Fourth Grade Physics of Sound Unit

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Unit overview

The purpose of this unit is to help students develop a conceptual understanding of the physics of sound. Students will construct their understanding by engaging in a variety of activities in which they explore sound and how it is created, altered, and carried from source to receiver. This unit was partially adapted from the FOSS Physics of Sound kit. Most of the materials for the stations in Lesson one, two and three were created from the FOSS kit.

Unit Objectives and Benchmarks and Standards Addressed

1. Students will observe and compare sounds. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
2. Students will explore how sound originates and is detected at a receiver (ear). (MT *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
3. Students will understand pitch and the physical properties of the sound source. (MT *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
4. Students will demonstrate how sound travels through a medium (Solid, liquid, or gas). (MT *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
5. Students will design an instrument and accurately present how the sound is created. (MT *Standard* 1 *Benchmark* 4, *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)

Time/Scheduling

eight to ten – 45 minute segments (over a two week period)

Pre-unit scheduling

- Contact tribal drummer to schedule visit to classroom during lesson #2
- Contact Speech Pathologist or Sign Language Interpreter to arrange their visit during lesson #3

Materials/Resources

- 2 sets of drop objects (aluminum foil ball, cardboard piece, clothespin, paper clip, plastic spoon, plastic chip, craft stick, and metal washer)
- 1 Drop chamber- tag board rectangle
- 1 Drop chamber vision barrier- cardboard rectangle
- Tongue depressors
- The Waterphone
- The Xylophone
- The Kalimba
- The String Beam
- Tone generator
- Beans or rice
- Listening tubes
- Tuning forks
- Stethoscope
- Water container

- Megaphone
- String telephones
- Wood dowels
- Project sheet
- Materials for creating projects
- Library and computer lab

Lesson #1 Sound Discrimination

Summary of the lesson

By dropping different objects in a drop chamber students will learn that different objects make different sounds. This is called sound discrimination. Students will recognize that common objects around them give off very unique sounds. They will then take those common objects and create a code that they will use to make a message for someone else to decipher.

Grade level

4th grade

Approximate time required/scheduling considerations

Two days (45 minutes each day)

Lesson Objectives and Standards and Benchmarks Addressed

1. Students will explore the concept that different objects make different sounds. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
2. Students will create a code to communicate a message. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
3. Students will decipher a message created by someone else. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
4. Montana Science Standards (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)

Resources/materials needed

- 2 sets of drop objects (aluminum foil ball, cardboard piece, clothespin, paper clip, plastic spoon, plastic chip, craft stick, and metal washer)
- 1 drop chamber- tag board rectangle
- 1 drop chamber vision barrier- cardboard rectangle

Teacher preparation

Construct drop chambers and create Ziploc bags that hold drop objects.

Background information needed to teach the unit

Most objects make an identifiable sound when dropped. The highness or lowness of a sound is its pitch. This depends upon the speed of vibration (the frequency) of the sounding object. Students who are familiar with these objects will be able to identify the object by the sound it makes when they are not able to see the object. Students will realize that it is hard to distinguish objects that are made of the same material because they would make the same sound. Students will also recognize that objects that make soft sounds maybe difficult to identify because they are hard to hear. In this activity, communication was created by combining sounds that represent words and also as part of this activity students will create sound codes to communicate with other students by dropping objects and listening to the sounds they make.

Procedure

Engage:

1. Have your students close their eyes and listen carefully as you drop an object (plastic spoon, coin, etc.) on a table.
2. Could the student identify what made the noise? Why or why not? (Most of the students will probably be able to because they are familiar with the objects.)

Explore:

1. Students will set up the Drop Chamber and sit across from their partner or another group of partners (their locations will depend upon how you set up the activity in your classroom).
2. As the students sit across from each other they will drop one object on their side of the drop chamber and the team on the opposite side will attempt to drop the same object. Students then lift the drop chamber to see how accurate they were in listening and identifying the object by its sound.
3. After taking turns back and forth until they are successful at identifying the objects, students will construct a list of the easiest to identify and those that are the hardest.

