We're Up to Our EARS in Hearing and Sound!

Grade Level or Special Area: Third Grade Science
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Length of Unit: Nine lessons (approximately 11 days; one day = 45 minutes)

I. ABSTRACT

This science unit engages third graders in a hands-on, experiential approach to learning about the human ear and the production of sound. Through the fun of singing, writing, experimenting, predicting, and responding, your students will learn all about the parts of the human ear, how sounds are made, the difference between pitch and intensity, how to protect their ears and hearing, and even about the famous inventor, Alexander Graham Bell.

II. OVERVIEW

A. Concept Objectives
   1. Students will understand that humans can make and hear sounds that have meaning and communicate messages.
   2. Students will recognize that sounds impact and influence our daily lives.
   3. Students will understand that sounds can be produced and project different appreciations and reflections.

B. Content from the *Core Knowledge Sequence*
   1. Science: The Human Body (p. 81)
      a. Hearing: How the Ear Works
         i. Sound as vibration
         ii. Outer ear; ear canal
         iii. Eardrum
         iv. Three tiny bones (hammer, anvil, and stirrup) pass vibrations to the cochlea
         v. Auditory nerve
   2. Science: Sound (p. 82)
      a. Sound
         i. Sound is caused by an object vibrating rapidly.
         ii. Sounds travel through solids, liquids, and gases.
         iii. Sound waves are much slower than light waves.
         iv. Qualities of sound
            a) Pitch: high or low; faster vibrations = higher pitch, slower vibrations = lower pitch
            b) Intensity: loudness and quietness
         v. Human Voice
            a) Larynx (voice box)
            b) Vibrating vocal chords: longer, thicker vocal chords create lower, deeper voices
         vi. Sound and how the human ear works
         vii. Protecting your hearing
   3. Science: Science Biographies (p. 83)
      a. Alexander Graham Bell

C. Skill Objectives
   1. Students will identify that our ears help us hear.
   2. Students will identify sounds using only their ears.
   3. Students will list what they know about their ears, hearing, and sound.

4. Students will list questions entailing what they would like to know about their ears, hearing and sound.
5. Students will record definitions of terms.
6. Students will identify the parts of the ear.
7. Students will identify the results of vibrations near the human ear.
8. Students will role play the parts of the ear in transmitting sounds to the brain.
9. Students will follow oral directions.
10. Students will assemble an Ear Accordion.
11. Students will discover that sounds are caused by vibrations.
12. Students will observe the cause and effect of a science experiment.
13. Students will illustrate a drawing and compose a sentence to share what they observed in a science experiment.
14. Students will cooperate and communicate with peers in a group activity.
15. Students will recognize that sound waves travel much slower than light waves.
16. Students will discover that when sound waves vibrate, sound goes out in all directions.
17. Students will identify that sound waves can travel through solids, liquids, and gases.
18. Students will predict the outcome of experiments.
19. Students will judge the accuracy of their predictions.
20. Students will understand the difference between pitch and intensity (volume).
21. Students will predict the pitch of a sound depending on the size of an instrument.
22. Students will illustrate pictures and write sentences to show pitch and intensity.
23. Students will sing a favorite song, while adjusting the pitch to become higher and lower.
24. Students will recognize that their larynx is also called their voice box, and it is located in their throats.
25. Students will identify that we use our vocal cords to make sounds with our voices.
26. Students will compose a tongue twister sentence with alliteration.
27. Students will identify what part of their mouths vibrates when making various verbal sounds.
28. Students will compose a poem using onomatopoeia.
29. Students will recognize that some sounds are pleasant and others are unpleasant.
30. Students will brainstorm sounds that are pleasant to the ear.
31. Students will brainstorm sounds that are unpleasant to the ear.
32. Students will create a Venn diagram.
33. Students will understand proper ear care.
34. Students will create a poster to show proper ear care.
35. Students will describe what the world might be like without telephones.
36. Students will recognize that Alexander Graham Bell was the inventor of the telephone.
37. Students will build a cup-and-string carrier (telephone).
38. Students will know the words spoke on the very first telephone call.

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. Ferguson, Beth, *The Ears*
2. Hurwitz, Sue, *Hearing*
3. Pringle, Laurence, *Hearing*

B. For Students
1. Familiarity with five senses and associated body parts (Core Knowledge Kindergarten)
2. Understanding of ways to take care of your body (Core Knowledge Kindergarten-Grade 2)
3. Introduction to the three states of matter: solid, liquid, gas (Core Knowledge Grade 1)

IV. RESOURCES

A. Macaulay, David. *The Way Things Work: Sound* (Video) (Lesson One)

V. LESSONS

Lesson One: Name That Sound! (one lesson, approximately 45 minutes)

A. *Daily Objectives*
1. Concept Objective(s)
   a. Students will understand that sounds can be produced and project different appreciations and reflections.
2. Lesson Content
   a. Science: Sound (p. 83)
      i. Qualities of sound
3. Skill Objective(s)
   a. Students will identify that our ears help us hear.
   b. Students will identify sounds using only their ears.
   c. Students will list what they know about their ears, hearing, and sound.
   d. Students will list questions entailing what they would like to know about their ears, hearing and sound.
   e. Students will record definitions of terms.

B. *Materials*
1. *The Way Things Work: Sound* (Video)
2. KWL chart (one copy on a transparency) (Appendix A)
3. CD player
4. Any sound effect CD
5. VCR
6. Overhead projector
7. Overhead screen
8. Vis-à-vis markers
9. Rulers (one for each student)
10. Vocabulary Learning Logs (one for each student – Appendix B)
11. Movie Reports (one for each student - Appendix C)
12. Movie Reports Rubric (Appendix O – one copy for each student)

C. *Key Vocabulary*
1. Ear: the human organ used for hearing
2. Sound: a distinctive noise, created by a vibration

D. *Procedures/Activities*
1. To begin the lesson, captivate the students' interests with a great start. Say to the students, "To kick things off today, we are going to play a game! We are going to conduct some sound experiments to test our ears. You are going to hear some mystery sounds, and I want you to see if you can identify them, simply by listening!"
2. Turn on the CD player with the mystery sounds CD. Play one sound at a time, inviting students to raise their hands to guess what the sound is. You may want

to begin with easier sounds (a bell, a police siren) and progress to more difficult sounds (running water, a roller coaster, etc.). Note: the sound of a toilet flushing is always a big hit!

3. Say to the students, "We are going to begin a fun and exciting unit! Starting today, we will begin learning about our ears, how we are able to hear, and how sounds travel through the air. We're going to start by brainstorming the things we know about our ears, our hearing, and sounds."
4. Pull down the overhead screen, turn on the overhead projector, and display the KWL chart. Ask the students, "What do we know already about our ears, hearing and sounds?" Write the students' ideas in the K column.
5. Say to the students, "I can see that you have a great understanding of this information – what you know will provide a good basis for what you are about to learn. Now, let's think about some things that we don't know – some things we would like to learn by the time this unit is complete. What do you want to learn?" Write the students ideas in the W column.
6. Say to the students, "I love these questions you have come up with! I can see that you are excited to jump into this unit, and I cannot wait to teach you all of these new and important things. I am going to keep this chart that we have started, and when we are all finished with this unit, we will revisit this and fill in the last column to show what we have learned."
7. Tell the students, "Sound is a form of energy, just like heat, light, and electricity. Sound energy is made when an object moves back and forth very quickly. These movements are called *vibrations*. When something strikes an object and causes it to vibrate, that energy becomes sound. If you use physical energy to hit a table, then the table vibrates, turning your physical energy into sound."
8. Ask the students to take out their rulers. Instruct students to lay the rulers on their desks so that about half of the ruler hangs off the desk. Tell students to hold the end of the ruler down to the desk with one hand, and then tell them to hit the unsupported end of the ruler quickly. What happens? The ruler vibrates! They have made sound!
9. Pass out the Vocabulary Learning Logs. Tell the students, "We are going to learn lots of new words as we study this unit together, and we will write each of the definitions down on this page. So when we're finished with it today, you'll want to put it in a safe place (maybe inside a science folder) so you'll know where to find it later. This page will be an excellent resource for you to study for our test at the end of the unit, so make sure you keep it in safe place! Let's look at the first word together." Write the word *ear* on the board, and write the definition beside. Encourage the children to copy the definition on their paper. Repeat with the word *sound*.
10. Tell the students, "We are now going to watch a video. As you watch this video, I want you to be thinking, listening, and paying careful attention to the information provided. When the movie is complete, I will ask you to write a sentence or illustrate a picture showing three things you learned from the video." Note: you may want to pass out the Movie Report sheets (Appendix C) before the video begins, to allow students to take notes.
11. Show the video. Note: it is approximately 13 minutes in length.
12. After the video, give students time to complete the Movie Report. You may want to give the students a copy of the Movie Reports Rubric (Appendix O) in advance, so they may know what criterion to focus on. Collect these Movie Reports. These may be scored with the Movie Reports Rubric.

