Jenny Au
Lesson 3
2/3/2014-2/7/2014

Summary of Lesson: Sound

This past week, I've been able to introduce the concept of sound to students in Mr. Vera's Geometry class. We started the class off with a DO NOW where they graphed five data points and labeled their graph on the x-axis and y-axis. Most of the students were out of practice, so this was a good refresher. This DO NOW exercise was important because during my lesson, the students had to take live data and plot on a graph and analyze it.
After the DO NOW, I asked the class what they know about sound. Then I asked them how does sound travel. The power point had a good visual moving figure of air particles moving from an oscillating drum. I explained that the sound wave travels through air and the air particles move back and forth to help the sound wave travel, but the particles themselves do not move along with the wave.

I asked students what frequency was. A few answered that something that repeats itself. Frequency related to sound is the number of waves per second with unit of Hertz (Hz). The frequency generator was attached to the oscilloscope for the students to see the number of waves increase as the frequency increased and they also heard the pitch of the sound increase.

Decibels was introduced as a unit of measure for how loud sound is. A table of different sound sources and different decibel ranges was shown. The students were most shocked to hear that mp3 players at max volume was at 103 dB. This was right after explaining that 90 dB without ear protection causes hearing loss.

After the decibel table was shown, a class room experiment was done. Here, we used a random noise generator connected to a speaker and amplifier. A sound pressure meter was used to record the sound pressure level of the speaker and at every 1 feet away up to 15 feet. Data was collected as a class and then after the experiment, the whole class had to graph their data and describe the relationship between the distance(feet) and the sound level(decibels).

A good exit question is asking why the sound pressure level did not decrease more than 54 dB after backing up 15 feet away from the speaker.

GK-12 Lesson Plan

Teacher: A.J. Vera
Period: 1,2,3,5,7 **Class: Lawrence High School Geometry Class**
Date(s): 2/3/2014-2/7/2014

SETTING THE STAGE	
Essential Question	How does sound travel?
Content Objective(s) (Student-friendly)	Learn about sound and how it travels. Students will see the signal generated from the function generator. They can change the dial of the function generator while simultaneously see and hear the sound from the oscilloscope and speaker.
Connection to previous or future lessons	Introduction to sound leads to another lesson that is related to geometric shape of speaker cone design.
Critical Thinking Questions	How does sound travel from the sound source (person talking) to the receiver (human ear)? What is the relationship between sound loudness and the distance of the sound pressure level meter?
Key Vocabulary	Sound, waves, loudness, decibels, frequency
Materials Needed/Safety	Oscilloscope, frequency generator, amplifier, speaker, wires, sound pressure level meter, projector and laptop for powerpoint presentation
ACTIVE INSTRUCTION	
• Launch (Engage)	Powerpoint presentation to show how sound travels. Introduce frequency for the frequency generator. A table of sound pressure levels in decibels were introduced with pictures related to the sound pressure level.
• Investigation (Explore)	A classroom experiment was done. Using the frequency generator and speaker, students used sound pressure level meter to measure sound pressure level of the speaker and backed up every 1 feet and took measurement for up to 15 feet.
TIME FOR REFLECTION	
• Summarization (Explain & Extend)	Students took measurements and had to analyzed the sound pressure level for every 1 feet away from the speaker. They understood that every time the meter backed away from the speaker, the sound level decreased.
• Assessment (Evaluate)	Mr. Vera grades them for class participation in his own grading book.
• Homework	None

