Project FOCUS
Best Lessons
FOURTH GRADE

Title of Lesson: 3
Theme: Physical Science
Unit Number: 4 Unit Title: Sound and Light
Performance Standard(s) Covered (enter codes):
S4P2

Enduring Standards (objectives of activity):

Habits of Mind

- ☐ **Asks questions**
- ☐ **Uses numbers to quantify**
- ☐ **Works in a group**

- ☐ **Uses tools to measure and view**
- ☐ **Looks at how parts of things are needed**
- ☐ **Describes and compares using physical attributes**
- ☐ **Observes using senses**
- ☐ **Draws and describes observations**

Content (key terms and topics covered):
Sound Wave, Vibration, Amplitude, Frequency

Learning Activity (Description in Steps)
Abstract (limit 100 characters): Students will learn about the basic principles of sound waves
Details: In order to prepare for this lab, create a small assessment which should be administered after the demonstration. Attached is an example of my assessment. Because the goal of this experiment is to teach children the differences between amplitude and frequency, it is necessary to find a song that produces a large array of high and low notes (hip hop songs work well). I used a song by the artist Soljah Boy to make the experiment more , and because this song's beat is composed of very low and high notes.
To begin, I briefly explained the way in which sound travels. To demonstrate this concept I made a group of children line up side by side, which was supposed to represent particles in the air. The child at the end of the line was designated as the ear drum. Once lined up, I gently pushed the child at the front of the line, and inevitably, each child bumped into the other like a stack of dominos. I explained that sound waves reach one's ear in a similar fashion. Speakers or vocal cords vibrate particles within the air therefore moving tiny hairs within the cochlea of the ear. These vibrations are interpreted by the temporal lobe of the brain; this function allows people to gauge the distance of sounds and to hear. I also used a bell to explain the general principles of sound. Note: I believe the part of the lesson I am about to explain was too complex. The purpose of using the

bell was to explain the concept of rarefaction. Rarefaction is the drop in pressure associated with impulse of a sound wave being carried outward and inward. For example, when a small bell is hit with an object, the metal rapidly vibrates in and out producing a sound wave. When the bell flexes outward, it pushes out on the surrounding air particles which in turn collide with other air particles. When the bell flexes inward, it pulls on the surrounding air particles which creates an area of low pressure which causes more air particles to be pulled inward.

After explaining the general movement of sound waves, I then discerned the difference between amplitude and frequency. I explained that the frequency of a sound wave—the speed at which the air pressure fluctuates—determines the pitch of a sound. Higher pitched sounds have larger frequencies and lower pitched sounds have smaller frequency. Amplitude—the size of each individual pressure fluctuation—determines how loud the sound is. Higher amplitude sounds move the ear drum's hair a larger distance. Once I finished my explanation of the terms associated with sound waves, I then performed my sound demonstration. I turned on the song I had chosen and turned the volume to a very high level. Huge bass notes were produced along with very high pitched notes. During the song, I would ask the children about the frequencies of the notes they heard. Also, because the volume was very high, each child was able to conclude that the amplitude of the sound waves was very large throughout the entire song.

<u>Materials Needed (Type and Quantity):</u>

-Speakers (preferably speakers that are capable of generating a large range of frequencies and amplitudes)

-A group of five children or more—part of the demonstration requires active participation from at lease five children.

-Although not necessary, it is helpful to prepare a worksheet that discusses and applies the terms learned during the lab session.

<u>Notes and Tips (suggested changes, alternative methods, cautions):</u>

This lab served as an excellent example of how sound works. Most of the children were capable of answering the questions I asked on the sound assessment. This lab worked because of the interactive examples and demonstrations. I would not recommend performing this lab on any children who are in a grade under the fourth; some of the topics are mildly complex for even fourth graders. It may be worth omitting the section on rarefaction because most children were unable to grasp the concept of pressure differentials. Also, I would seriously recommend performing some sort of assessment at the end in order to solidify the previously learned concepts.

1. Does sound travel in a wave like fashion? True or False

2. What does the frequency of a sound wave determine?

a. pitch b. loudness

3. What does the amplitude of a sound wave determine?

a. Pitch b. Loudness

4. Draw a simple diagram of a sound wave. (remember to label the amplitude, pitch, and wave length).

5. If I were to lightly ring a small, hand held bell would the amplitude of the sound be large or small?

6. If I were to turn my car stereo all the way up, would the resulting music have large or small amplitude?

7. The sound emitted by my car's sub woofers has a high _____ and a low _____.

Sources/References:

1)
2)
3)