

i Can't Hear You

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For the
My Environment, My Health, My Choices project



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Abstract:

Personal listening devices, MP3 players, and iPods are a significant part of students' lives. There is a growing concern, however, that this technology might lead to a significant increase in the incidence of hearing loss. This learning experience is designed to raise students' awareness of the environmental health risks associated with MP3 player use in particular and noise pollution in general.

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Teachers, we would appreciate your feedback. Please complete our brief, online Environmental Health Science Activity Evaluation Survey after you implement these lessons in your classroom.

The survey is available online at: www.surveymonkey.com/s.asp?u=502132677711

Name _____ Class _____

1. The field of science that focuses on how the factors such as noise, air, and water pollution influence human health and disease is
 1. industrial chemistry
 2. environmental health
 3. biodiversity conservation
 4. microbiology

2. Noise level is measured in units of
 1. decigrams
 2. decibels
 3. deciwatts
 4. deciamps

3. In the inner ear sound vibrations from the eardrum (tympanic membrane) are transformed into nerve impulses by the snail-shaped organ called the
 1. cochlea
 2. stapes
 3. incus
 4. malleus

4. Excessive exposure to loud noise leads to hearing loss because it damages the tiny hairs in the
 1. outer ear
 2. middle ear
 3. cochlea
 4. brain

5. Noise-induced hearing loss, is most likely result from
 1. repeated exposure to loud noise
 2. repeated exposure to low noise
 3. one exposure to loud noise
 4. onet exposure to low noise

6. Damage to your hearing will be caused by prolonged exposure to sound pressure levels as low as
 1. 85 dB
 2. 100 dB
 3. 120 dB
 4. 180 dB

7. Some forms of hearing damage do not involve deafness. For example, the symptoms of a condition called tinnitus include
 1. ringing in the ears
 2. inability to hear specific sound frequencies
 3. brain damage that affects both speech and hearing
 4. damage to the incus and staples

8. The recommendation from hearing specialists that MP3 devices, including iPods should be used for no more than an hour a day and at levels below 60 percent of maximum volume is known as the
 1. 60 percent/1 minute rule
 2. 60 percent/60 minute rule
 3. 1 percent/60 minute rule
 4. 30 percent/ 30 minute rule

9. Which statement below best summarizes the information in the following chart which provides recommendations on what permissible noise exposures at different decibel levels?

Continuous dB	Permissible Exposure Time
85	8
88	4
91	2
94	1
97	2

1. Increasing exposure time decreases the number of dB of noise
 2. For every 3 dBs over 85dB, the permissible exposure time before possible damage can occur is cut in half.
 3. Exposure to any noise greater than 85 dB for one hour can be hazardous
 4. Exposure to noise from normal conversation levels may result in hearing loss.
-
10. Hearing loss due to prolonged, excessive exposure to loud noises, including loud music is
 1. temporary
 2. preventable
 3. unlikely
 4. easily cured

Teacher Answer Key for Pre-test and Post-test Questions

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Learning Context

Subject Area: Biology or Environmental Science

Overall Purpose:

To increase students' awareness of the environmental health risks associated with noise pollution in general and mp3 players in particular.

Learning Objectives:

By the end of this activity, students will be able to:

- List several sources of noise pollution in our environment
- Name the decibel as unit used to measure sound (noise), and identify decibel levels that may be hazardous
- Understand the difference between magnitude of exposure and duration of exposure as it relates to noise
- On a diagram of the human ear, label the parts, indicate their functions, and indicate those parts most subject to damage by noise pollution.
- Describe the basic physiology of normal human hearing process and explain how noise pollution interferes with this process to lead to hearing damage or hearing loss
- Describe symptoms associated with hearing damage caused by exposure to loud noise
- Explain the risks associated with iPods, mp3 players, and other personal listening devices especially when used with ear buds versus cannister style ear phones
- Suggest guidelines for safe use of personal listening devices, including the "60 percent/ 60 minute rule", use of headphones rather than earbuds, and best of all use of noise-canceling headphones
- Prepare and present a report explaining the health risks related to loud noise exposure (iPod misuse and other sources) and suggestions for eliminating or reducing these risks

Prerequisite knowledge and skills:

Ability to work in small and large groups; brainstorming techniques

Procedure

Classroom Timeline:

- Day 1 (40 min.) - Introduce the new Board policy and discuss noise pollution and hearing damage; assign work groups and begin reading articles
- Day 2 (40 min.) - Read articles and write group presentation
- Day 3 (40 min.) - Present each work group's presentation to the entire class, soliciting feedback for possible revisions. Class chooses one group's presentation to be given to the incoming freshman class

Equipment and Supplies:

Each group (3 or 4 students) needs:

- 2 sheets of large chart paper

- one set of markers
- 1 set of articles
- text book

Each student needs:

- paper and pen or pencil for recording individual notes and ideas
- a copy of the student handouts

