Shh… What Was That Noise?
Identifying Sound Decibels

Author
Heather Moll

Grade Level
High School

Duration
2 class periods

National Standards
GEOGRAPHY STANDARDS
Essential Element 1: The World in Spatial Terms
1. How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information

Common Core Standards
(AZ College and Career Ready Standards)
9-10 Reading Standards for Literacy in History/Social Studies
9-10.RH.4 Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.
9-10 Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects
Production and Distribution of Writing
9-10.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

a. Produce clear and coherent functional writing (e.g., formal letters, envelopes, experiments, labels, timelines, graphs/tables, procedures, charts, maps, captions, diagrams, sidebar, flow charts) in which the development, organization and style are appropriate to task, purpose, and audience.

Other Arizona Standards
SOCIAL STUDIES STANDARDS
Concept 1: The World in Spatial Terms
PO 1. Construct maps using appropriate elements (i.e., date, orientation, grid, scale, title, author, index, legend, situation).

Concept 4: Human Systems
PO 6. Analyze factors (e.g., social, biotic, abiotic) that affect human populations.

SCIENCE STANDARD
Strand 1: Inquiry Process
Concept 1: Observations, Questions, Hypotheses
PO 4. Predict the outcome of an investigation based on prior evidence, probability, and/or modeling (not guessing or inferring).

Concept 2: Scientific Testing (Investigating and Modeling)
PO 5. Record observations, notes, sketches, questions, and ideas using tools such as journals, charts, graphs, and computers.

Strand 5 Physical Science
Concept 5:
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#### Interactions of Energy and Matter
PO 2: Describe the following characteristics of waves: wavelength, frequency, period, amplitude

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#### TESOL Standard(s)

**ESL: English for Content**
Through The Use Of ESL Methodologies, The Student Will:
EFC-A. Create, read, and interpret visual information relating to science, social studies, and math.
A1. Draw and label maps.
**EFC-C. Compose in a variety of forms.**
C1. Use Math, Social Studies, and Science target vocabulary.
**EFC-D. Communicate clearly using math, science, and social studies target vocabulary.**
D2. Participate in small and large groups.
**EFC-E. Comprehend reading materials.**
E1. Read a variety of Math, Science, and Social Studies materials.
E6. Scan material for relevant information.

#### Arizona English Language Proficiency Standards

**Stage V Reading**
Comprehending Text
Standard 4: The student will analyze text for expression, enjoyment, information, and understanding. The student will demonstrate knowledge of reading comprehension by:
B-21: applying understanding of content area vocabulary within math, science, and social studies texts.

**Stage V Language**
Standard 1: The student will identify and apply conventions of standard English in his or her communications. The student will demonstrate knowledge of sentence construction by:
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B-16: producing interrogative sentences beginning with “where.”
B-19: producing interrogative sentences beginning with “why.”

Overview

In our modern world, citizens have become accustomed to noise from early morning until night. Television, ipods, radio, classrooms, homes, businesses, and even rural areas are producing sounds. Is it possible to get away from all of this noise?

Purpose

In this lesson students will learn about sound waves and investigate their homes and schools to determine noise levels. They will use their hand held devises to measure levels of sound in various places and then solve a problem using what they have learned. This lesson includes strategies for diverse learners (ELLs).

Key Vocabulary

crest: highest point of a wave

decibel: a unit used to express the loudness of a sound

sound: vibrations that travel through the air and can be heard by a person or animal

trough: low point of a wave

wave height: the difference between a wave’s high point (crest) and its low point (trough)

wavelength: the distance between two wave crests

Materials

- Smart devices with one of the following sound apps installed. (Students can use their own devices.)
  1. Apple Apps: Decibels; MetalMed dB Lite; or any others
  2. Android Apps: Sound Meter; Sound Meter Lite; or any others
- Decibels Data Tables worksheet
- Parts of a Wave worksheet
- Parts of a Wave Answer Key
- Map of your school grounds, or city.
- Designing Your Own High School worksheet

Objectives

The student will be able to:

1. identify the distinctive parts of a sound wave.
2. gather information and solve a problem.

Procedures

SESSION ONE

Engage:

1. Draw a t-chart on the board or on a paper under the document camera. One side should be titled “Loud.” One side should be titled “Quiet.”
2. Ask the students to think about places they have been that are loud or very quiet.
3. Lead a discussion with your class about what some of these locations are, write them on the board as they are listed. (Preparation: Adapting content, Linking to Background)
4. Model the use of the decibel meter to the class. Have them be very quiet and then have them be loud to show the differences on the device. (Scaffolding: Guided Practice)
5. Give students time to install a sound measuring app on their hand held devices. (See Materials for suggested apps.)