E. *Assessment/Evaluation*

1. Collect the students' Movie Reports. Read or have them verbally share what they learned about the ear or sound.

Lesson Two: The Ear and Its Parts (one lesson, approximately 45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
   a. Students will understand that humans can make and hear sounds that have meaning and communicate messages.
2. Lesson Content
   a. Science: Human Body: Hearing: How the Ear Works (p. 82)
      i. Sound as vibration
      ii. Outer ear; ear canal
      iii. Eardrum
      iv. Three tiny bones (hammer, anvil, and stirrup) pass vibrations to the cochlea
      v. Auditory nerve
      vi. Sound and how the human ear works
3. Skill Objective(s)
   a. Students will identify the parts of the ear.
   b. Students will record definitions of terms.
   c. Students will identify the results of vibrations near the human ear.
   d. Students will role play the parts of the ear in transmitting sounds to the brain.
   e. Students will follow oral directions.
   f. Students will assemble an Ear Accordion.

B. *Materials*

1. Appendix D: Journey through the Ear (one for the teacher)
2. Appendix E: Ear Accordion booklet (one for each student)
3. Appendix B: Students' Vocabulary Learning Logs (one for each student)
4. Large plastic bag (one)
5. Three pieces of construction paper (label one *hammer,* one *anvil*, one *stirrup)*
6. Clear container of water, labeled *cochlea*
7. String or yarn, about 3 feet long
8. Scissors (for each student)
9. Glue (for each student)
10. Colored pencils or crayons (for each student)

C. *Key Vocabulary*

1. Auditory (ear) canal: the tube between the outer ear and the ear drum
2. Ear drum: a thin skin that stretches across the inner end of the ear canal
3. Hammer: a tiny middle ear bone
4. Anvil: a tiny middle ear bone
5. Stirrup: a tiny middle ear bone
6. Cochlea: a spiral shaped organ filled with liquid
7. Auditory nerve: a nerve that sends signals to the brain
8. Eustachian tube: connects the middle ear with the throat
9. Lymph: the liquid found inside the cochlea

D. *Procedures/Activities*

1. Say to the students, "Yesterday, we learned that our ears help us hear, and we even tested our ears to see if we could identify sounds just by listening. Today we are going to learn more about the ear and its parts. By the end of today's

lesson, you will be able to name all of the parts inside your ear, and you will understand how sounds travel from the world and into your brain."

2. Tell the students, "Today, we are going to take an imaginary journey through an ear! We are going to learn how sound travels from the outside world and into our ears, all the way to our brains." Select students to play the roles of Eardrum, Hammer, Anvil, Stirrup, Cochlea, and Brain.
3. Have the students stand in a straight line, next to one another. Ear drum holds the plastic bag taut and places it against the elbow of Hammer. Hammer stands elbow to elbow with Anvil; Anvil stands elbow to elbow with Stirrup; and Stirrup stands elbow to elbow with Cochlea, who holds the water-filled container. Place one end of the string (which represents the auditory nerve) into the water, and have Brain hold the other end of the string. (See Appendix D for detailed example.)
4. To begin, have the class say, "Vibrating vibrations!" Eardrum makes the plastic bag vibrate against Hammer's elbow. When Hammer feels the vibrating bag, he starts to shake his elbows back and forth, passing the vibration down the line until it reaches Cochlea.
5. Tell the students, "There are tiny hair-like cells that line the inside of the cochlea. These cells change the sound's movement energy into electrical impulses. When the brain notices the water sloshing about, that means sound energy is being changed into electrical energy so it can travel through the auditory nerve to the brain." At this point, Brain shows that he or she has received the message by repeating what the class said to start this chain reaction. You may want to repeat this once (or twice!) more to see that the students understand the connections made in the inner ear.
6. Say to the students, "Now that we have seen how sound travels through the ear, let's record the definitions of each of the parts we learned. Please take out your Vocabulary Learning Logs." On the board, write the following words: auditory (ear) canal, ear drum, hammer, anvil, stirrup, cochlea, auditory nerve, and Eustachian tube, and lymph. Write each definition beside each term, and give the students time to record these definitions on their Learning Logs.
7. Tell the students, "Now, you are going to make an Ear Accordion to keep for yourself. This display of an ear will help you study the parts of the ear and to remember how they work." Distribute copies of Appendix E, Ear Accordion.
8. Give students oral directions on how to assemble the Ear Accordion. For students with special learning needs, write the directions on the board as well. Say, "First, you need to color the three pieces. Cut out the three pieces along the solid black lines. Tape or glue the three pieces together to make one long strip. Fold the strip accordion-style along the dotted lines so that the outer ear is on top." Give students time to color and assemble the Ear Accordion.

E. *Assessment/Evaluation*

1. Have students name the parts of the ear and identify their job in delivering sounds to the brain.
2. Allow students to quiz each other on terms recorded on the Vocabulary Learning Log.

Lesson Three: Communicating Messages Through Sounds in Our Daily Lives (one lesson, approximately 45 minutes)

A. *Daily Objectives*
   1. Concept Objective(s)
      a. Students will understand that sounds can be produced and project different appreciations and reflections.
   2. Lesson Content
      b. Sound (p. 82)
         i. Sound is caused by an object vibrating rapidly.
         ii. Sound waves are much slower than light waves.
   3. Skill Objective(s)
      a. Students will discover that sounds are caused by vibrations.
      b. Students will observe the cause and effect of a science experiment.
      c. Students will illustrate a drawing and compose a sentence to share what they observed in a science experiment.
      d. Students will cooperate and communicate with peers in a group activity.
      e. Students will recognize that sound waves travel much slower than light waves.

B. *Materials*
   1. Rubber bands (two for each student)
   2. Bowls (two)
   3. Rice (one cup)
   4. Plastic wrap
   5. Balloons (one for each student)
   6. Students' Vocabulary Learning Logs (one for each student)

C. *Key Vocabulary*
   1. Vibrate: to move back and forth, quickly
   2. Vibration: rapid movement that occurs when the air shakes to create a sound; it is produced by plucking, stroking, blowing, or hitting

D. *Procedures/Activities*
   1. Tell the students, "We have learned about the parts of ears, and we have learned how sound travels through our ears and into our brains so we can hear and identify sounds. Today, we are going to take a look at what sound is, how it happens, and how we use it to communicate! Now, watch me very closely. We will do several experiments today, and you'll want to use your observation skills."
   2. Loop one end of a rubber band around an object such as a chair. Pull the other end a little, but not enough to break it. Pluck it. Ask the students, "What is happening to the rubber band?" (It vibrates.) "What does it mean to *vibrate?*" (It means that something is moving back and forth very quickly.) Write *vibrate* on the board and the definition beside it. Have the students take out their Learning Logs and record this definition.
   3. Ask the students, "What vibrates when I pluck the rubber band?" (the rubber band) "Do you hear a sound? What kind of sound?"
   4. Tell the students to lightly touch their throats and hum softly. Ask, "How does your throat feel? Tell the students to hum high and low sounds and ask them, "How does your throat feel differently, depending on how high or low you hum?" Tell the students to hum loudly and softly, and ask them to share how their throats feel differently with the different volumes.
   5. Give each student a balloon. Instruct students to blow up the balloons and to knot them. Tell the students to hold the balloons up to their mouths and to talk

against them. Do the balloons tickle their noses as they vibrate from their speech? They will be able to feel the vibrations in their hands and against their faces. Remind the students that vibrations are made when an object moves back and forth extremely fast. Our voices make vibrations in the air that hit the balloon and make it vibrate.