Instructions for Implementing the Activity:

Day 1

1. Place students in groups of 3 or 4. Distribute markers and large paper to each group.
2. Ask students to think about what “noise pollution” means to them; have them record their thoughts on the large paper.(2-3 minutes)
3. Hand out “**Noise Pollution Brainstorming**” sheet, one per group; ask each group to complete and be ready to share with class in 5 minutes
4. Ask volunteers to share some of their group’s responses with the class; discuss a bit until someone, even if it is you, mentions mp3 players or iPods
5. When i Pods are mentioned react noticeably and say “GOOD! I am glad you brought that up.” Proceed to tell the class that you have a very important announcement: The Board of Education has banned iPods in school, effective immediately. You, as current sophomores, are being given an assignment: Research and prepare a brief presentation to be given to the incoming freshmen explaining this policy, including health risks and reasons why this ban is reasonable. So, even if you don’t like the new rule, you have to find out enough about the problem to defend it and be convincing in your presentation.
6. Hand out the “**Board of Education ‘News You Can Use**” memo to each group, along with several articles on iPod use and hearing damage. See Student Resources section for suggested Internet articles to provide for this research. Tell the students they will be going on a ‘treasure hunt for information’ that they can use to support the board of education’s position.
7. Instruct each group to read these articles to find out more about this problem and find justification for the new ban on ipods. Explain that each group will share their presentation with the class.

Day 2

Schedule one class period for reading, research, and writing a script or a PowerPoint for the presentation.

Day 3

Schedule one class period for group presentations and feedback

Noise Pollution Brainstorming

Source	Effect

Board of Education News You Can Use...

iPods Banned from School

Effective immediately, all mp3 players, including iPods and walkman are banned from possession or use on school property. This decision by the School Board was based on a growing body of evidence about hearing damage associated with use and overuse and misuse of these personal listening devices.

There are health risks associated with noise pollution, specifically exposure to loud noise at close range or use of personal listening devices (ie. Walkman, iPod, MP3 players with ear buds). The School Board has asked your group to develop a presentation that will explain to students in your school why this ban is good and reasonable.

To do this, you will need to do research to find articles and studies that explain the normal functioning of the human ear and information on damage to the ear and hearing that can be caused by excessive or improper use of personal listening devices. Your group's presentation should provide information to support the Board's ban from an Environmental Health perspective. It should also suggest possible ways to use personal listening devices safely when they are used outside of the school setting.

Include the following information in your presentation:

1. What units are used to measure sound? What decibel levels are considered associated with hearing problems?
2. Is it just the magnitude (loudness) of noise, or are the frequency and duration of exposure also important?
3. Make a diagram of the human ear, label the parts, and indicate the function of each part. What parts are most subject to damage by noise?
4. Describe the basic physiology of normal human hearing process. How does excessive noise interfere with this process to lead to hearing damage or loss?
5. What symptoms are associated with hearing damage caused by exposure to loud noise?
6. Why might using ear buds rather than canister-style earphones might pose a greater risk for hearing damage?
7. What are some guidelines for safe use of personal listening devices that might prevent hearing damage?

Sample Answers for Student Handouts

Noise Pollution Brainstorming

Source	Effect
Airplanes Trains Traffic Cars Lawn mowers Machinery Radios Loud music iPods mp3 players Walkman	Loss of sleep Headaches Stress Loss of sleep Annoyance Disturbing peace and quiet Hearing damage Tinnitus Deafness Hearing loss

Assessment Plan

Formative Assessment:

The teacher should monitor the groups' progress by visiting each group as they work and observing their work ethic and work output. Try to stay as "hands-off" as you can so the students own the problem and the project. Try to be the "guide on the side" rather than the "sage on the stage".

Alternative Summative Assessment Options:

Students could:

- Make a Powerpoint presentation, video, or Poster to present to the School Board or to the other classes.
- Produce a music video or public service announcement to show on the student-run television station
- Write biological haikus to convey their thoughts and feelings on this subject
- Wear sound blocking earplugs for 10 minutes, a class period, at lunch, while watching a television show, while listening to a song, or for a whole day and then report on the experience and what it might be like to have hearing loss.
- Visit an audiology center and interview the staff
- Explore learning to lip read or use sign language
- Write to a local or national musician and ask about hearing protection and hearing loss issues
- Research occupational exposure to noise pollution and laws/guidelines for protecting workers.

