



3-5 Physical Science 3-5 Nature of Science

Southern Nevada Regional Professional Development Program

High Sounds and Low Sounds

INTRODUCTION

Eric Clapton and George Harrison could certainly make their guitars “speak”. They captured sounds by manipulating the strings on their guitars. There was always wonderment as to how they could do that with their instruments.

Violinists also have the ability to pluck the strings of their violins and play *staccato*. A range of pitches permeates the air. It’s music to our ears, but it’s also science.

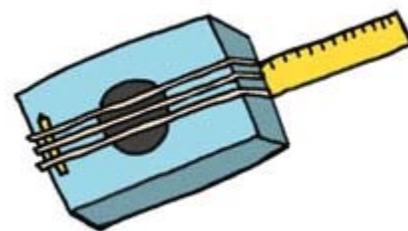
WHERE’S THE SCIENCE?

Whatever the sound may be it is caused by a **vibrating** object. Vibration is the back and forth motion of particles as the air pressure increases and decreases around the object. The air molecules vibrate and eventually the sound travels to your ear. When Eric Clapton tunes his guitar, he is adjusting the **tension** of the strings. When he increases the tension of a string, it will cause it, the string, to **vibrate** more rapidly, and the **pitch** to become higher. As the tension of the string is lessened, the string will **vibrate** more slowly and the **pitch** will become lower.

MATERIALS

(per group)

- Plastic box
- Eight (8) rubber bands of the same thickness
- Assorted rubber bands



PROCEDURES

1. Play an audio clip of a guitar being played. You can access these at www.discoveryeducation.com. Ask students to describe what they hear. What instrument is being played? Tell them that today they are going to explore sound by making an instrument.
2. Model how to create the guitar by stretching the rubber bands around the box in a vertical pattern. Instruct the students to do this in their group and record their observations in their science notebook of how the guitar behaves when plucked. **NOTE:** The tighter the rubber band, the higher the **pitch** will be.
3. Challenge them to try **tuning** the rubber bands to play the scale. (Collaborate with the music teacher to make cross-curricular ties.)
4. Call the students to the gathering area with their science notebooks. Discuss what they noticed about their guitars. Record their observations on chart paper and post in a visible place. Tell them that using what they have learned about pitch you would like to present them with a new challenge. Ask them to predict how using rubber bands of different thicknesses will affect the **pitch**. Instruct them to record their prediction in their science notebook and share these with the class.
5. Send them back to their groups and begin this part of the investigation. Remind them to record their observations in their science notebooks. They may want to include sketches of what their guitar looks like.
6. After the investigation is complete, once again call the students to the gathering area and discuss their results. Record their observations on the chart paper and write any further questions.

EXTENSIONS

- Gather four bottles that are the same size and kind – Snapple bottles work well. Fill with different amounts of water. Tap each bottle with a pencil. What do you hear? What do you notice?
- Have students that play instruments perform for the class. Discuss how the pitch changes.

- Challenge the students to create their own guitar using household items.

Additional Resources

<http://www.canteach.ca/elementary/physical12.html>

Directions on how to make a sound viewer.

www.discoveryeducation.com

Video clip called “Guitar” that shows students how to make their own guitar.

<http://fossweb.com/modules3-6/PhysicsofSound/index.html>

Interactive website that explores sound.

Vocabulary

Pitch: How high or low a sound is.

Tension: The degree to which a material has been stretched.

Tune: To adjust the musical pitch.

Vibration: A rapid back-and-forth movement.

Nevada State Science Standards

P5C2 Students know the wave characteristics of sound. E/S

N5A1 Students know scientific progress is made by conducting careful investigations, recording data, and communicating the results in an accurate method. E/S

N5B3 Students know the benefits of working with a team and sharing findings. E/L