6. Let the students make miniature drums. Give each student a bowl, enough plastic wrap to cover the top of the bowl, and two rubber bands. Instruct students to stretch the plastic tightly over the mouths of the bowls and then to put rubber bands around them to secure the plastic in place.
7. Give each student a teaspoon of rice. Instruct students to put the rice on top of their drums. Have students tap the tops of their drums. Ask the students, "Can any of you explain what is happening?" (The students use physical energy to tap the plastic, which makes the plastic vibrate and make sound. The vibration of the plastic makes the rice move as the plastic drops away from the rice and then comes back up with each tap.)
8. Tell the students, "We know that light travels at 186,000 miles per second. Do you think that sound travels at the same speed as light does?" (No, nothing is faster than the speed of light.) Tell the students, "Sound travels much slower than the speed of light. Sound travels at 1,000 feet per second. We can see an example of this when a thunderstorm is approaching. We may see a flash of lightning and then several seconds later hear a boom of thunder. It takes longer for the sound to reach us than for the light flash. Another example of how much faster light is than sound is at a baseball game. We may see the batter swing the bat and a split second later, we hear the crack of the ball hitting the bat. The sound takes longer to reach us than the light bouncing off the batter. This is how we know that sound waves travel much slower than light waves."
9. Tell the students, "We make noises to communicate with one another. Sometimes we use words, and other times we just make noises; we laugh, cry, gasp, sigh, and many other sounds that tell others what we are thinking or feeling. But sometimes, when we use words, our messages can get a little mixed up. We're going to play a game called Operator to show how that can happen when messages are passed to many different people."
10. Seat the students in a large circle. Whisper a message to the person sitting beside you; that person will whisper the message to the person next to them. Continue passing the message until it has been passed all the way around the circle. If a person is unsure of the message, he may ask to have it repeated one time by saying, "Operator?" If he still is unclear on what to say, he should take his best guess and pass on the message. When it has reached the last person in the circle, that person will repeat the message aloud. It is always interesting to see how the message is altered in the passing!

E. *Assessment/Evaluation*

1. Have students illustrate a picture of any of the experiments completed in class. They must write a sentence explaining what is happening in the picture and what that tells us about sound.

Lesson Four: How Does Sound Travel? (one lesson, approximately 45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
    a. Students will understand that sounds can be produced and project different appreciations and reflections.

2. Lesson Content
    a. Sound (p. 82)
        i. Sounds travel through solids, liquids, and gases.
3. Skill Objective(s)
    a. Students will discover that when sound waves vibrate, sound goes out in all directions.
    b. Students will identify that sound waves can travel through solids, liquids, and gases.
    c. Students will predict the outcome of experiments.
    d. Students will observe cause and effect.
    e. Students will judge the accuracy of their predictions.

B. *Materials*
1. Large bowl of water
2. Small bowl of water
3. Penny
4. Small rock
5. Cork
6. Slinky
7. A ball of aluminum foil
8. Piece of thread
9. Empty glass
10. Spoon
11. Balloon partially filled with water (do not overfill!)
12. Balloon inflated with air
13. Tuning fork
14. Appendix F: Sound Centers I (one copy, cut into strips for display in centers)
15. Appendix G: "Solids, Gases, Liquids, too!" Song (one copy for teacher)

C. *Key Vocabulary*
1. Solid: of definite shape and volume; not liquid or gas
2. Liquid: the state of matter in which a substance exhibits a characteristic readiness to flow, little or no tendency to disperse, and relatively high compressibility
3. Gas: state of matter distinguished from the solid and liquid states by relatively low density and viscosity

D. *Procedures/Activities*
1. Prior to the lesson, set up the class for work in centers or small groups. Set a table in the center of the room, for all the class to see, and on this table put your large bowl with water. Cut Appendix F into separate cards with directions given. Place these at various stations around the room, and assemble these centers with the following materials:
    a. Slinky Springs: slinky
    b. Bouncing Balls: make a ball with aluminum foil and tie a piece of thread around the foil; also, put an empty glass and a spoon on the table
    c. Balloon Radio: radio, balloon filled partially with water, balloon inflated with air
    d. Tuning Water: tuning fork, small bowl of water
    e. Desk Top Noises: a desk
2. Gather the class around the water bowl. (Depending on the size of your class, you may want to use more than one container for more visibility.) Ask the class, "What is a wave?" (A wave is when something moves freely back and forth or up and down in the air, like tree branches in the wind.) Ask the students to use their hands to show what a wave looks like.

3. Ensure that the water is fairly still on the table. Hold a penny about a foot above the water near the center of the bowl, and drop it. The penny will create waves in the water. Have the students observe the waves. Ask them, "What do you notice about these waves? Do the waves go in one direction only, or do they move out in a circle from the place the penny entered the water? The waves in the water move out in all directions, and sound waves move out in all directions from the source, also."
4. Tell the class to observe the waves closely as you drop another object into the water. This time, drop something larger, like the small rock. Ask the students, "What do you observe? Were these waves bigger or smaller? These waves were larger because the rock was larger than the penny. The rock hit the surface with more force, making bigger waves. When an object vibrates with a lot of force or intensity, it will make bigger waves, too. When sound waves are bigger, do you think the sound is louder or softer? The bigger waves are louder sounds."
5. Ask the students, "Do you think the water in the waves is moving? Or do you think the waves are moving over the water instead?" You will get many varied responses, probably. To test this question, place a piece of cork in the water. Ask the students, "Can you predict what will happen if I drop a rock into the water again? Will the waves move the cork across the water?" Accept all predictions from the students. When the cork has settled and water is still, test to see if the students' predictions are accurate. Drop a small rock into the water, away from the cork. Tell the students, "Watch the waves move outward from the rock and over to the cork. What happens to the cork? It bobs up and down in place, but it stays in about the same place. The waves move on past the cork, however. Can you explain what this means?" (The waves move through water, but the water doesn't move. Sound is the same way. Its waves move through matter, like solids, liquids, and gases, but the waves do not move the matter.)
6. Tell the students, "You will have some time today to work in centers. You will work in small groups, and you will be conducting your own science experiments. Remember these expectations when you work in centers:
    a. Make sure everyone has a turn
    b. When you are finished, leave everything as you found it for the next group
    c. Do not move to another center until you get a signal from me."

    Divide the students into groups of 3-5, and disperse them to work in centers. Signal them to rotate to new centers every five minutes.
7. After the students have rotated through each center, gather them in a large group. Ask the students, "What were some of your observations of these experiments?" Facilitate a discussion on what the students saw, heard, and felt during these experiments.
8. Teach the students "Solids, Gases, Liquids, Too" Song. (See Appendix G.)
9. Tell the students, "We have learned today that sound waves travel through water, but do you think we can hear sounds under water? Well, you have a very unique homework assignment tonight – it involves getting in the bathtub! You are going to test sound under water. Tonight, I want you to put your head under the water in the bathtub, and then tap the side of the tub. Listen, and see what you hear with your head under the water. Ask yourself, can you hear it? Does it sound louder or quieter? Come prepared to discuss this in the morning!"
10. To follow up the next day, ask the students to share their experiences with listening under water. They should have found that the sounds are louder under water. Explain to the students that this is because sound travel through water and

other liquids much faster than it travels through air. That's why the tapping sounds louder under the water!

E. *Assessment/Evaluation*
   1. Students will verbally share their findings in the various experiments, both in the classroom and at home.
   2. Students can sing the "Solids, Gases, Liquids, too!" Song.

Lesson Five: What's the Difference Between Pitch and Intensity? (one lesson, approximately 45 minutes)

A. *Daily Objectives*
   1. Concept Objective(s)
      a. Students will understand that sounds can be produced and project different appreciations and reflections.
   2. Lesson Content
      a. Sound (p. 82)
         i. Qualities of sound
            a) Pitch: high or low; faster vibrations = higher pitch, slower vibrations = lower pitch
            b) Intensity: loudness or quietness
   3. Skill Objective(s)
      a. Students will understand the difference between pitch and intensity (volume).
      b. Students will predict the pitch of a sound depending on the size of an instrument.
      c. Students will predict the outcome of experiments.
      d. Students will judge the accuracy of their predictions.
      e. Students will illustrate pictures and write sentences to show pitch and intensity.

B. *Materials*
   1. Wide assortment of rubber bands (varied in thickness)
   2. Small empty boxes (shoe boxes are fine)
   3. Guitar
   4. Recorder
   5. Picture of a tuba (only if you do not have access to an actual tuba!)
   6. Picture of a trumpet (only if you do not have access to an actual trumpet!)
   7. Appendix H: Sound Centers II (one copy, cut into strips for display at centers)
   8. Two long, cardboard tubes
   9. Ticking watch
   10. Plastic tube (one)
   11. Index card (one)
   12. Hair comb (one)
   13. Four pop bottles, filled with varied amounts of water

C. *Key Vocabulary*
   1. Pitch: the highness or lowness of a sound, determined by the speed the sound is traveling
   2. Frequency: the speed of a vibration
   3. Intensity (volume): the loudness or softness of a sound, determined by how strong the object is vibrating

D. *Procedures/Activities*
   1. Prior to the lesson, set up the classroom for work in centers or small groups. Cut Appendix H into separate cards with directions given. Place these at various

stations around the room, and assemble these centers with the following materials:

a. Bouncing Sounds All Around: two long cardboard tubes, a ticking watch, and a wall
b. Tube and Water: plastic tube, bowl of water
c. Index Card Madness: index card, hair comb
d. Pop Bottle Music: four pop bottles, filled with varied amounts of water

