

THE SCIENCE OF FRINGE

EXPLORING: PHYSIOLOGICAL EFFECTS OF MUSIC

A SCIENCE OLYMPIAD THEMED LESSON PLAN
SEASON 3 - EPISODE 2: **THE BOX**

Overview:

Students will learn about the different characteristics of music and how it can have physiological effects on the listener.

Grade Level: 9–12

Episode Summary:

The team works to discover what caused a group of people to enter a trance like state and ultimately die. A mysterious box is found to be the cause, and Walter hypothesizes that it is emitting intense sound waves that cause those effects. When another group of victims is found in a subway station, the team must work quickly to find a way to neutralize the box without being affected by it themselves.

Related Science Olympiad Event:

Sounds of Music - Prior to the competition, students will build one wind instrument and one percussion instrument based on a 12-tone tempered scale, prepare to describe the principles behind their operation and be able to perform a major scale, a required melody and a chosen melody with each.

Learning Objectives:

Students will understand the following:

- A piece of music can have a variety of objective characteristics, such as volume and tempo, in addition to subjective characteristics such as genre and temperament.
- The human brain responds to music, which affects the nervous system, resulting in changes to physiological characteristics such as heart rate.

Episode Scenes of Relevance:

- The burglars opening the box and going into a trance.
- Peter demonstrating the effect of different types of music on his brain waves.
- View the above scenes: <http://www.fox.com/fringe/fringe-science>

FOX CODE



FOR SMARTPHONES

Online Resources:

- Fringe “The Box” full episode: <http://www.fox.com/watch/fringe>
- Science Olympiad Sounds of Music event: http://soinc.org/sounds_of_music_c
- Music Acoustics: <http://www.phys.unsw.edu.au/music/>
- The Physics of Music and Musical Instruments:
http://www.tufts.edu/as/wright_center/workshops/workshop_archives/physics_2003_wkshp/book/pom_book_acrobat_7.pdf
- Surprising Effects of Music: <http://www.emedexpert.com/tips/music.shtml>

Procedures:

1. Tell your students that they are going to learn about the physiological effects of music and experience it themselves.
2. Have your students research characteristics and classifications of music in resources such as music textbooks and websites and discuss what they have learned.
3. Divide your class into pairs. Have each pair complete the following activity:
 - a. Materials: stop watches or timers, CD player with speakers, a variety of music CD’s such as classical, techno, easy listening, country or rock.
 - b. Demonstrate to the class how to measure a person’s heart rate by putting a finger on their inner wrist or just below their ear and counting the number of beats that occur in 15 seconds (multiply by 4 to get beats per minute).
 - c. Have the pairs collect their resting heart rate and record it.
 - d. Play something ‘soft’ such as a classical or easy listening song and ask the class to measure their heart rates again and record the results.
 - e. Play something ‘loud’ such as a techno or rock song and have the class again measure their heart rates and record the results.
 - f. Repeat the process with several other music types or with different volumes.
4. Discuss with the class the results of the activity. Be sure to address:
 - a. How did volume or tempo of the music affect their heart rates?
 - b. Was there a difference within the class based upon the genre of the music and the personal likes and dislikes?
 - c. How long after a song played did it take for their heart rates to return to the ‘resting rate’?

Additional Discussion Suggestions:

- Knowing that different types of music can either increase or decrease heart rates, what type of situations do the students encounter outside the classroom that might be impacted positively by appropriate music choices? Examples include exercising and late-night study sessions.
- What other physiological impacts might be occurring while listening to music? Examples include breathing rate, alertness, and pain sensitivity.

Extension to Other Subjects:

Physics: Some musical instruments require little effort to play, while others involve a lot of physical activity. List several types of instruments and see if there is a correlation between the physiological effects of the typical music played with them.

Fine Arts: Music can also evoke various emotional responses. Discuss examples of music that is associated with emotions such as happiness and sadness and whether there is a correlation to the physiological effects of the music.

Social Studies: Different styles of music are stereotypically associated with various cultures or demographic groups. What general characteristics can be drawn about a group based upon the characteristics of their music?

National Science Standards Alignment:

E. Science and Technology – An understanding of science and technology establishes connections between the natural and designed world, linking science and technology.

H.E.1 Abilities of technological design

- b. Propose designs and choose between alternative solutions.
- c. Implement a proposed solution.
- d. Evaluate the solution and its consequences.