Sound

Minnesota Standards		
Standard	**Benchmark**	**Code**
Understand that scientific inquiry is a set of interrelated processes incorporating multiple approaches that are used to pose questions about the natural world and investigate phenomena.	Generate questions that can be answered when scientific knowledge is combined with knowledge gained from one's own observations or investigations.	3.1.1.2.1
	Recognize that when a science investigation is done the way it was done before, even in a different place, a similar result is expected.	3.1.1.2.2
	Maintain a record of observations, procedures and explanations, being careful to distinguish between actual observations and ideas about what was observed.	3.1.1.2.3
	Construct reasonable explanations based on evidence collected from observations or experiments.	3.1.1.2.4
Energy appears in different forms, including sound and light.	Explain the relationship between the pitch of a sound, the rate of vibration of the source, and factors that affect pitch.	3.2.3.1.1

Cross Curricular Standards		
Standard	**Benchmark**	**Code**

What do I Need to Know?

 **I can explain how the pitch of a sound and the speed of vibrations are related.**

 **I can describe the factors that affect pitch.**

Hypothetically Thinking

What do you know about…

- ✓ **Sound and how it travels?**
- ✓ **Pitch and volume?**

What do you wonder…

- ✓ **What causes sounds to make different pitches?**
- ✓ **What causes a sound to be louder or softer?**
- ✓ **How does sound travel?**

Vocabulary Investigation

vibration – a rapid movement

pitch – the high or low of a sound

volume – the loudness or softness of a sound

Expanded vocabulary:

variable – a factor that can change the outcome

frequency – how often or frequent something happens

decibel – a unit of measurement used to describe the intensity of a sound

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Sound Off

Good Vibrations

Have you ever wondered how a sound is created? Try this: Put your fingers gently on your throat and in a whisper voice, say your name. What did you feel? Now, with your fingers still on your throat, say your name in a normal speaking voice. What did you feel that was different than when you whispered? You felt a vibration when you used your normal speaking voice.

FAST FACT:

Sound waves travel about 767 miles per hour!

All sounds are created by movement called vibrations. These vibrations travel as sound waves through mediums such as air and water. Even though we cannot see sound waves, they are there.

Sound travels in waves.

Interactive Activity 1.1

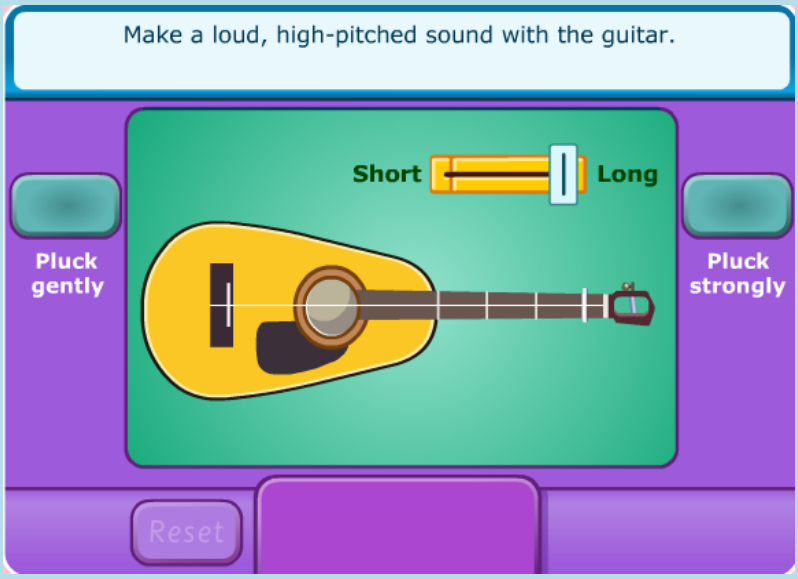
Click here:

Demonstration of pitch vibration

Pitch is created by the frequency of a vibration. Therefore, if the vibration is fast, the pitch is high. The slower the vibration is, the lower the pitch. Think about instruments and the different pitches they can make. The same is true with voices. High pitch voices happen because the vibrations are moving rapidly. Lower pitch voices are because those vibrations are moving at a slower speed. Next, you are going to experiment with a variety of instruments to create different pitches.

Interactive Activity 1.2

Click on the image below to explore pitch.