2. To begin, tell the students, "One of sound's characteristics is that it can be high, low or somewhere in between. This is called the *pitch*. What makes a sound's pitch? (A sound's pitch is caused by the speed of a vibration, or the frequency of it.) A sound vibration that is very fast, happening at short, frequent intervals, has a high pitch. One that is slower has a low pitch. Ladies and gentlemen, today you will have an opportunity to experiment with different pitches by playing with rubber bands!"
3. Give each student (or pair of students) a box and two rubber bands, a thick one and a thin one. Instruct the students to stretch their rubber bands around the boxes so they stretch across the short way. Tell the students to pluck the rubber bands with their fingers. They will be able to see the rubber bands vibrate as well as hear the sounds they create. Ask them, "Which sounds higher, the thick or the thin rubber band?"
4. Now instruct the students to change the rubber bands so that they are stretched over the long direction of the boxes. Ask the students, "When you pluck the rubber bands now, are the sounds higher or lower than when the rubber bands weren't stretched as much? (The pitch is higher.) From this we can deduce that the rubber band tension affects the pitch as much as the width of the rubber band. Tighter bands are stretched thinner, and so they produce a higher pitch than a looser rubber band.
5. The class can see how the thickness and the tension of a string affect its pitch by observing a guitar. Show the guitar to the students. Ask them, "Can you predict which string will make the lowest sound and which will make the highest sound?" Pluck the strings in the order the students' request, beginning with the string the students predict will produce the highest pitch. The thinner strings will produce a higher pitch.
6. Let the students hear how the tension affects the frequency of a string's sound. Pluck a string and then turn the tuner, making the string loose. The pitch will drop. Repeat, this time tightening the string. The class can hear the string change its pitch as the tension pulling against it changes.
7. Show the recorder to the students. Play softly on the instruments, making notes of different pitches by covering up the holes with your fingers. Ask the students, "Why do you think the pitch changes when I cover up the holes?" (When you cover the holes, this alters the length of the tube that the air has to travel through before it escapes through a hole. As more holes are covered, the air vibrates along more of the tube and makes a lower note.) Ask the class, "How many of you have heard an organ played at church? Church organs have tiny pipes for high notes, and huge pipes for low notes."
8. Hold up the pictures of the trumpet and tuba. Ask the students, "Which instrument do you believe makes the lower pitch notes?" (The tuba makes the lowest notes of all the brass instruments. Most tubas have between 19 feet and 23 feet of tubing!)
9. Tell the students, "We have talked about pitch, the highness and lowness of a sound. Boys and girls, pitch is different from intensity. Pitch is how high or low

a sound is, and intensity is how loud or soft a sound is. Let's make soft sounds with our voices until I hold up my hand to signal you to stop. Now let's make loud sounds with our voices until I signal you to stop! That is intensity: how loud or soft something is. Intensity is caused by how strong an object is vibrating. When we shout, our vocal chords are vibrating very strongly, and when we whisper, they are vibrating very softly. That is intensity."

10. Tell the students, "You will have some time today to work in centers. You will work in small groups, and you will be conducting your own science experiments. Remember these expectations when you work in centers:
    a. Make sure everyone has a turn
    b. When you are finished, leave everything as you found it for the next group
    c. Do not move to another center until you get a signal from me."

    Divide the students into groups of 3-5, and disperse them to work in centers. Signal them to rotate to new centers every five minutes.
11. After the students have rotated through each center, gather them in a large group. Ask the students, "What were some of your observations of these experiments?" Facilitate a discussion on what the students saw, heard, and felt during these experiments.

E. *Assessment/Evaluation*

1. Have students illustrate two pictures: one to show what causes sounds to have high or low pitches, and another picture to show two things that have different levels of intensity in their sounds. Students should write a paragraph to explain their illustrations.
2. Students will verbally share their findings in the various experiments in the classroom.

Lesson Six: Humans Make Sounds, Too! (one lesson, approximately 45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
    a. Students will understand that humans can make and hear sounds that have meaning and communicate messages.
    b. Students will recognize that sounds impact and influence our daily lives.
2. Lesson Content
    a. Sound (p. 82)
        i. Human Voice
            a) Larynx (voice box)
            b) Vibrating vocal cords: longer, thicker vocal cords create lower, deeper voices
3. Skill Objective(s)
    a. Students will sing a favorite song, while adjusting the pitch to become higher and lower.
    b. Students will recognize that their larynx is also called their voice box, and it is located in their throats.
    c. Students will identify that we use our vocal cords to make sounds with our voices.
    d. Students will compose a tongue twister sentence with alliteration.
    e. Students will identify what part of their mouths vibrates when making various verbal sounds.
    f. Students will compose a poem using onomatopoeia.

B. *Materials*
   1. Balloons (one for each student)
   2. Paper and pencil for each student

C. *Key Vocabulary*
   1. Larynx: voice box
   2. Vocal cords: rubber band-like folds in the larynx; when air passes through these bands, vocal sounds are made
   3. Onomatopoeia: the use of words that imitate the sounds they're describing

D. *Procedures/Activities*
   1. Lead your class in a favorite song. Then begin to sing at a higher pitch, encouraging the class to sing higher with you. Drop to a lower pitch. Ask the class how it feels to sing at a high pitch compared to singing at a low pitch. Tell the students to notice that when they sing, they are exhaling. Can they sing when they are inhaling? Let them try! It will sound quite different from when they sing as they exhale. Have them describe how this feels.
   2. Give students the balloons and tell them to blow them up so they are fairly full, but do not tie a knot in the end. Instruct them to let the air out slowly. They can do this by pinching the neck of the balloon and pulling it as wide as they can. As they pull it wider, the opening will become much tighter, and the sound will increase in pitch. When more air can get through, as the students loosen the neck and let more air out, it will drop in pitch. Ask the students, "Can you compare this experiment with the tension of the rubber bands we played with yesterday?" (When the rubber band had a higher tension, it made a higher pitch. The same is true with the balloons.)
   3. Ask the students, "Where are your vocal cords? Point to them. The vocal cords are located in your larynx, or your voice box, which is in your throat. The vocal cords are like rubber bands inside our throats, and when we breathe and air flows through them, they vibrate. This is how we create sounds with our voices. Feel your voice box. Now let's sing our song again." Repeat the song you sang at the beginning of the lesson. Encourage the students to continue to touch their throats as they sing. They will feel their vocal cords moving.
   4. Tell the students, "In men, the larynx grows larger and it often makes a bump in the throat. This bump has a nick name; it's called the Adam's apple. Men's vocal cords are generally longer, so they have lower voices. Women's vocal cords are generally shorter, so they have higher voices."
   5. Say to the students, "We make sounds by vibrating our vocal cords, but we can also make sounds by vibrating our tongue and our lips. What vibrates when you make the following sounds? (Discuss each sound as the students experiment with them.) MMMM? VVVVV? TTTT? BBBB? KKKK? LLLL?
   6. Tell the students, "Bees and flies buzz, cats meow, and birds chirp. Can you tell me how it sounds when someone jumps into a swimming pool? Splash! How does it sound when someone is at the door, and there isn't a doorbell? Knock-knock! What do we say when a doorbell rings? Ding-dong! These kinds of words are called onomatopoeia. Onomatopoeia is the use of words that imitate the sounds they're describing."
   7. Write onomatopoeia on the board. Teach the class how to say onomatopoeia. It rolls off your tongue in a pleasant rhythm. You may want to tell them this interesting fact: this is one of the only words that have four different vowels in a row!
   8. Ask the students to make a list of onomatopoetic words. You can start them off with words like *drip, buzz, bang, meow, pop, rattle,* and *chirp.* Encourage them

to think of at least ten words. Ask the students to write poems that use at least three of their sound words!

E. *Assessment/Evaluation*
   1. Have students write a tongue twister sentence (with alliteration) at the top of a page. Draw a person making that specific sound. Be sure your drawing shows the correct mouth shape for that sound, and show what is vibrating to make that sound.
   2. Ask students to write sound poems that use at least three of their onomatopoetic words.

Lesson Seven: That Does (or Does Not) Sound Good! (one lesson, approximately 45 minutes)

A. *Daily Objectives*
   1. Concept Objective(s)
      a. Students will understand that sounds can be produced and project different appreciations and reflections.
   2. Lesson Content
      a. Sound (p. 82)
         i. Qualities of sound
   3. Skill Objective(s)
      a. Students will recognize that some sounds are pleasant and others are unpleasant.
      b. Students will brainstorm sounds that are pleasant to the ear.
      c. Students will brainstorm sounds that are unpleasant to the ear.
      d. Students will work cooperatively with a partner.
      e. Students will create a Venn diagram.

