NIH SEPA Environmental Health Investigators
Measuring Skills and Tools Curriculum: Lesson 3
Grade Level: Middle School
Duration: 1 hour

Noise Pollution Continued

Next Generation Science Standards

Disciplinary Core Ideas:
ESS3.C: Human impacts on Earth systems
PS4.A: Wave properties

Objectives

1. Students will discuss that sound is formed by sound waves.
2. Students will identify how noise pollution affects their environment and health.
3. Students will recognize the importance of large data sets.

Materials:

- Tuning forks
- Small tub of water
- Paper towels
- Piece of wood/or small hard object
- Digital sound meters (1 per group)
- "Sound Data Collection" sheet (1 per student)
- Clipboards (1 per student)
- Projector/smart board
- Video clip of "Chiefs Fans Break Guinness World Record": https://www.chiefs.com/video/chiefs-fans-break-guinness-world-record-11498811

Activities:

Bell Ringer: Watch the video of the Guinness Book of World Records' loudest crowd at an open air stadium. Review the sound and decibel information from the last session. Discuss how sound above 85 dB qualifies as pollution and how that affects human health with prompts such as these:

- Name one time you heard a noise so loud that it hurt your ears.
- What are a few local jobs that might have conditions that hurt the workers' ears?

- What do you think is the loudest place at your school? Is it only loud for a short time period or does it last all day?

(5 minutes)

Lecture: Explain how sound is formed through sound waves. Refer to the Khan Academy video in the resource section and discuss with students how waves can transport energy through a medium without transporting the medium itself. (10 minutes)

Activity 1: Pass out tuning fork materials and have students first tap the forks against their hands and then place it in the water without touching the outside of the container. Discuss what they see. Then, hit the tuning forks on a firm object, such as a piece of wood (not with too much force) and repeat the activity and discuss. Try this with different size tuning forks if available. Make sure the students understand that this is a visual demonstration of how sound waves pass through a medium. Explain the next activity while students are cleaning up. (10 minutes)

Activity 2: Put students in the same groups as the previous session and pass out digital sound meters and their "Sound Data Collection" sheets from the previous session. Have students visit the same locations and collect 10 more data readings. (20 minutes)

Discussion: Come back together and discuss the data that the students collected. Discuss the importance of large datasets and the various statistical analyses that can be conducted to summarize data such as mean, minimum, maximum, and range. Have the students calculate these descriptive statistics from the dataset from their first location. Then discuss how these descriptive statistics (mean, minimum, maximum, and range) help summarize and communicate datasets. (15 minutes)

Resources:

Khan Academy *Production of Sound* video provides background information on sound production: https://www.khanacademy.org/science/ap-physics-1/ap-mechanical-waves-and-sound/introduction-to-sound-waves-ap/v/production-of-sound

National Institute of Health (NIH) produced a video which explains how sounds make their way from the source to your brain: https://www.youtube.com/watch?v=eQEaiZ2j9oc

Group Names:_____

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Sound Data Collection

Location	Sound in dB

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