Experiment 1.1 Experiment with sound and make your own Goose Honker. Watch the video below and learn how to create the Goose Honker.

Goose Honker Experiment

You will need:
-yarn or string
-paperclip
-plastic or paper cup
-scissors
-water

Be sure to observe and analyze the different sounds made when you create a variable in the experiment. For example, if you change the length of your string, does the sound change?

In your science notebook, record your observations.

Draw Conclusions

Are the vibrations of the string moving quickly or slowly? How do you know?

What variables change the pitch in this experiment? How do you know?

Analyze & Extend

1. What did you learn by making the Goose Honkers?

2. What are some ways to change the pitch of the Goose Honker?
3. What questions come to your mind about sound after doing this experiment?

Experiment 1.2

Secret Sounds

In this activity, discover how secret sounds can be hidden in unlikely places. Watch the video, try it, and answer the follow-up questions in your science notebook. (Click on image.)

You will need:
-wire hanger
-yarn
-scissors

Draw Conclusions

1.Describe the sound you heard when you hit the hanger against the wall, without having the strings near your ears.

2. Describe the "secret" sound you heard when you hit the hanger against the wall, with the strings near your ears. Why are the sounds different?

3. Is there a way to change the pitch of the "secret sound"? If so, how can you change it? If not, why not?

Analyze & Extend

Some people say that if a singer sings just the right note loud enough, he or she may shatter a glass. Do you think this is true? What evidence supports this saying?

Can You See Sound?

Experiment 1.3

We know that sound travels in waves, can have different pitches and volume, but we don't see the sound waves. In this experiment, you will get to "see" sound and what happens when you change the pitch and volume.

Draw Conclusions

Describe what you saw before making a sound, during the sound, and after the sound. If there were changes, what caused them?

How Does the Ear Hear?

Fun Fact: Ears not only help you hear, but help you balance.

Did you hear something? Maybe the sound you heard was as quiet as your cat licking her paws. Or maybe it was loud, like a siren going by. Sounds are everywhere, and you have two cool parts on your body that let you hear them all: your ears!

Your ears are in charge of collecting sounds, processing them, and sending sound signals to your brain. And that's not all — your ears also help you keep your balance. So if you bend over to pick up your cat, you won't fall down — or even worse — fall on your cat. Meow!

The ear is made up of three different sections: the outer ear, the middle ear, and the inner ear. These parts all work together so you can hear and process sounds.

The Outer Ear: Catch the Wave

The outer ear is the part of the ear that people can see. It's what people pierce to wear earrings and what your friend whispers into when it's time for a secret. The main job of the outer ear is to collect sounds, whether they're your friend's whispers or a barking dog.

The outer ear also includes the ear canal, where wax is produced. Earwax is that gunky stuff that protects the canal. Earwax contains chemicals that fight off infections that could hurt the skin inside the ear canal. It also collects dirt to help keep the ear canal clean. So earwax isn't just gross. It's gross and useful.

The Middle Ear: Good Vibrations

After sound waves enter the outer ear, they travel through the ear canal and make their way to the middle ear. The middle ear's main job is to take those sound waves and turn them into vibrations that are delivered to the inner ear. To do this, it needs the eardrum, which is a thin piece of skin stretched tight like a drum.

The eardrum separates the outer ear from the middle ear and the three tiniest, most delicate bones in your body. They include:

- the **malleus** (say: **mah**-lee-us)
- the **incus** (say: **in**-kus)
- the **stapes** (say: **stay**-peez)

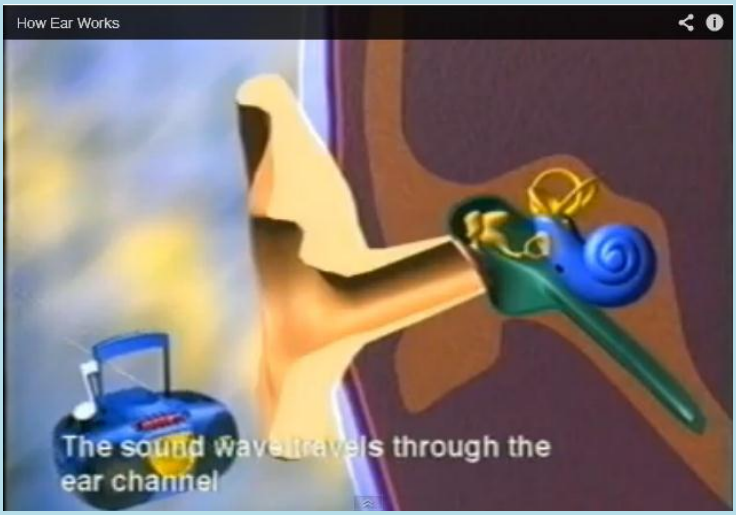
When sound waves reach the eardrum, they cause the eardrum to vibrate. When the eardrum vibrates, it moves the tiny ossicles. These bones help sound move along on its journey into the inner ear.