B. *Materials*
   1. Carpet area for children to sit on the floor in a circle
   2. Appendix I: "Likeable/Dislikeable Sounds" Venn Diagram (one for each child)

C. *Key Vocabulary*
   None

D. *Procedures/Activities*
   1. Seat the children in a circle. Say to the students, "There are some sounds that are nice to hear. For example, I like the sound of a cat purring, and I also like the sound of a marching band. What kind of sounds do you enjoy?" Give each child an opportunity to share a favorite sound.
   2. Say to the students, "You came up with some very pleasant sounds to hear! But there are also some sounds that we don't like to hear. For example, I don't like the sound of fingernails on a chalkboard. What kinds of sounds do you dislike?" Give each child an opportunity to share a disliked sound.
   3. Say to the students, "Are there some sounds that might sound nice to one person, and bad to another person? Sure! For example, I like to listen to thunderstorms, but that might be scary for some people to listen to. What are some sounds that people might feel differently about?" Foster discussion among the students.
   4. Tell the students, "Now, you will get to work with a partner to complete this next task. I'm going to give you this Venn diagram to complete. On this side (point to the left circle), you will list at least five sounds that both of you like to hear. On this side (point to the right circle), you will list at least five sounds that both of you dislike. In the middle, you need to list at least three sounds that one of you likes and the other dislikes." Distribute the paper and let the children get started.

5. Let students verbally share their diagrams.

E. *Assessment/Evaluation*

1. Students completed the Venn diagram with five likeable sounds, five dislikeable sounds, and three sounds that are both likeable and dislikeable.

Lesson Eight: Protect Those Ears! (one lesson, approximately 45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
   a. Students will understand that humans can make and hear sounds that have meaning and communicate messages.
   b. Students will recognize that sounds impact and influence our daily lives.
2. Lesson Content
   a. Sound (p. 82)
      i. Protecting your hearing
3. Skill Objective(s)
   a. Students will understand proper ear care.
   b. Students will create a poster to show proper ear care.

B. *Materials*

1. Markers for each child
2. Construction paper (one for each child)
3. Appendix P: Ear Care Poster Rubric (one for each child)

C. *Key Vocabulary*

None

D. *Procedures/Activities*

1. Say to the students, "Our ears are very important to us. They certainly make our lives much easier! What are some things you think we should remember to protect our ears?" Facilitate discussion.
2. Write students' answers on the board. Answers should include:
   a. Never poke anything in your ear, including cotton swabs. You could poke holes in your ear drum.
   b. Cover your ears with your hands if loud or painful sounds surprise you.
   c. Use doctor-approved ear plugs if you have to be around loud sounds for long periods of time.
   d. Turn down your television and stereo, especially if you use headphones.
   e. If you have an earache or other pain in your ears, tell an adult so you can get some help.
   f. If your hearing seems muffled or blocked, tell an adult.
   g. Wash the outside part of your ear gently with soap and water on a washcloth. Do not stick the washcloth down into your ear. Dry your ears very well.
   h. Do not hit people on their ears.
   i. Do not make loud noises next to people's ears.
3. Give each student a piece of paper and markers. Tell students, "Now is your chance to make a Protect Your Ears poster! Choose one or more of the rules we've written on the board, and draw a picture of that rule." You may want to display the students' finished posters in the classroom.
4. Collect students' posters, and grade them according to the Ear Care Poster Rubric (Appendix P).

E. *Assessment/Evaluation*

1. Students create a poster to show proper ear care.

Lesson Nine: Who Was Alexander Graham Bell? (one lesson, approximately 45 minutes)

A. *Daily Objectives*
   1. Concept Objective(s)
      a. Students will understand that humans can make and hear sounds that have meaning and communicate messages.
      b. Students will recognize that sounds impact and influence our daily lives.
   2. Lesson Content
      a. Science: Science Biographies (p. 83)
         i. Alexander Graham Bell
   3. Skill Objective(s)
      a. Students will describe what the world might be like without telephones.
      b. Students will recognize that Alexander Graham Bell was the inventor of the telephone.
      c. Students will build a cup-and-string carrier (telephone).
      d. Students will know the words spoke on the very first telephone call.

B. *Materials*
   1. A pin
   2. For each pair of students: two paper cups, 4 to 6-ft length of heavy thread or string, two paper clips, and a pencil
   3. Appendix J: Cup-and-string voice carrier (telephone) (one copy for teacher)

C. *Key Vocabulary*
   1. Telephone: an instrument that converts voice and other sound signals into a form that can be transmitted to remote locations and that receives and reconverts waves into sound signals

D. *Procedures/Activities*
   1. Ask the students, "Think about how often you use the telephone. What do you use it for? What do your parents use it for? What do you think the world would be like without telephones?" Encourage discussion among the students.
   2. Tell the students, "Well, lucky for us, a very intelligent man invented the telephone many, many years ago. This man, named Alexander Graham Bell, was born in Scotland 1847 – that was more than 150 years ago! His family called him Aleck. Even when he was very small, he was interested in sound and how we speak. On a trip to London once with his father, he saw a demonstration of a *speaking machine*. He decided that he wanted to make a speaking machine, too! He and his brother built a model of a mouth, throat, nose, tongue, and lungs. They pumped air from the model lungs through the vocal cords in the throat and moved the tongue and mouth so that the speaking machine could make humanlike sounds. From what he learned, Aleck was able to move the mouth and vocal cords of his pet dog so that the dog would growl words!"
   3. Say, "Aleck wanted to read everything he could about talking, hearing, and sound. He even tried to read books in other languages! One book was by a German scientist. Aleck misunderstood what he read; he thought the scientist had written that there might be a way to send voices through a wire. He thought this was an interesting idea, and he started experimenting to see if he could do it. When his two brothers died of an illness and Aleck also become sick, his parents moved with him to Canada. When he recovered from his illness, Aleck moved to Boston and began teaching at a school for the deaf. He also continued his work on sending a voice over a wire. By a lucky chance, Aleck met Thomas Watson who worked at an electrical machine shop. Thomas Watson was very good at making things, and Aleck was full of ideas. What a great team! Together, they figured out how to change sound vibrations from a voice into electrical signals

that could travel quickly through a wire. The wire could carry the signals into an earpiece or receiver where they could be changed back into sound waves that a person could hear."

4. Say, "One day, when they were working on their invention, Thomas Watson was in one room and Aleck was working in another. Aleck spilled acid and called out, 'Mr. Watson, please come here. I want you." Watson heard Alexander Graham Bell's voice coming through the receiver he was working on! This was the very first telephone call. Alexander Graham Bell went on to invent other things also, but the telephone was his most famous invention. He helped people in two ways: by inventing the telephone and educating people who were deaf. The telephone he invented looked very different from the kinds we use in our homes today, and that is because inventors have changed and improved his original invention over the years."
5. Tell the students, "Today you will get to make your own telephone with a partner. Do you think string can carry sound vibrations? We will find out today!" Draw a picture on the board of how to build a cup-and-string voice carrier. Be sure to show that the string must be pulled tightly between the two cups. Divide the students into groups of two, and pass out the materials.
6. Let the students build the telephone. Give them opportunities to stretch the string between the cups and send messages to one another.
7. Ask, "What have you learned today? Can a piece of string carry sound vibrations? (yes) When we talked into the cup, the bottom of the cup vibrated and caused the string to vibrate. The vibrating string made the bottom of the other cup vibrate so the partner could hear what was said. Today we have made some very simple telephones. What happened when the string was not pulled tight? (Sound could not travel on the string.) Why do you think the string had to be tight for the telephone to work? (Because the string could not vibrate when it was loose.)"

E. *Assessment/Evaluation*

1. Have students write a paragraph telling how their lives would be different without a telephone.

VI. CULMINATING ACTIVITY

A. Revisit the KWL chart as a class. Facilitate a class discussion to review what the students knew before the start of the unit, what they wanted to know, and now what they have learned at the close.
B. Hearing and Sound Test (see Appendices K and L)
C. Have a Music Mania party! Celebrate what the students have learned about sound by making musical instruments! (See Appendix M.)
D. Take a field trip to hear an orchestra! What an exciting way to see and hear musical instruments that make such beautiful sounds!