Explain:

1. The class will come together and discuss the findings.
2. Make a chart of the easiest and hardest objects to identify and ask students to share why they placed the object in that category. Sometimes an object that one group thought was easy another group might identify as difficult, so it is interesting to hear their reasoning.
3. Introduce the term sound discrimination with the definition – all objects have a unique sound and that is how we are able to tell sounds apart (metal sounds different than plastic).
4. Have students place this word in their journal with the definition and a picture of the activity that we did today.

Elaborate: Drop Code (Day 2)

1. Ask students to discuss with a partner how we communicate with one another.
2. Challenge the students to create a way to communicate with the opposing team using only the drop chamber and the drop objects.
3. Have the students share their ideas and help guide them if they get stuck. Help students recognize that different objects represent different letters and they can spell words to each other.
4. Distribute the drop chambers and materials for them to explore using their new form of communication.

Formative assessment

Evaluate:

1. Students will demonstrate their ability to create code messages for their classmates to successfully solve.
2. Students will exchange partners and teach their new partner how to listen and understand their code.

Summative assessment

Students will take a vocabulary test (Appendix A) prior to the unit and then they will take a vocabulary test at the completion of the unit. Students will be keeping a vocabulary notebook where they will add their new vocabulary words each lesson. Students will draw pictures of the words, construct a sentence using the words, and add antonyms & synonyms to their notebook. The rubric for grading the notebooks is included as Appendix B. We will also be organizing a word wall that will include student pictures and definitions of the words.

Lesson #2 Sound Vibrations

Summary of the lesson

Students will look for evidence that different length of instruments and tension produces different pitches of sounds, the longer the instrument the lower the pitch and the shorter the instrument the higher the pitch. The differences in pitch are caused by the speed of the sound waves vibrating.

Grade level

4th grade

Approximate time required/scheduling considerations

Two parts - a 30 minute and 45 minute session

Lesson Objectives and Standards and Benchmarks Addressed

1. Students will explore different instruments and the pitch they produce. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
2. Students will identify that longer, slower sound waves produce lower pitch. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
3. Students will identify that shorter, faster sound waves produce higher pitch. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)

Resources/materials needed

- Tongue depressors
- The Waterphone (Appendix F)
- The Xylophone (Appendix E)
- The Kalimba (Appendix D)
- The String Beam (Appendix C)
- Tone generator
- Beans or rice

Teacher preparation

Gather and create instruments needed for mini activities.
Copy and laminate the station cards
Contact Tribal drummer to coordinate with your class schedule and theirs.
Make sure there is internet access and a way to project the following website http://library.thinkquest.org/19537/Physics.html that has sound waves images that students can see.

Background information needed to teach the unit

Sound is created when the air around us gets pushed quickly and then the push stops. When sound travels no particles actually travel, only energy, which causes air molecules to vibrate. An example of his is when

an alarm clock rings the vibrating bell bumps some air molecules next to it, those molecules jostle the ones next to them all the way across the room until they hit our eardrum. The speed and frequency of those sound waves create the pitch and volume of the alarm that we hear. Vocabulary words introduced during this lesson vibration, frequency, and pitch.

Procedure

Part 1 - Vibration

Engage:

1. Have students place their fingers on the front of their throats to feel the vibrations as they hum. Ask students to share what they felt.
2. Ask the following guiding questions. What happens if they move their fingers up and down their throat? What happens if they tilt their head back and stretch their neck?

Explore:

1. Students will use a tongue depressor and twang it on the edge of their desk to explore different low and high pitches. Have the students share with a partner what they find.
2. Ask the following guiding questions: Can they make the twang louder or softer, higher or lower? What do they have to do to change the pitch?