Explore:

6. Explain to the class that they will work in teams to explore different parts of the campus and record decibel levels. (Grouping Option: Small groups)
7. Distribute Decibels Data Tables worksheet to the class. Point out that they will need to find at least three locations on campus with different decibel readings.
8. Allow them 15-20 minutes to do this depending on how large your campus is in size. (Application: Hands On, Promotes Engagement)
9. As homework, have the students record at least two decibel readings around their home: one loud and one quiet. Have them mark the readings and location on their Decibels Data Tables Worksheet. (Scaffolding: Independent
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Practice

SESSION TWO

Explain:
10. Distribute Parts of a Wave worksheet. Allow the students time to individually fill out the worksheet. (Grouping Option: Independent)
11. Explain the different parts of a wave to the students and how it relates to decibel levels. (Scaffolding: Guided Practice)
12. Show the first 3 minutes of Bill Nye Sound YouTube video. (Scaffolding: Comprehensible Input) https://www.youtube.com/watch?v=iJ27q5QHU1U

13. Distribute a map of their own school and have partners mark where the quiet and loud locations were located. Have one partner share out their findings and put the class data on a school map that is under the document camera. Look at the spatial distribution. Where are the noisy areas? (Grouping Option: Partners)

Elaborate:
14. Distribute Designing Your Own High School worksheet. Explain the assignment and how it will be graded. Give them about 25 minutes of class time to design their school keeping in mind sound issues. Assignment can be homework. (Assessment: Written, Individual or Group)

Evaluate:
15. On day the assignment is due, have students explain to groups of three or four how they designed their schools and ask for feedback. Student may submit their maps that day or based on feedback, revise their maps and then submit. (Scaffolding: Comprehensible Input)
16. Give Parts of a Wave worksheet as vocabulary test. (Written Assessment: Individual)
17. ELL students can complete the ELL writing assignment on writing “where” and “why” questions. (Written Assessment: Individual)

Assessment

Science: Decibels Data Tables worksheet can be graded for completeness. Mastery will be considered 100%.

Parts of a Wave worksheet can be used as a vocabulary test and graded for correctness.

Mastery will be considered a score of 80% or higher.

Reading: Parts of a Wave worksheet can be used as a vocabulary test and graded for correctness. Mastery will be considered a score of 80% or higher.

Vocabulary test can be given. Mastery will be considered a score of 80% or higher.

Geography and Writing: Designing Your Own High School map can be graded for elements of a map (date, orientation, scale, title, author, legend, and symbols) as well as the concept that noise influences where humans locate certain features. Mastery will be considered a score of 80% or higher on the Scoring Criteria.

ELP Writing: Sentences created by ELLs will be graded on their correct use of “where” and “why.” Mastery will be considered 1 error in the 8 questions written about their map.

Extensions

Have students keep recording sound samples as they occur around them. A chart in the room could be made like a thermometer with new data being added to the chart (rock concerts, gun firing, whistle blowing, etc.).

Talk about ear protection and the damaging effects of excessive decibels.

Show the YouTube video on Cool Things Sounds Can Do. (3 minutes) https://www.youtube.com/watch?v=Ude8pPjawKI

Or Can Silence Actually Drive You Crazy? http://youtu.be/mXVG1b3bzHl (10 minutes)

Sources

Mr. Andersen explains how sound waves are created and perceived. A brief discussion of pitch and loudness are included. A generated sound of varying pitches is also included. (9 minutes) https://www.youtube.com/watch?v=OFU2jwl8Uwg

This black and white production looks like something from the 1950s but it does a good job of showing how the sound waves are different with different pitches (2 minutes)
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https://www.youtube.com/watch?v=YsZKvLnf7wU
&list=PL06FF8833CADA0ACC&index=6

Sound waves are all around us, and when harnessed, can do some super cool things. It also looks at a few ways we’re using the power of sound waves to our advantage. (3 minutes)
https://www.youtube.com/watch?v=Ude8pPjawKI

A soundproof setting is used to show how sound travels and explores the idea that sound is necessary for humans. (10 minutes)
http://youtu.be/mXVGlb3bzHl

Bill Nye on Sound (23 minutes total but first 3 minutes are good if time is an issue)
https://www.youtube.com/watch?v=iJ27q5QHU1U