VII. HANDOUTS/WORKSHEETS

A. Appendix A: KWL Chart (Lesson One)
B. Appendix B: Vocabulary Learning Log (Lessons One, Two, Three)
C. Appendix C: Movie Report (Lesson One)
D. Appendix D: Journey through the Ear (Lesson Two)
E. Appendix E: Ear Accordion (Lesson Two)
F. Appendix F: Sound Centers I (Lesson Four)
G. Appendix G: "Solids, Gases, Liquids, too" Song (Lesson Four)
H. Appendix H: Sound Centers II (Lesson Five)

I. Appendix I: "Likeable and Dislikeable Sounds" Venn Diagram (Lesson Seven)
J. Appendix J: Directions for Cup-and-String Voice Carrier (Lesson Nine)
K. Appendix K: Hearing and Sound Study Guide (Culminating Activity)
L. Appendix L: Hearing and Sound Test (Culminating Activity)
M. Appendix M: Hearing and Sound ANSWER KEY (Culminating Activity)
N. Appendix N: Making Musical Instruments (Culminating Activity)
O. Appendix O: Movie Reports Rubric (Lesson One)
P. Appendix P: Ear Care Poster Rubric (Lesson Eight)

VIII. BIBLIOGRAPHY

A. Ferguson, Beth. *The Ears.* New York: Marshall Cavendish Corporation, 2004. ISBN: 0-7614-1592-0.
B. Hurwitz, Sue. *Hearing.* New York: Rosen Publishing Group, 1998. ISBN: 0-531-11656-5.
C. Macaulay, David. *The Way Things Work: Sound* (Video). Wynnewood: Schlessinger Media, 2002. ISBN: 1-57225-583-8.
D. Pringle, Laurence. *Hearing.* New York: Marshall Cavendish Corporation, 2000. ISBN: 0-7614-0735-9.
E. Siepak, Karen Lee. *Sound.* Greensboro: Carson-Dellosa Publishing Company, 1994. ISBN: 0-44222-11569-2.

Appendix A

KWL Chart

What do we Know?	What do we Want to know?	What did we Learn?

Vocabulary Learning Log

Name: _____ Date: _____

Hearing and Sound Vocabulary Learning Log

Ear: _____

_____

Sound: _____

_____

Auditory (ear) canal: _____

_____

Ear drum: _____

_____

Hammer: _____

_____

Anvil: _____

_____

Stirrup: _____

_____

Cochlea: _____

_____

Vocabulary Learning Log, continued

Auditory nerve: _____

_____

Eustachian tube: _____

_____

_____

Lymph: _____

_____

Vibrate: _____

_____

Vibration: _____

_____

Sound waves: _____

_____

Pitch: _____

_____

Intensity: _____

_____

Appendix C

Movie Report

Name: _____ Date: _____

Directions: Write or illustrate three things you learned from the movie.

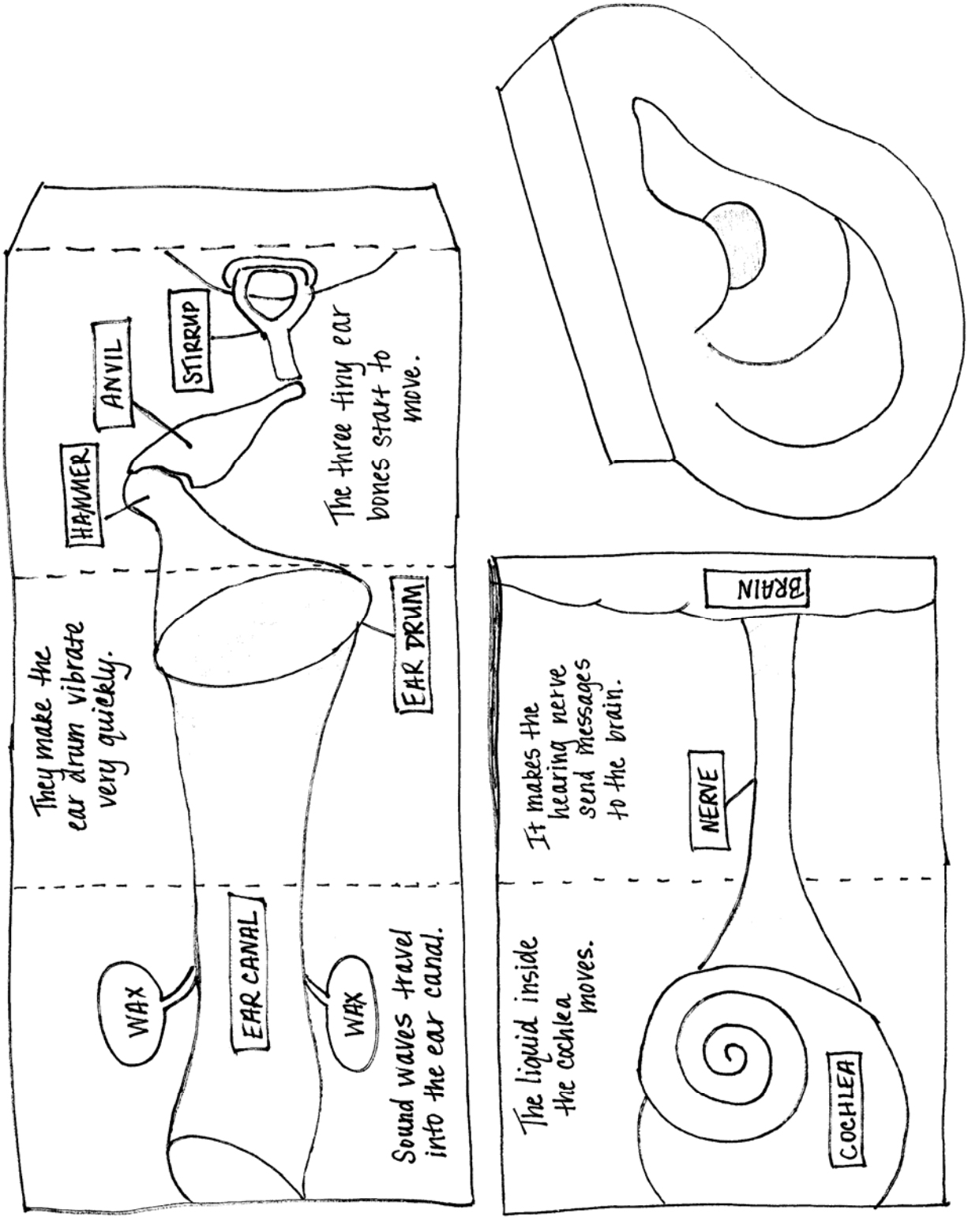
1.
2.
3.

Appendix D

Journey Through the Ear

Appendix E

Ear Accordion



Sound Centers I

Slinky Springs

1. Two students hold the ends of the Slinky. Stretch the slinky.
2. Another student should tap one end of the Slinky one time. Watch the vibration travel in a wave to the other end.
3. Tap the spring in the middle. Notice the vibrations will travel away in both directions.
4. Tap the spring quickly several times, so that the waves are close together. This is like a high-pitched sound, which we will learn more about later.
5. Now tap the spring more slowly, so that the waves are farther apart. This is like a low-pitched sound.

Bouncing Balls

1. You will see a ball made from some kitchen foil, and there is a thread wrapped around the ball.
2. Put the glass on the table. Hold the thread so that the foil ball just touches the glass.
3. Gently tap the other side of the glass with a spoon. What happens to the foil ball? The ball should jump away. As you tap the glass, it vibrates and makes a noise. The vibrations make the ball move.

Sound Centers I, continued

Balloon Radio

1. There are two balloons: one filled with water, and one filled with air. Turn the radio on to a soft volume.
2. Place one side of the water balloon against the radio and the other side against your ear. Listen to the radio. What do you hear?
3. Now, try listening to the radio through the air-filled balloon. What do you hear?
4. What was different about the sound from the radio?

Tuning Water

1. Strike the tuning fork against the heel of your shoe. (Don't strike a tuning fork against a hard object.)
2. Insert the tuning fork into the bowl of water. Notice how the vibrations of the fork cause waves to form.
3. Sound travels in waves caused by vibrations also!

Desktop Noises

1. Have one student place his ear on the desk surface.
2. Have another student tap on the desktop.
3. What does the student with his ear on the desk observe?
4. Have another student scratch on the desktop.
5. What does the student with his ear on the desk observe? Is the sound loud or soft?

Appendix G

"Solids, Gases, Liquids, too!"

Solids, Gases, Liquids, too!
(sung to the tune of "Where is Thumbkin?")

Solids, gases.
Solids, gases.
Liquids, too.
Liquids, too.
Sound waves can pass through
Sound waves can pass through
Me and You!
Me and You!

Sound Centers II

Bouncing Sounds All Around

1. Ask one student to hold one of the tubes at an angle to the wall with the ticking watch at the other end of the tube.
2. Hold the other tube to your ear and aim it at the same spot on the wall as your friend's tube is pointing. Can you hear anything? If not, adjust the angle your tube makes with the wall (still pointing it at the same spot.
3. Is there anything special about the position at which you can hear the watch? What does this tell you about what is happening to the sound waves as they hit the wall?