Explain:

1. Bring the entire class together to have a discussion about what happens to the tongue depressor when they make the pitch higher or lower.
2. Demonstrate what happens when beans are place on the tone generator. What happens as the pitch is raised higher? What happens when the pitch is lowered? What happens to the beans when the volume is turned up or turned down?
3. Draw pictures of sound waves on the board for high pitch, low pitch, high volume, and low volume so that students can see a representation of what they look like and their differences.
4. Write the vocabulary words vibration, high frequency, and pitch in their science notebook with a definition, picture, and any other information that will help them remember these words

Part 2 - Length vs. pitch and tension vs. pitch

Engage:

To guide a discussion, ask the following questions: Do any of the students play a musical instrument? Dp any of the student's siblings play an instrument? What did it sound like? Why do musical instruments sound good sometimes but not at other times? What causes the sound from the instrument?

Explore:

1. Set up a Waterphone, Kalimba, Xylophone, and String Beam so students can explore length and tension and what that does to the pitch.
2. Put students in groups. The groups travel around the classroom to explore how tension and length affect the pitch. They will write down observations as they travel from station to station. (Appendix C, D, E and F)

Explain:

1. Gather students as an entire class and randomly call on students to share their findings. Use the following guiding questions: Why do they think that the length and the tension affect the pitch? When is it higher? When is it lower? Why do some musical instruments have a higher pitch and others a lower pitch?
2. Have students add tension, tune, and sound source to their sound science notebook.

Elaborate:
Invite Tribal drummer to come into classroom to share with students how a drum is made and works to produce tribal music (another possibility is a flutist that could show the students how they make their flutes).

Formative assessment
Evaluate:
Students will complete a probe where they identify length and its effect on pitch. (Appendix M)

Lesson #3 How Sound Travels

Summary of the lesson

Students will explore how sound travels from the sound source to the sound receiver. Students will identify which medium (solid, liquid, or gas) is the easiest for sound waves to travel through by observing them as they travel through stations.

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Grade level

4th Grade

Approximate time required/scheduling considerations

45 min.

Lesson Objectives and Standards and Benchmarks Addressed

1. Students will explore how sound travels. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
2. Students will understand the function of the ear and identify the parts of an ear. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
3. Students will identify that sound waves travel fastest through solids. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)

Resources/materials needed

- Listening tubes
- Tuning forks
- Stethoscope
- Water container
- Megaphone
- String telephones
- Wood dowels

Teacher preparation

Set up stations and make copies of station directions.

Background information needed to teach the unit

Sound waves are called longitudinal waves because they are a compression wave. Sound is created when the air around us gets pushed quickly and then the push stops. You can use a slinky to demonstrate this kind of wave by pushing the slinky forward and a pulse moves down the length of the slinky so students will be able to see the compressions. Sound travels at different speeds depending on what it is traveling through. Sound waves travel the slowest through gases, faster through liquids, and fastest through solids. Sound waves require some kind of material to travel through. They can't move through a vacuum (like outer space) - light waves can. The human ear was formed to create a very efficient sound receiver. The

outer ear acts as a large funnel for the sound to travel into. The eardrum vibrates and sends the message into the inner ear where the brain takes the message and it is understood. Showing students a picture of the ear could help with the students understanding its function. Vocabulary words introduced during this lesson are: amplify echolocation, decibel, sound wave, sound source, and sound receiver.

Procedure

Engage:

1. Brainstorm the word wave and list on the board all of the types of waves (possible responses are: hello, sports wave, water, sound, etc.)
2. Then demonstrate how a wave moves by having students stand in a circle holding hands and raising those connected hands as you go around the circle. Then have students disconnect hands and have students bump into each person as the wave travels around the room. Explain to students that a sound wave moves like the second demonstration of bumping into each other.
3. Have students return to their seats and ask them the following questions: Can sound waves travel through liquids? Can sound waves travel through solids? Can sound waves travel through gas?

Explore:

Students will travel through stations exploring how sound travels through liquid, solid, and gas while writing down their findings. The stations are:

- Sound through solids- string (Appendix G)
- Sound through solids- wood (Appendix H)
- Sounds through water (Appendix I)
- Sounds through air (Appendix J).

