Pocket Sound Blaster

SNG-600

Frequency, Wave Length, and Pitch:

Sound is a tone you hear as the result of regular, evenly spaced waves of air molecules. The most noticeable difference is that some tones sound higher or lower than others. These differences are caused by variations in spacing between the waves; the closer the waves are, the higher the tone sounds. The spacing of the waves—the distance from the high point of one wave to high point of the next one—is the **wavelength**.

All sound waves travel at about the same speed in a given medium. So, waves with a longer wavelength don't arrive (at your ear, for example) as often (frequently) as the shorter waves. Scientists and engineers call this aspect of a sound—how often a wave peak goes by—**frequency**.

The word that musicians use for frequency is **pitch**. The shorter the wavelength is, the higher the frequency, and subsequently the higher the pitch of the sound. In other words, short waves sound high; long waves sound low.

Many instruments produce sound by vibrating a column of air inside a tube, e.g. flute, trumpet, and saxophone. A vibrating object creates a sound wave. The actual frequency at which an object will vibrate at is determined by a variety of factors. Each of these factors will either affect the wavelength or the speed of the object.

Since frequency = speed/wavelength, an alteration in either speed or wavelength will result in an alteration of the natural frequency.

When you blow into the side hole of the pocket sound blaster, the rubber diaphragm vibrates as air pressure repeatedly increases and then is released. The vibration then resonates through the chamber and exits through the open end of the tube.

Classroom Activities

ACTIVITY 1:

As you blow into the hole of the Sound blaster, lightly touch the diaphragm to see whether the sound changes. Does the pitch get higher or lower? Drummers can change the tension on their drumheads to change the pitch.

ACTIVITY 2: Length of the Tube (Column of Air)

Use cardboard tubes (toilet paper, paper towels, mailing tubes) of varying lengths to make the Pocket Sound Blaster tube longer. You'll have to taper the ends of the cardboard tubes to make them fit the outside diameter of the Pocket Sound Blaster.

Shorter is Higher / Longer is Lower: Change the length of this vibrating column of air by varying the length of a tube. Because the Pocket Sound Blaster is short, it produces a higher pitch or frequency. This happens because sound waves can travel, or vibrate, a shorter distance faster than a longer distance.

ACTIVITY 3:

Since the Pocket Sound Blaster tube is approximately 3" long, make a series of cardboard tubes in 3 inch increments (3", 6", 9", 12" etc.) to see how this affects the tone.

ACTIVITY 4: Slide Trombone

As you blow into the hole of the Sound Blaster, insert your other hand's thumb and move it in and out. Notice any change in pitch? For longer tubes, use a cork on the end of a barbecue skewer or thin wooden dowel to change the column of air and to make your own 'trombone.'

ACTIVITY 5:

The plastic ring holds on the diaphragm of the Pocket Sound Blaster. Gently remove the ring and explore with other diaphragm material: wax paper, parchment paper, zip bag plastic, other balloons, latex or Nitrile glove material, etc. What changes do you discover?

ACTIVITY 6: Sound Energy

Can the sound from the Pocket Sound Blaster perform work?

a. Try to blow out a birthday candle with the Pocket Sound Blaster.

b. Put some confetti or puffed rice cereal in the tube and blow through the side hole. What happens?

c. Hold the Sound Blaster so the rubber end is upright. Place some puffed rice on the latex and blow. Observe the movement of the puffed rice due to the vibration of the surface.

NGSS Correlations

Our Pocket Sound Blaster and these lesson ideas will support your students' understanding of these Next Generation Science Standards (NGSS):

Elementary

1-PS4-1

Students can conduct investigations showing evidence that vibrating materials can make sound and that sound can make materials vibrate.

Middle School

MS-PS4-2

Students can use this tool to develop and use a model to describe how waves are reflected, absorbed, or transmitted through various materials.

Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons. For us, "*Teachers Serving Teachers*" isn't just a slogan—it's our promise to you!

Please visit our website for more lesson ideas:

TeacherSource.com/lessons

Check our blog for classroom-tested teaching plans on dozens of topics:

http://blog.TeacherSource.com

To extend your lesson, consider these Educational Innovations products:

Sound Tubes (SS-600)
Sound Tubes are our absolute favorite sound toy. When spun in a circular motion, these tubes produce a tone. As the Sound Tubes are spun faster, the tone steps up in frequency. Due to the harmonics of the tube, there is not a gradual increase in frequency.

Wave Modeling Spring (SPR-1)
This 6-foot-long spring stretches to over 30 feet! Perfect for modeling standing and moving transverse waves as well as moving sound waves. Demonstrate the relationship between wavelength and frequency in a way your students will never forget. You can even stretch the spring through a large slit in a piece of cardboard to demonstrate how a polarizing filter works.

Plastic Wave Spring (SPR-225)
This highly visible, lightweight plastic spring is easier for students to manipulate than metal wave springs, allowing for more flexibility in classroom demonstrations and student lead experimentation. Investigations include the measurement of the phase of reflected waves, the velocity of transverse or longitudinal waves, determination of the frequency and wavelength of a wave, and experiments on standing waves. Includes five experimental lesson plans.