Tube and Water

1. Blow across the top of the tube.
2. Move the tube up and down in the water, as you blow across the top.
3. Notice the change in pitch. What makes it higher? What makes it lower?

Sound Centers II, continued

Index Card Madness

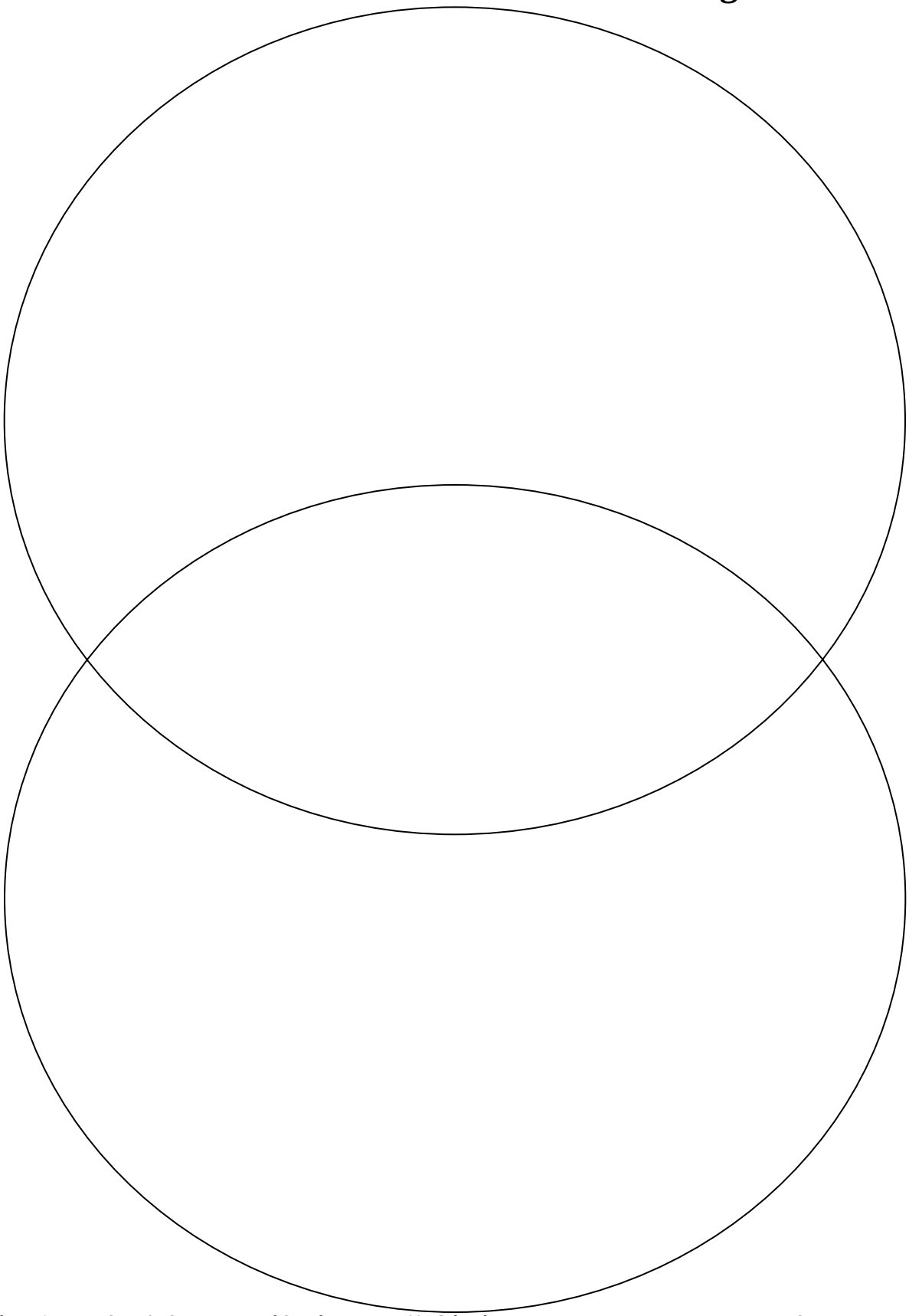
1. Run the end of the index card over a hair comb at different speeds.
2. What happens when you move it very fast? What happens when you move it very slowly?
3. The faster the index card moves, the faster it vibrates, and the higher the sound (pitch) becomes. Why does this happen?

Pop Bottle Music

1. Practice blowing across the top of a bottle to make sounds.
2. Fill four juice or soda bottles with water. The level of water should be different in each bottle.
3. Blow across the top of the bottles. Put the bottles in order from highest note to lowest note.
4. What do you observe? Why?

Appendix I

"Likeable and Dislikeable Sounds" Venn Diagram



Name _____

Appendix J

Directions for Cup-and-String Voice Carrier

1. Poke a small hole in the bottom of each paper cup.
2. Thread the string through the hole, tying a small knot on the inside so the string cannot slip back through the hole.
3. Stretch the two cups between two students, making sure the string is taut.
4. Students can now transmit messages to each other!

Hearing and Sound Study Guide

Sound is a form of energy caused by an object that is moving back and forth.

Vibration occurs when the air shakes to create sound. It is produced by plucking, stroking, blowing, or hitting.

Intensity is the loudness or softness of a sound and depends on how strong the object is vibrating.

Pitch is the highness or lowness of a sound. It is determined by the speed that the sound is traveling.

A **decibel** is the measure of the loudness of a sound.

We use **sonar** to measure distance by timing echoes.

An **echo** is the sound heard when vibrations bounce back from an object.

The **speed of sound** depends upon the substance through which it travels.

The **ear drum** is a thin skin that stretches across the inner end of the ear canal.

The **middle ear bones** are called the hammer, anvil, and stirrup.

The **cochlea** is a spiral shaped organ filled with liquid.

Lymph is the name of the liquid found inside the cochlea.

The **auditory nerve** sends signals to the brain.

The **Eustachian tube** connects the middle ear with the throat.

The tube between the outer ear and the ear drum is the **ear canal**.

Hearing and Sound Study Guide, continued

When **sound waves** vibrate, the air waves go off in all directions.

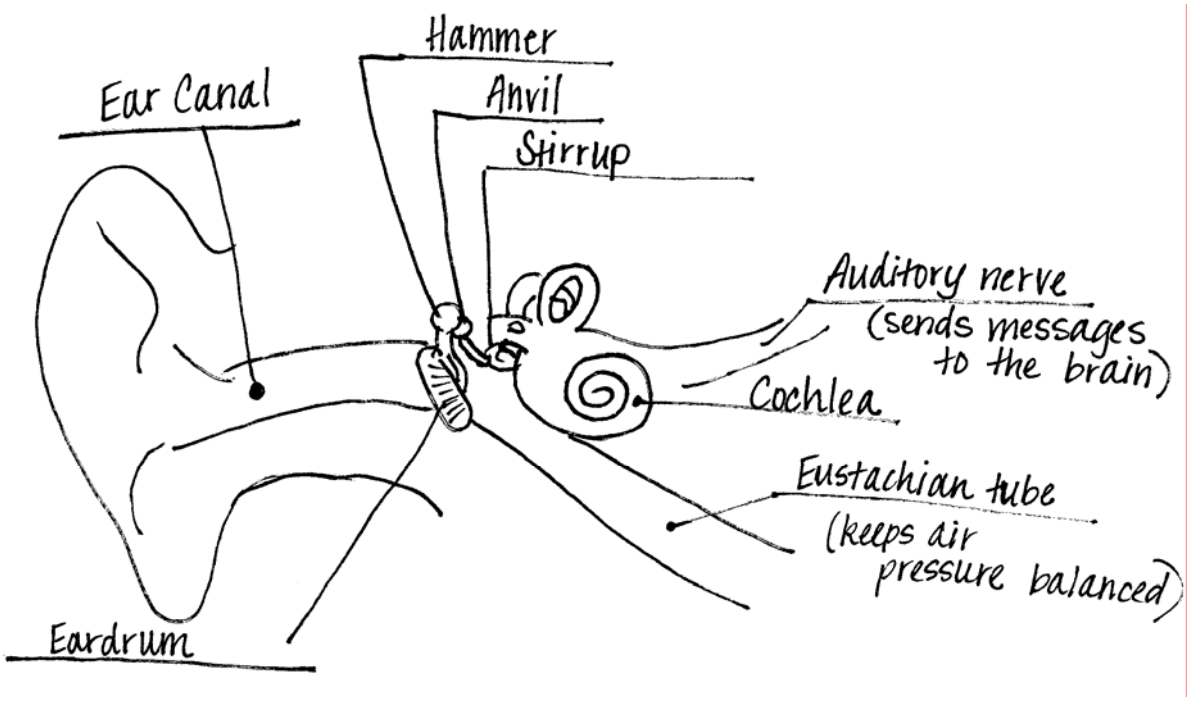
The voice box is also known as the **larynx**.