Explain:

1. In a group, discuss the findings at each station about how sound travels, its speed and clarity.
2. To show students why sound travels faster through solid materials line students up into two lines. The students in the first line hold hands with the person next to them, but in the second line they keep their hands at their sides.
3. The first person in each line squeezes the hand of the person next to them all the way down the line. The student at the end of each line picks up an object to show the pulse travelled the full length of their line. This will show the students that sound travels quicker through solid materials because their particles are closer together. The line not holding hands will be slower because they have to grab hands before they can squeeze.
4. Show students a diagram of the ear and explain how the bones of the ear work to receive the sounds.
5. Students will add the following words to their science notebook: amplify, decibel, sound wave, sound receiver and sound source.

Elaborate:

1. Research in the computer lab how echolocation works and how bats or whales communicate.
2. Invite a speech pathologist and a sign language interpreter in to share with students their roles in helping people whose sound source or sound receivers don't work efficiently.
3. Students will add echolocation to their science notebook.

Formative assessment

Evaluate:

Students will complete a probe to show their understanding of sound waves and how they travel. (Appendix N)

Lesson #4 Sound Projects and Presentations

Summary of the lesson

Students use what they have learned for further study about sound. They may choose to create an instrument that plays at least two pitches or investigate and demonstrate something about sound. They will present their projects to the rest of the class.

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Grade level

4th grade

Approximate time required/scheduling considerations

Two to three 45 minute sessions (to work on projects) and one to two 45 minute sessions (for students to present)

Lesson Objectives and Standards and Benchmarks Addressed

1. Students will design an instrument that plays at least two pitches. (MT Science *Standard* 1 *Benchmark* 4, *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
2. Students will research a topic related to sound. (MT Science *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)
3. Students will share their instrument or research with the class. (MT Science *Standard* 1 *Benchmark* 4, *Standard* 2 *Benchmark* 3, *Standard* 2 *Benchmark* 7)

Resources/materials needed

- Computer lab
- Library
- Project choices
- Various materials to construct projects with

Teacher preparation

Students will need to pick the project that they would like to research and/or create an instrument. You may want to research web sites in advance that would help students in creating an instrument.

Background information needed to teach the unit

Students have been exposed to many sound making instruments. Some have been real instruments like the Kalimba and the Tribal Drum, but others have been just noise making creations. They will show their knowledge of vibrations, pitch, volume, and sound waves to create an instrument or project and will present their knowledge to the class.

Procedure

Engage:

1. Watch the Magic School Bus – Haunted House (Students are heading to a music competition where they have created an instrument that doesn't sound exactly like they want it to and they discover what changes they need to make to create the sound they want)
2. Give students the attached project list (Appendix K)

Explore:
Students choose a project and begin to explore resources needed to fulfill the requirements of their project.

Explain:
Students will present their project or findings to the class.

Elaborate:
Students will answer questions that are asked by their classmates at the end of their presentation. They need to be prepared for this questioning time and/or find the answer to those questions and report back to the class.

Formative assessment

Evaluation:
Rubric to grade project (Appendix L)

Summative assessment

Students will retake the Science vocabulary test (Appendix A) and turn in their journal that will be graded using the rubric (Appendix B).

Appendix A - Sound Vocabulary Test

Underline the sentence that best defines the vocabulary word.

