosed a .PDF version of both the teacher and student versions	Goals ☐ Students develop understanding of the content ☐ Observations and experiences are discussed and critiqued ☐ Students develop vocabulary ☐ Students are able to connect the content presented to previous experiences
Elaborate Phase Elaborate – Reading Your students will complete – <i>Elaborate – Tinnitus</i> . This reading will require your students to move beyond what was covered directly in the lesson and allow them to further develop their understanding.	Duration: 1 hour Teacher Role – Facilitate learning and keep students focused Goal ☐ Students use their newly obtained knowledge to propose solutions and extend their learning to new situations
Teacher Notes: - Students will work individually or in small groups - This reading contains 5 comprehension questions and 3 extension question. It is fully editable so I encourage you to remove any question(s) in order to meet the needs of your students as well as your time frame	
Evaluate Phase Quiz Have your students complete - <i>Evaluate – Sound and Hearing Quiz</i> . All quiz questions will come from the lesson, reading, and lab station activity.	Duration: 30 min Teacher Role – Distribute and collect evaluation Goal ☐ Students are given the opportunity to demonstrate their understanding and evaluate their own progress
Teacher Notes: ➢ It's sometimes best to have the students peer evaluate ➢ Placing students in small groups and having them exchange papers to mark will accomplish two things 1) Provide immediate feedback on the quiz they just completed 2) Significantly reduce your marking time ➢ Peer evaluation is not needed, only suggested when appropriate	

Each phase is clearly described

A Complete Lesson

Creating Sound

- All sound is created in a similar way
- A disturbance causes a compression, which is followed by a rarefaction, followed by a compression, and so on as the signal moves away from the source

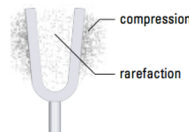
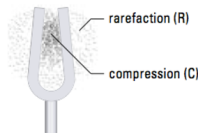


← Make sure your students are on track

Student copies with blanks
Videos embedded right into
your slideshow

Creating Sound - The Tuning Fork

- When you hit a tuning fork, you cause the arms to vibrate back and forth
- _____
- When the arms come back together the air molecules move back to their original spot (a rarefaction)



Hearing Loss and Earbuds

- There are many ways to lose your hearing such as disease, trauma, wax buildup, nerve damage, aging, etc., but the most common cause of hearing loss among teens is listening to music too loudly while wearing earbuds
- Earbuds are especially bad since it sends the sounds directly into the ear



Interactive and Engaging Activities

Tinnitus Ringing in the Ears

Scientific Reading Comprehension Article and Extension Activity

Tinnitus – Ringing in the Ears

What is tinnitus?

Tinnitus is a condition usually described as ringing in the ears that can only be heard by the individual experiencing the condition. Tinnitus is not associated with any psychological disorders. It is patients are not imagining the sound. Other sounds associated with tinnitus include hearing, hissing, whistling, whooshing, roaring, clicking, chirping, screaming, static, pinning, or even a musical sound. The noise can be low- or high-pitched, intermittent or continuous, heard bilaterally within the head or in one or both ears, and the volume can fluctuate during the day, often becoming most intense at night or in times of relative quiet. Some cases of tinnitus are temporary, while others are permanent. Some cases are so severe as to be debilitating, making difficulty hearing, concentrating, sleeping, and working.

There are two general types of tinnitus: subjective and objective.

Subjective tinnitus is the most common, accounting for over 90% of cases. In this type of tinnitus, only the sufferer can hear the noise.

Objective tinnitus, on the other hand, is very rare. In this type of tinnitus, the patient's circulatory or muscular systems create the noise and they can be heard by others.

Tinnitus is one of the most common health problems in the United States, affecting about 50 million people, or nearly 15% of the population. Of these, approximately 2 million experience debilitating tinnitus. In Germany, about 19 million people have tinnitus, about 2.5 million of these cases are chronic, and 1 million are very severe. About 10% of the United Kingdom's population suffers from this condition.

While tinnitus is irritating on its own, it can have other effects, including psychological, emotional, physical, and social problems, such as stress, fatigue, irritability, anxiety, and depression.

What causes tinnitus?

There are many causes for tinnitus, so it is a symptom of several 200 different medical conditions, but the most common is **damage to the inner ear**, associated with either **age-related** or **noise-induced hearing loss**. When tinnitus is a symptom of age-related hearing loss, it is generally heard in both ears and the noise is usually of high-frequency sounds. When it is due to damage caused by prolonged exposure to intense noise, tinnitus affects only one ear and the hearing loss is often near the frequency of the noisiest sound. In the case of hearing loss, overexposure to that tinnitus in the brain filling in missing frequencies as they are lost.

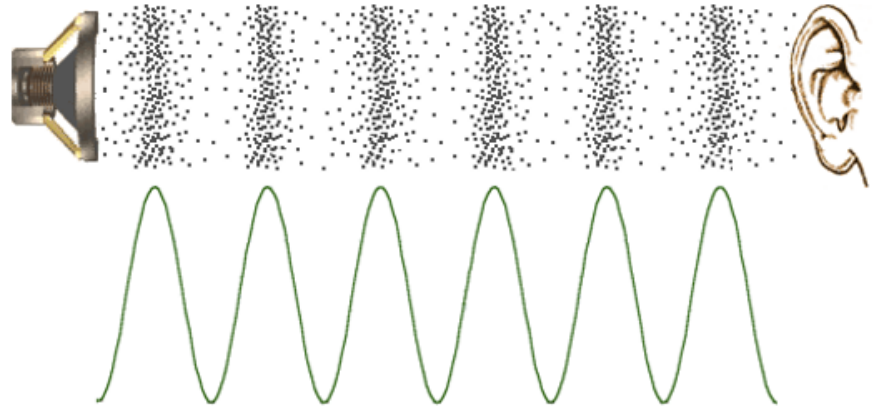
Some risk factors for tinnitus include noise exposure, smoking, gender (men are affected more often than women), and age (older people are affected more often than younger people). Despite this fact, tinnitus is becoming more common in young people due to inappropriate use of personal music devices, leading to inner ear damage.

Other causes of tinnitus include:

Obstructions in the middle ear, which can cause pressure to build up in the inner ear and have an impact on the ear drum, leading to tinnitus. The ear drum is very sensitive and can become irritated if touched. Obstructions can include excessive ear wax, loose hair, or earplugs that are not used correctly.



Sound and Sound Energy – Lab Station Activity



7 Lab Station Activities to get your kids
out of their seats and engaged in their
learning

Improve your students' **Literacy** and **Analysis Skills**, use as an **Emergency Substitute Plan**, or create **Applicability** in your classroom

Get away from tired practices and unengaged students



Provide a Scientifically-Proven means of instruction



Incorporate Technology and Increase Collaboration