Know:

That sound travels more quickly through solids than liquids and gases.
That sound travels slower than light.
That sound travels in waves
About Alexander Graham Bell
About noises that hurt your ears

Be able to label the following in the ear:

Ear canal
Eardrum
Hammer
Anvil
Stirrup
Cochlea
Auditory nerve
Eustachian tube



Hearing and Sound Test

Name _____ Date_____

Fill in the blanks with the correct word from the list below. Some words may be used more than once. Remember: Spelling counts!

Vibrates	Solids	Slower
Gases	Waves	Tongue
Faster	Intensity	Pitch
Higher	Lower	Voice box
Lymph	Lips	
Larynx	Liquids	

1. Sound waves can travel through _____,

_____, and _____.

2. The loudness or softness of sound is called _____.

3. The voice box is also called the _____.

4. Sound occurs when something _____.

5. Sound travels best through _____.

6. Sound waves travel _____ than light waves.

7. The highness or lowness of a sound is called _____.

8. When an object vibrates very fast, the pitch is _____.

9. The liquid inside the cochlea is called _____.

Hearing and Sound Test, continued

10. Humans make sound when their _____,

_____, or _____ vibrates.

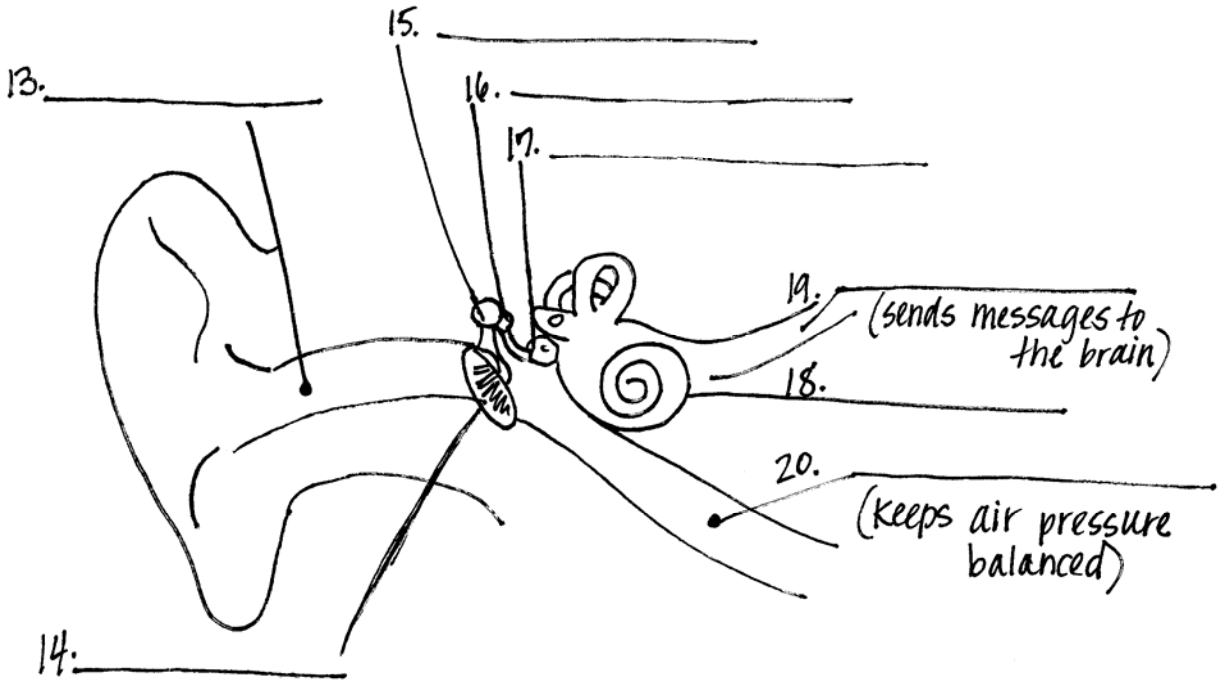
Answer the following questions in complete sentences.

11. What are two examples of noises that can hurt your ears?

12. What are two important things Alexander Graham Bell did to help others?

Label the following parts of the ear:

Cochlea	Eustachian tube	Eardrum
Ear canal	Auditory nerve	Stirrup
Anvil	Hammer	



Appendix M

Hearing and Sound Test ANSWER KEY

1. Gases, liquids, solids
2. intensity
3. larynx
4. vibrates
5. liquids
6. slower
7. pitch
8. higher
9. lymph
10. lips, tongue, voice box
11. Answers may vary
12. Helped educate people who could not hear, invented the telephone
13. ear canal
14. ear drum
15. hammer
16. anvil
17. stirrup
18. cochlea
19. auditory nerve
20. Eustachian tube

Appendix N

Making Musical Instruments!

Drums and Other Percussion Instruments

- Your class can make drums by tightly wrapping plastic over the tops of bowls and securing them with rubber bands. Let students experiment with different-sized bowls, the tension of the plastic wrap, and other coverings such as foil, leather, or cloth.
- Makes shakers! Give the students a variety of plastic bottles, aluminum cans, and other containers. Students may put varying amounts of dry beans and rice in them. Seal the openings with appropriate lids or plastic wrap. Instruct the students to shake their shakers and compare the sounds. Encourage them to shake hard, soft, swirl them around, and tip them back and forth slowly. Listen to the different sounds!
- Scrapers are fun! Staple sandpaper to blocks of wood. Use coarse, medium, and fine sandpaper.
- Sticks are often used to add percussion to music! Let the students simulate these by clapping together blocks of wood and actual sticks from outdoors. Show the students some sticks made especially for music, if possible.

Stringed Instruments

- Your class has experimented with rubber bands and boxes. Let students create different stringed instruments by supplying them with a wide assortment of rubber bands and boxes. Encourage them to try to string their boxes with rubber bands that sound quite different from each other. Let them try using fishing wire, dental floss, and thread as well. These will make higher-pitched sounds compared to many of the rubber bands, provided you can secure them tightly enough.

Wind Instruments

- Fill a table with all shapes and sizes of glass bottles. Show the students how to blow across the top of a bottle to produce a noise; let the class experiment with all the bottles. Provide the students with funnels and water, and encourage them to put water in some of the bottles, but don't fill the bottles completely. Focus on the different pitches with the different water levels. The more air that is in the bottle, the deeper the pitch.
- Take a plastic recorder and blow into it with all the holes open. Compare this sound to that made3 when all the holes are covered. Tape the holes closed, and then let a student blow through the recorder. How does the pitch change when the students plunges the recorder in a container of water as he or she blows?
- Make recorders by cutting small holes into milkshake straws!

(adapted from *Sound*, Karen Lee Siepak, 1994)

Appendix O

Movie Reports Rubric

	POINT VALUES				
CATEGORY	**5**	**4**	**3**	**2**	**1**
INFORMATIONAL ACCURACY	Three pieces of Information from movie 100% accurate	Information mostly accurate Less than two errors	Information adequate three-four errors	Information poor More than five errors	Information incomplete
SENTENCES/ DRAWINGS COMPLETED ACCURATELY	Sentences completed with no grammatical errors; Drawings easily identifiable and completed with accuracy	Sentences completed with less than two grammatical errors; Drawings partially identifiable with near accuracy	Sentences completed with three-four grammatical errors; Drawings are poorly identifiable and inaccurate	Sentences completed with more than five errors; Drawings are unidentifiable and inaccurate	Incomplete
DRAWINGS COLORED	Exceptional	Good	Satisfactory	Poor	Unacceptable
OVERALL NEATNESS	Exceptional	Good	Satisfactory	Poor	Unacceptable
				SCORE:	**___/20**

Adapted from TeAch-nology.com- The Web Portal For Educators! (www.teach-nology.com)

Appendix P

Ear Care Poster Rubric

	POINT VALUES				
CATEGORY	**5**	**4**	**3**	**2**	**1**
Ear Care Rules	Rules 100% accurate	Rules mostly accurate, Less than two errors	Rules adequate three-four errors	Rules poor More than five errors	Rules incomplete
Grammar Spelling Punctuation	Sentences completed with no grammatical errors	Sentences completed with less than two grammatical errors	Sentences completed with three-four grammatical errors	Sentences completed with more than five errors	Incomplete
Poster Colored	Exceptional	Good	Satisfactory	Poor	Unacceptable
Overall Neatness	Exceptional	Good	Satisfactory	Poor	Unacceptable
				SCORE:	**___/20**

Adapted from TeAch-nology.com- The Web Portal For Educators! (www.teach-nology.com)