Vocabulary Word	Sentence A	Sentence B
Amplify	Katlyn used a microphone to make her voice louder.	Tashyna whispered to her friend.
Decibel	Braden's mom wanted to know how loud Braden's IPod was.	Brennan used sign language to talk to his grandfather who couldn't hear.
Echolocation	When Justice yelled his voice travelled a great distance away.	Whales use whistles to find their dinner in the ocean.
High-Frequency	Michelle made the wire taut to make rapid vibrations.	Katlynn put her finger on the wire to slow the vibrations.
Pitch	Micalann turned up the volume to make the sound louder.	Kylei covered the holes on the flute to make the sound lower.
Sound Discrimination	Justice could tell the difference between a plastic spoon and a metal washer.	Kyla couldn't tell what made the sound.
Tension	Nate made the guitar string tight.	Brendon pounded on the top of the drum.
Tune	Braden adjusted the way his guitar sounded.	Emonie played the trumpet loud.
Vibration	Chase dumped out some of the water to make the bottle sound different.	Julian plucked the guitar string to make it move and make sound.
Volume	Penni hit the drum harder to make it louder.	Kade covered a hole in the flute to change the note.
Sound Wave	Pepper spoke and the sound traveled to Dude's ear.	Hallie was excited to see Mary and moved her hand up and down.
Sound Receiver	Vincent put his hands up to his mouth and yelled so his friends on the playground could hear him.	Devon cupped her hand around her ear to hear the whisper.
Sound Source	Aaron blew into the flute.	The hearing aide worked well to catch the vibrations.

Appendix A (continued)
Please indicate "Yes" or "No" as to whether you agree or disagree with the statement and then write an explanation for your choice.

1. Would you amplify your voice if you were sitting in the library?

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_____

2. Would you use decibels to measure how fast sound can travel?

_____

_____

3. Does a bat use echolocation?

_____

_____

4. High-Frequency tells you how loud you can turn up your IPod.

_____

_____

5. The pitch of your voice changes as you get older.

_____

_____

6. Sound discrimination is when you don't like a noise.

_____

_____

7. Your ear is a sound receiver.

_____

_____

8. Would you change the tension if you turned up the volume on a stereo?

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_____

9. Tuning an instrument makes it sound better.

_____

_____

10. A cow mooing is a sound source.

_____

_____

11. A sound wave is easy to see.

_____

_____

12. A guitar string vibrates to make a sound.

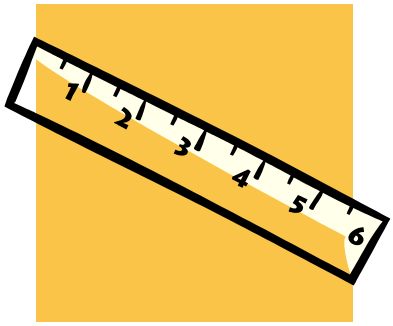
_____

_____

Appendix B - Sound Notebook Rubric

	Good 5 pts	Fair 4 pts	Poor 3 pts	Comments
Drawing Entry	Drawings meet all criteria: Neat, proportional to paper, colorful, labeled, realistic	Drawings has four out of five criteria	Drawing is missing two or more criteria	
Synonym and Antonym	Accurate context for and use of vocabulary word.	Inaccurate context for OR use of vocabulary word.	Inaccurate context for and use of vocabulary word.	
Sentences	Sentences meet all criteria: Sentence has a subject, predicate, correct grammar, correct capitalization, and no spelling errors.	Sentences meet four out of five criteria	Sentence is missing two or more criteria	
Timeliness	Weekly entries (drawings and sentences) completed on time.	Most entries (drawings and sentences) completed on time.	Few entries (drawings and sentences) completed on time.	

Appendix C - The String Beam



Investigation

1. Slide the cup along the ruler while plucking the string. Listen and vote on when the sound has a higher pitch.
2. Takes turns with making sure that everyone gets a turn. Play just two notes with keeping the cup still and plucking the string, then moving the cup to another spot and plucking the string. When does the instrument play a higher pitch?

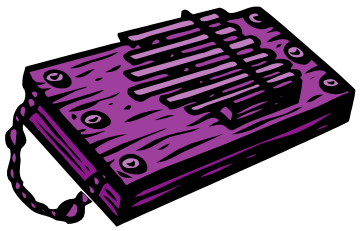
Record

Write down your observation. What does the length of the string have to do with the pitch of the instrument? Or does it?

Further investigation

- What other things can you do with the string beam to change the pitch?
- Can you play a song?