The Inner Ear: Nerve Signals Start Here

Sound comes into the inner ear as vibrations and enters the **cochlea** (say: **ko**-klee-uh), a small, curled tube in the inner ear. The cochlea is filled with liquid, which is set into motion, like a wave, when the ossicles vibrate.

The cochlea is also lined with tiny cells covered in tiny hairs that are so small you would need a microscope to see them. They may be small, but they're awfully important. When sound reaches the cochlea, the vibrations (sound) cause the

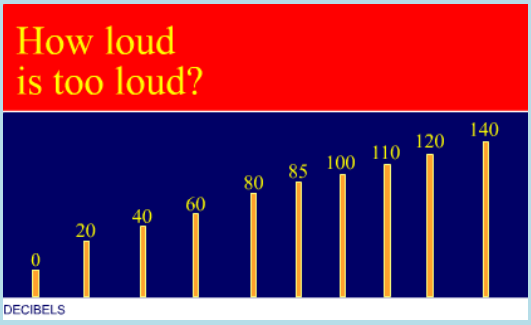
hairs on the cells to move, creating nerve signals that the brain understands as sound. The brain puts it together and hooray! You hear your favorite song on the radio. (Resource: http://kidshealth.org/kid/htbw/ears.html#)



Volume

You have probably noticed that sounds can be loud or soft. This is called volume. Volume can be measured by a unit of measurement called decibels (dB). The larger the decibel number, the louder the sound. If you think about a jet plane compared to a whispering voice, which would have a higher decibel? It is also important to know that high decibels can be damaging to your hearing. Let's look at this interactive sound ruler to get a better understanding of volume and how it is measured.

Interactive Activity 1.3



Chapter Review

http://quizlet.com/111352119/sound-unit-flash-cards Flash cards to review unit vocabulary.
*Please note there are some word cards not covered in this unit.

1. Compare and contrast high pitch sounds to low pitch sounds.

Review Game: http://www.quia.com/ba/17326.html

Conclusion

What do you know about…

- ✓

What do you wonder…

- ✓

Additional Resources

Teacher Resource: This link shares extra ideas (that use basic items) to show the relationship between **sound and vibrations**. Utilize if you feel your students need more visual or hands-on work in understanding this idea.
http://www.curriki.org/xwiki/bin/view/Coll_rula247/soundexperementsgrade4

Teacher Resource: This link will take you to a video by Bill Nye the Science Guy. The video discusses sound, how it travels and how the ear hears sound. Video is approximately twenty-five minutes long. **http://www.youtube.com/watch?v=iJ27q5QHU1U**

Teacher Resource: This worksheet allows students to categorize what level of decibel sounds are in our everyday life. There is an answer sheet, also. To encourage higher level thinking, have students do with a partner or small group, then bring together to see what level they categorized each sound and discuss why they put it in that category. Finish the discussion by sharing the correct answers. Scroll down to "Audio Quiz".
http://www.audiology.org/resources/consumer/pages/kids.aspx

Assessment Options:
Performance: https://sites.google.com/site/3rdgradephysicsofsoundunit/create-an-instrument-performance-assessment
*Students create an instrument out of recyclable items. Rubric is included.

Paper/Pencil: Question bank to choose questions from to create test.

http://www.gobookee.net/sound-energy-assessment-for-third-grade/

SCIENCE NOTEBOOK

Goose Honker Experiment
1) Are the vibrations moving quickly or slowly? How do you know?
2) **What variables change the pitch in this experiment? How do you know?**
Secret Sounds Activity
1) Describe the sound you heard when you hit the hanger against the wall, without having the strings near your ears.
2) Describe the "secret" sound you heard when you hit the hanger against the wall, with the strings near your ears. Why are the sounds different?
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