Sound

Jenny Au

NSF GK-12 Fellow

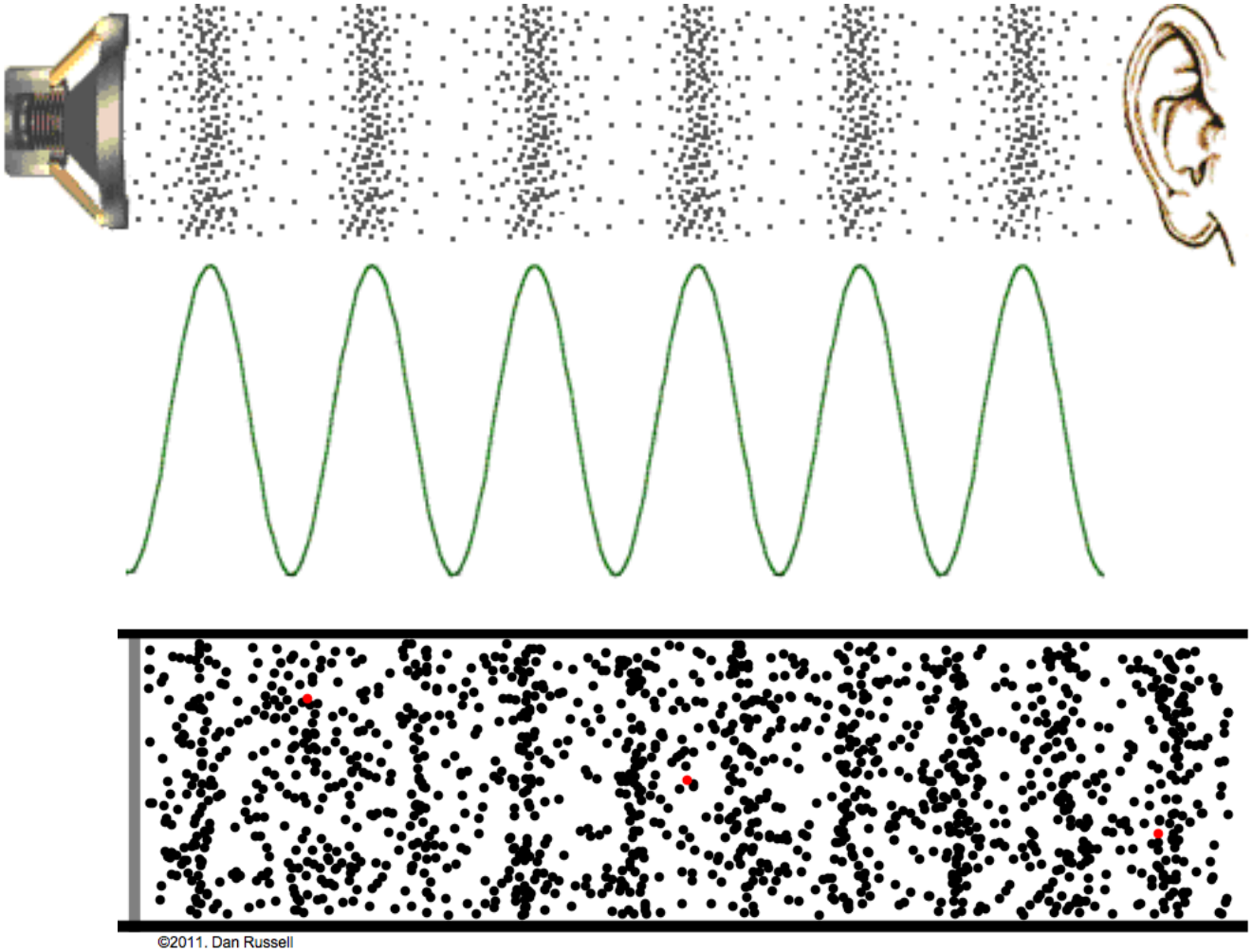
Vibes and Waves in Action

Center for Advanced Computation and Telecommunications

University of Massachusetts Lowell

What do you know about sound?

How Sound Travels to the ear



http://scienceconceptions.wikispaces.com/Do+the+Wave
http://www.acs.psu.edu/drussell/demos/waves/wavemotion.html

Frequency

- the number of occurrences of a repeating event over a unit time

- the number of waves per second

Units: Hertz (Hz) 1/sec

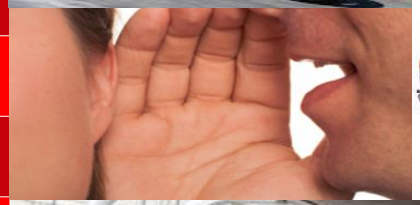
What is a Decibel?

- The decibel (dB) is the unit to measure the intensity of sound
- The human ear is extremely sensitive
  - Hear your fingertip brushing lightly over your skin
  - Hear a loud jet engine
- The jet engine is about 1,000,000,000,000 times more powerful than the smallest audible sound
- That's a big difference!

How Loud is too Loud?

Decibels	Sound Source
150	Firecracker
140	Jet Engine at 100 feet (hearing loss)
125	Pain Threshold
120	Ambulance Siren
115	Loud Rock concert
110	Chain saw at 3 feet
103	MP3 player at max level
100	Motorcycle
95	Subway train at 200 feet
90	Power mower at 3 feet (hearing loss)
85	Heavy city traffic
60	Normal conversation at 3 feet
30	Whispered voice
0	Threshold of normal hearing










Measurements!

A Sound level meter can be used to measure the pressure at different locations