Appendix D - The Kalimba



Investigation

1. Unscrew the wing nuts to loosen the 5 steel springs, place the five bars so that they are at different lengths, tighten down the wing nuts. Pluck two of the bars listening closely to which one has a higher pitch.
2. Continue to do this using different bar combinations until you are accurate on which bar makes a higher pitch.
3. Place the bars in order from highest to lowest pitch.

Record

Draw what your Kalimba looks like with its bars from highest to lowest pitch.

Highest ----------Lowest

Record what you learned about the length of the bar and the pitch that it produces.

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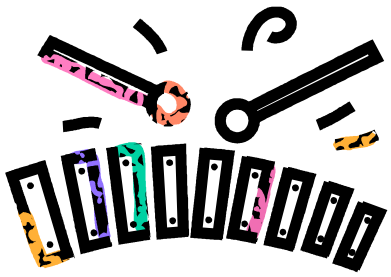
_____
_____
_____
_____
_____
_____
_____
_____
_____

Further investigation

- What happens to the pitch on the opposite side of the Kalimba?
- Does it make a different sound when using different tools to pluck the springs?

Appendix E - The Xylophone



Investigation

1. Place two tubes on the foam, strike them individually with the mallet, and decide which one has a higher pitch.
2. Repeat taking turns until you are confident you can place the tubes in order from highest to lowest pitch.

Record
Draw the tubes in order from highest to lowest pitch.

Highest ----------Lowest

Does the length of the tube have anything to do with the pitch it makes?

Further investigation

- Can you play a song on the xylophone?

Appendix F - The Waterphone

Investigation

1. Tap on the bottles two at a time to see which one has a higher pitch. Continue to repeat until you are able to put them in order from highest to lowest pitch.

Record

Draw the bottles indicating how much water is in them from highest to lowest pitch.

Highest ----------Lowest

What observations did you see while you were doing the investigation?

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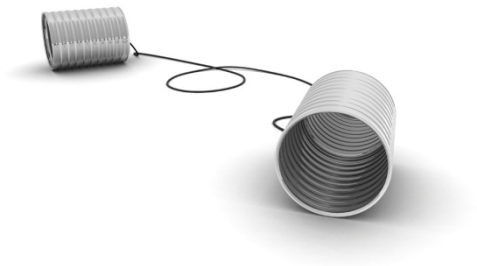
_____
_____
_____
_____
_____
_____
_____
_____
_____

Further investigation

- Can you blow across the top of the bottles to make it have a sound? Does the pitch stay the same?

Appendix G - Sounds through solids-string



Investigation

1. Talk softly with your partner standing a short distance away. How does it sound? Is it easy or hard to hear your partner?
2. Talk softly using the telephone. How does it sound? Is it easier or harder to hear your partner?

Record

Write your answers to the questions above.

_____
_____
_____
_____
_____

Further investigation

- Use a telephone that has a shorter or longer string. Does this make a difference?
- Use a higher voice or a lower voice. Is there a difference?

Write down your findings.

_____
_____
_____
_____
_____

Appendix H - Sounds through solids – wood

Investigation

1. Put your ear to the desk and have someone scratch it. What do you hear? Now sit up and have them scratch it again. What do you hear? Are they the same or different?
2. Wrap a tissue to the end of the dowel and tape it in place. Carefully hold it next to your ear and rub the end of the stick. What do you hear? Now pull the stick away from your ear and rub the end of the stick. What do you hear? Are they the same of different?

Record

Write down what you did and what it sounded like. Does sound travel differently through wooden objects or through the air?

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_____
_____
_____
_____
_____
_____

Further investigation

- Hold the stick up to the wall and place it next to your ear. What do you hear?
- Besides rubbing the end of the stick what other things can you do that would make sounds and what do they sound like when you have the stick near your ear?

Record

What new things did you find?

