

Activity name: Noise Pollution

This activity is meant to provide a real-world application of the ATEEC Recommended Core Curriculum's math, science, technical, communications, or critical thinking knowledge and skill concepts, which have been identified by the ATEEC Fellows as necessary preparation for environmental technology occupations.

Appropriate for which course(s)? Introductory Environmental Tech course, Environmental Regulations, Quantitative & Qualitative Analysis, Environmental Science, Occupational Safety and Health

Concept/skill learned (i.e. from K/S Tables): Translate real world problems in relationships. Use a calculator to solve problems. Construct, read and interpret graphs. Calculate mean, median, mode, standard deviation, standard error, range; read and follow laboratory and field equipment; interpret and evaluate field analysis results, use scientific field equipment, design of field testing matrix, critical thinking, budgeting

Cognitive Level: Application analysis.

Approximate time to complete activity: 2 - 3 hours depending upon travel time to sampling sites

Source of idea or activity (for published source, please include author, title, publisher, date): Name

SCANS skills: Reading, written, arithmetic, problem solving, manages money, acquires and evaluates information, organizes, "maintains."

Materials/resources needed (equipment, print media, electronic media, videos, supplies, etc.):

- Transportation
- Decibel sound level meter or decimeter (if not available borrow from industry or OSHA, industrial hygiene department.)
- 50-100 meter measuring tape
- Laboratory field book for recording data
- Quad map of selected sampling site

Objective: The objective of this field laboratory exercise is to introduce students to the concept of noise pollution and the effectiveness/ineffectiveness of two types of noise barriers - structural (wood, stone, concrete, etc.) and natural vegetation.

Description of activity:

Teacher's note: It requires that a trip be made to a nearby road (preferably limited access) where two sites can be found - one with noise barrier(s) installed (note: this exercise works equally well whether noise barriers are installed on both sides of a highway or only on one side) and one where the only noise barrier is natural vegetation. Both sites, to ease the taking of noise level measurements should have secondary roads that cross at a right angle to the main road and not have significant amounts of traffic. Additionally, sites should be selected to be as close as possible to where road grade and traffic counts are comparable.

1. Students should be instructed to keep a record of all time and materials used in completing the field laboratory exercise.
2. Students should be provided with an enlarged section of the a "quad" sheet for the two sites, showing the main road and cross roads. Students should be instructed to prepare ahead of time a proposed sampling matrix and to mark these sites on a map.
3. Upon reaching each sampling site, students should be instructed to revisit their laboratory designed field sampling matrix and make changes, as appropriate, based on site specific observations.
4. Noise level measurements should be then taken of the locations identified in the sampling matrix. Three measurements should be taken at each site and the results averaged. Samples taken from the vegetation noise barrier site should be taken approximately 50 meters off the shoulder of the road.
5. Estimates should be made of the height of and length of the noise barriers using geometry; additionally, a description of the type should be written; height, density and crown cover should be measured and/or calculated.

Date	Task	Time Used (15 minute increments)	Other Costs

Data Analysis:

1. Calculate the total expense of doing the field laboratory exercise utilizing a cost of \$50.00 per person hour for labor and estimated values for other expenses.
2. Plot distance from main road at both sites.
3. Calculate the mean, median, mode, standard deviation, standard error and range using the entire set of data for each of the four north and south zones. (High school students might calculate mean and range.)
4. Plot means of both types of noise barriers.

Assessment Ideas:

Interpret the results of the field sampling and data analysis.

Design a brochure for homeowners to use which would aid in "quieting" noise levels on property.

Design an experiment to detect the noise pollution in a selected workplace environment.

Extensions:

1. Extension of this laboratory exercise to include two sites with noise barriers (one with barriers on both sides and one with barriers only on one side) provides additional insights into the effectiveness/ineffectiveness of noise barriers.
2. Prior to, during, or after completion of this field exercise students may be instructed to research some of the theoretical work supporting the use of noise barriers and then develop a comparison between their empirical results and the levels one would expect to observe based on sound barrier theory.

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