# Sample Project Report

## Heading

# Mr. Riesen Projects in Science

Date Tuesday, 11:00 am

Sound Waves

Grade Level Targeted: High School

**Purpose** To demonstrate practically the nature of sound waves

**Materials** Guitar Guitar Pick Long Demo Spring

Audience Stage/Amphitheater Sunglasses

Cool Dude Hat Bar Stool Chair 2 Prepared Songs

VCR/TV

### Procedure

1. **Background Activity**
2. Ask students to close their eyes for 60 seconds and listen.
3. After the 60 seconds have them write down any sounds they heard.
4. List these on the board.
5. Ask students the source of these sounds (*tapping/hitting, vibration, explosion, blowing, etc.)*
6. Take students to an amphitheater or stage setting or arrange the students in a semi-circle as an audience. The guitar will be a “hook” to grab students’ attention.
7. Talk to the students about the basic aspects of sound (*see Discussion section*).

**Vocabulary requirement**

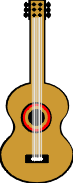
1. For each of the CAPITALIZED WORDS in the discussion section, display a poster showing the word and its **meaning**.
2. For each of the CAPITALIZED WORDS in the discussion section, display a poster showing the word and its **usage in a sentence**.
3. Have the students apply each of the CAPITALIZED WORDS in some context.

* *For this report, the Discussion section and the Conclusion and Question section accomplishes the Vocabulary requirement.*

1. Place the bar stool in the midst of the students for performing or play the video of the pre-recorded performance (*This acts as the actual project*).
2. Play the video of the two songs written for the “Teachers Have Feelings, Too” album.
3. Go over the “Conclusion and Questions” section with students.

**Discussion**

1. Pluck a string on the guitar. Ask students how sound is created in various materials (*Sound is created by or through vibrations or oscillations*).
2. What happens when one plucks a string harder? (*The sound gets louder*) This is the concept of “**AMPLITUDE**” or loudness.
3. Ask for and give examples of other materials that produce sounds through vibrating (*vocal cords, Xylophone, speakers, rubber bands, bumblebees, jets, drums, lips, stringed instruments, etc.*)
4. Tell students that sound is described or characterized by PITCH or scientifically we say, “**FREQUENCY**.” Pitch is related to how many cycles of sound waves pass by in a certain amount of time. (*Show students how the sound travels on the guitar string*)
5. Show students the concept of wavelength by demonstrating different finger positioning on the guitar, producing different sounds. Play a scale on one string to demonstrate the change in **WAVELENGTH** which changes the pitch or frequency of that note. *Demonstrate that the higher up the “neck” of the guitar one plays, the higher the frequency, yet the shorter the wavelength*.
6. *Demonstration with a long spring* 🡪 Have students go out in the hallway
7. Using the long spring, demonstrate a transverse wave and a longitudinal wave (pulse)



1. Demonstrate the difference between FREQUENCY (*how many waves or pulses travel back and forth in one second*) and WAVELENGTH (*the actual length of a wave*) using the long spring.
2. Why does the sound change from string to string even if the wavelength of each string is the same? (*Because different materials vibrate to produce different sounds/tones/pitches*)
3. One other important aspect of sound is the speed or velocity at which the waves travel. We call this the **SPEED OF SOUND**. Give students examples of sound waves traveling at different speeds in different kinds of materials:
4. AIR … (330 m/s or ~12.2 mph)
5. WATER … (~1300 m/s or ~36 mph) … “sonar”
6. METAL … (faster than air or water … telegraph, fax, telephone

**Conclusions and Questions**

1. What produces sound waves? (*vibrations or oscillations*)
2. What basic terms are used to describe sound waves?

* *Wavelength is the string length on the guitar*
* *Frequency is the pitch of the notes heard*
* *Wave speed is the speed of sound*
* *Amplitude is the loudness or volume of the sound*

1. What is the relationship between frequency and pitch? (*They are basically the same thing*)
2. What is the relationship of wavelength to sound? (*Usually the longer the wavelength, the lower the pitch or frequency. For example, compare a bass, cello, viola and violin according to the length of the strings and the sound produced*)