_____
_____
_____
_____
_____
_____

Appendix I - Sounds through water

Investigation

1. Tap your fingers in the air. What does it sound like? What happens when you tap your fingers closer and closer to your ear?
2. Have your partner disinfect the ear pieces of the stethoscope and then put it on. Now tap your fingers together. What does it sound like? What happens when you tap your fingers closer and closer to the stethoscope? (Caution: Do not strike or tap the stethoscope diaphragm.)
3. Switch and do steps one and two so that you can hear what it sounds like.
4. Now tap your fingers together under the water in the basin. What do you hear?
5. Have your partner put on the stethoscope and put the diaphragm under the water. Now tap your fingers together under the water in the basin. What do they hear? Is it different than in the air?
6. Repeat step 5.

Record

Write down all of your observations. What did you find when the sound traveled through water compared to traveling through air?

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_____
_____
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_____
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Further investigation

- What is it like for a fish in a fishbowl when someone taps on the outside?

_____
_____
_____

Appendix J - Sounds through air

Investigation

1. Listen to the sound that the tuning fork makes when you hold it close to your ear. (Note: Hit the edge of one tine on the block of wood to get the tuning fork to start to vibrate.) What do you hear?
2. Have your partner strike the tuning fork and hold the paper tube to your ear while they place the tuning fork inside the tube. What do you hear now? Is it different? Why?
3. Repeat steps one and two so that your partner can hear what it sounds like.
4. What happens if you put the tuning fork farther up inside the tube while you are listening? Does it sound different?

Record

Write down your findings to the questions above. Does the tuning fork sound different when it is held in the tube compared to holding it next to your ear? Why?

_____
_____
_____
_____
_____
_____
_____

Further investigation

- Use the timer to see how long you can hear the tuning fork held next to your ear and then time to see how long you can hear the tuning fork held inside the tube. What did you find? Why?

_____
_____
_____
_____
_____

Appendix K - Project Ideas

1. Make a detailed drawing of the ear and explain how it works.
2. Make a chart of things in the environment that have high and low sounds.
3. Create a sound center in the classroom. Display objects that make sounds and provide a brief description of each sound.
4. Create a collage from catalogs and magazines of things that make noise.
5. Make a list of rooms in your house and the different sounds that can be heard in each room.
6. Use the internet to discover how they get sound onto motion pictures.
7. Take apart an old radio to see what is inside. Describe the items that you found.
8. Write an essay describing the special problems faced by people who are hearing impaired and research how a hearing aid works.
9. Write a poem using several “sound” words.
10. Read a book about sound and write a book share for the class.
11. Create a musical instrument that changes pitch.
12. Research animal communications and share with the class your findings.
13. Conduct research and write a report as to how bats can navigate.
14. Research sound inventors and write a report about what they invented and how it has changed the world.
15. Investigate jobs that are loud and research what can save the hearing of someone working at those jobs.

Appendix L - Homemade music instrument or sound project rubric

Excellent 4 pts	Good 3pts	Needs Improvement 2pts	Unsatisfactory 1pt
Completed on time and project following teacher approved plans	Completed on time but did not follow teacher approved plans	Completed late and project didn't follow teacher approved plans	Project not complete
Project is neat and done with attention to detail	Project is neat	Project is not neat	Project is poorly made
The student demonstrates the instrument or project to the class using sound vocabulary accurately	The student has slight difficulty demonstrating the instrument or project to the class	The student has great difficulty demonstrating the instrument or project to the class	The student did not demonstrate instrument or project to the class

Self evaluation:

Followed directions _____

Appearance and sound _____

Performance _____

Total points _____

Teacher evaluation:

Followed directions _____

Appearance and sound _____

Performance _____

Total points _____

Excellent= 11-12 points
Good = 9-10 points
Need to Improve = 6-8 points
Unsatisfactory = 0-5 points

Appendix M - Pitch

A.

B.

C.

Which instrument has the lowest pitch? Explain why.

Which instrument has the highest pitch? Explain why.

Appendix N - Sound travel

Why would a railroad worker put his ear against a track? Do you think that this is a smart way to tell if a train is coming? Explain your thinking.