Suggested Student Resources

- On iPods and hearing loss: Just turn it down, http://news.com/2061-11199_3-6034391.html
- MPSs May Threaten Hearing Loss, <http://www.cbsnews.com/stories/2005/08/25/health/webmd/main796088.shtml>
- iPod earbuds Damage Hearing, http://www.newsfactor.com/story.xhtml?story_id=40317
- Listen: iPods can damage your ears, http://www.4hearingloss.com/archives/2005/07/listen_ipods_ca.html
- MP3users hearing damage warning, <http://news.bbc.co.uk/2/hi/health/4162028.stm>
- Apple sued over iPod related hearing loss, <http://arstechnica.com/news.ars/post/20060202-6100.html>
- Limit use of iPod earbuds to protect your hearing, <http://www.msnbc.msn.com/id/10648715/>
- Play it loud, and you may pay for it..., <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2005/09/22/DDGKUER3M323.DTL>

- iPods can make you deaf, <http://www.thisislondon.co.uk/news/articles/18532179?source=Evening%20Standard>
- Precautionary Tales, <http://www.precautionarytales.net/2005/05/ipod-panic-ipods-can-make-you-deaf.shtml>
- Apple Hit With iPod Hearing Loss Lawsuit, <http://www.informationweek.com/news/showArticle.jhtml?articleID=178601009>
- Eh? iPod Earbuds Can Cause Hearing Loss, <http://www.informationweek.com/news/showArticle.jhtml?articleID=175006733>
- Earbuds may lead to permanent hearing damage, http://sportsmedicine.about.com/od/tipsandtricks/a/iPod_safety.htm
- How to Prevent Hearing Loss, <http://www.wired.com/news/columns/0,70434-0.html>
- iPods and Hearing Damage? <http://www.journalism.wisc.edu/j419/webfall05/32306/iPod.html>
- H.E.A.R. Honors The Foo Fighters, <http://www.hearnet.com/index.shtml>
- Behind the Music: iPods and Hearing Loss, http://online.wsj.com/public/article/SB113685799723842312-dZrxb_eZm44vfy74topaLm...
- Hearing Damage And Loud Music, <http://www.abelard.org/hear/hear.htm>
- Experts warn of iPod hearing loss, <http://www.macworld.co.uk/news/index.cfm?NewsID=11524&Page=1&pagePos=1>

New York State Learning Standards

Standard 4, Key Idea 1,

Performance Indicator 1.2:

- Major Understanding 1.2a, 1.2c The components of the human body, from organ systems to cell organelles, interact to maintain a balanced internal environment. To successfully accomplish this, organisms possess a diversity of control mechanisms that detect and make corrective actions.
- Major Understanding 1.2d If there is a disruption in any human system, there may be a corresponding imbalance in homeostasis.
- Major Understanding 1.2e The organs and systems of the body help to provide all the cells with their basic needs. The cells of the body are of different kinds and are grouped in ways that enhance how they function together.

Standard 4, Key Idea 5

Performance Indicator 5.2 Explain disease as a failure of homeostasis

- Major Understanding 5.2a Homeostasis in an organism is constantly threatened. Failure to respond effectively can result in disease or death.
- Major Understanding 5.2h Disease may also be caused by inheritance, toxic substances, poor nutrition, organ malfunction, and some personal behavior. Some effects show up right away; others may not show up for many years.
- Major Understanding 5.2j Biological research generates knowledge used to design ways of diagnosing, preventing, treating, controlling, or curing diseases of plants and animals.

Standard 1, Key Idea 1,

Performance Indicator 1.1

- Major Understanding 1.1a Scientific explanations are built by combining evidence that can be observed with what people already know about the world.
- Performance Indicator 1.2 Hone ideas through reasoning, library research, and discussion with others, including experts.
- Major Understanding 1.2a Inquiry involves asking questions and locating, interpreting, and processing information from a variety of sources.
- Major Understanding 1.2b Inquiry involves making judgments about the reliability of the source and relevance of information.

Performance Indicator 1.3 Work toward reconciling competing explanations; clarify points of agreement and disagreement.

- Major Understanding 1.3a Scientific explanations are accepted when they are consistent with experimental and observational evidence and when they lead to accurate predictions.
- Major Understanding 1.3b All scientific explanations are tentative and subject to change or improvement. Each new bit of evidence can create more questions than it answers. This leads to increasingly better understanding of how things work in the living world.
- Major Understanding 3.4b Claims should be questioned if the data are based on samples that are very small, biased, or inadequately controlled or if the conclusions are based on the faulty, incomplete, or misleading use of numbers.
- Major Understanding 3.4c Claims should be questioned if fact and opinion are intermingled, if adequate evidence is not cited, or if the conclusions do not follow logically from the evidence given.

Performance Indicator 3.5 Develop a written report for public scrutiny that describes the proposed explanation, including a literature review, the research carried out, its result, and suggestions for further research.

- Major Understanding 3.5a One assumption of science is that other individuals could arrive at the same explanation if they had access to similar evidence. Scientists make the results of their investigations public; they should describe the investigations in ways that enable others to repeat the investigations.
- Major Understanding 3.5b Scientists use peer review to evaluate the results of scientific investigations and the explanations proposed by other scientists. They analyze the experimental procedures, examine the evidence, identify faulty reasoning, point out statements that go beyond the evidence, and suggest alternative explanations for the same observations.