

Measuring Sound in NYC's Environment

Description:

Students will learn how to quantitatively measure sound levels in the environment using sound level meters.

Objectives:

- To understand the difference between sound by quantitative measurements
- To measure and analyze sound data according to the scientific method
- To explain in real numbers the definition of harmful sound and its relation to mental and physical health effects

Vocabulary:

Decibel, sound exposure, ambient noise

Recommended for:

5th – 12th grade students

Materials:

- Paper or Data Log
- Pencils
- Sound Level Meters - Free applications available on your smart phone (recommended); also at Home Depot.
- Loudness Chart

Background Information:

Sounds are caused by vibrations and are measured in units called decibels (dB). Most sound is measured in dBA, or A-weighted decibel, which is the decibel level that follows the frequency sensitivity of the human ear at low levels. dBA is good for measuring damage to the ear. Measurements of 85 dBA and higher are defined as harmful sound. Extended exposure to levels over 85 decibels can cause

hearing damage as well as mental and emotional stress.

Please note that sound meters range in their sensitivity and accuracy, and that a phone app will not be as accurate as the sound meters that NYC DEP noise experts use when they take measurements in response to a noise complaint.

Methods:

- *Review & Intro:* Ask students to define sound. Then ask them to define noise. Write down their responses.
- Explain how the volume of a sound is measured in decibels. Decibel measurements 85 dB and higher are defined as physically harmful sounds.
- Generate two lists with the students: one will include examples of sound and the other list will include examples of noise. Organize both lists in order from quietest to loudest.
- Have students explain the differing characteristics between the two lists.
- Tell students that they will be measuring sound levels; they will thus, be seeing a quantitative determination of sounds and noise.
- Demonstrate how to use the sound level meter app before they go into the field.
 - Examples of places to measure sound: in the classroom, in the hall, in the cafeteria, library, gym, outside in the schoolyard, outside on the sidewalk, on a main street compared to a side street, etc.
- Break students into small groups. Each group should create a hypothesis for their

experiment (i.e. I hypothesize that I will find more sounds than noises within my school).

- While in the field, each group must create a chart for the sound they are recording and the dBA measurement. Remember that there is always a certain level of ambient, or background, noise.

Location	Sound Measurement (dBA)
Hallway during class time	33 dBA
....

- Compile student data (on the board).
- Create a list of the collected sounds and dBA measurements on the board from quietest to loudest.
- Pass out the Loudness Scale as a reference. Students can create a similar scale for their school, based on the data they collected.

Discussion:

- Did some of your sound level readings surprise you? Give an example. Explain why you may have thought otherwise.
- Does a noise have to be loud? What makes something a noise?
- Which parts of your environment were the quietest or loudest?

Extension:

Part 1:

- Introduce sounds and noises heard on commutes. How do the students get to school? What are sounds and noises students hear on their commute to school?
- Explain that you are going to look into sound levels on the train/ bus.

- Have students measure noise level when the train/bus is arriving, while it is in the station, and when it is leaving, and when the train/bus is not there. If you want, you can also measure noise on the train or bus.
- Discuss what was noisy or loud. Look for the sources of the loud sounds and the noises. (*Remember that loud sounds are not necessarily noise. Some loud sounds can be **wanted** and some quiet sounds can be **unwanted***).
- Brainstorm ways to reduce noise associated with transit.
- You can refer to the [NYC Noise Code Transit Operation Strategies](#).

Part 2:

- Discuss noise at an airport. Pull up a map of NYC and find the LaGuardia and JFK airports on the map.
- What types of noises are associated with airplanes?
- Use [Webtrack](#) to observe the current flight of airplanes and the ground level sound measurements at different nearby points.
- Note that these sound measurements are an LEQ measurement, a continuous recording of dBA levels at 16 times per second.
- Make sure to look at the “Start Here,” “Investigate,” and “Legend” tabs to explore the site.
- Where would students want to put sound meters on the map?

For more information contact:

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Also visit DEP’s website at:

www.nyc.gov/dep