Sounds Alive!!

Grade Level: 3
Presented by: Julie Edmunds, R.N. Harris Elementary School, 1520 Cooper St., Durham, NC 27703 (919) 560-3967.
Length of Unit: 13 lessons (plus two culminating activities)

I. ABSTRACT
As part of a larger unit on energy, this unit combines the arts, mathematics, literature, a hands-on approach, and technology to teach Core concepts on sound and hearing. Through a variety of activities that build on and reinforce one another, students gain an understanding of pitch, volume, and how the ear works. Students demonstrate their understanding of sound through creation of a musical instrument and through a computer presentation.

II. OVERVIEW
A. Major concepts that students need to understand are as follows:
   1. Sound is caused by vibrations.
   2. Faster vibrations lead to higher pitch; slower vibrations lead to lower pitch. For this reason, the length of the object vibrating affects the pitch of the object.
   3. Sound travels in waves. Sound waves travel more slowly than light waves.
   4. Sound can carry through solids, liquids and gases. It will sound different in each medium.
   5. Sound causes the eardrum to vibrate, which passes the sound through the hammer, anvil, and stirrup. The vibrations go to the cochlea, which is filled with fluid. Small hairs pick up the vibrations and pass them to the auditory nerve, which sends them to the brain.
   6. The larynx works by vibrating vocal cords.

B. Core Knowledge content includes:
   Science IV: Sound
   Science II: Human Body, E: Hearing
   Science VII: Science Biographies: Alexander Graham Bell
   Music II: Appreciation A: The orchestra
   Language Art I: Poems, Eletelephony

C. Skills to be taught include:
   1. Scientific processes (designing an experiment, observing and recording data, interpreting data).
   2. Explaining concepts in writing.
   3. Using descriptive language.
   4. Measuring length (revisited.)
   5. Using computers to create a project.

III. BACKGROUND KNOWLEDGE
A. For teachers: The Scholastic Science Place unit on Sound does a great job of giving background information on the science concepts of sound, energy, vocal cords, and hearing. There is also a good collection of activities for students. Blood and Guts does an excellent job on the hearing and voice aspects. Neil Ardley's A Young Person's Guide to Music is very useful for information on musical instruments; it also provides a background on music.
B. For students: No background knowledge on sound is assumed. Children should be familiar with making, recording, and interpreting observations. Some familiarity with basic computer skills (word processing) is assumed. They should also know how to measure length.

IV. RESOURCES (complete information is in bibliography)
Books:
The Magic School Bus in the Haunted Museum: A Book About Sound (Scholastic, 1995)
The Very Quiet Cricket by Eric Carle
Thunder Cake by Patricia Polacco
a biography of Alexander Graham Bell
Multimedia:
Video: Magic School Bus in the Haunted Museum (can be taped off PBS station)
Musical Instruments CD-ROM

V. LESSONS

A. Lesson One: History Sets the Scene

1. Objective/Goal:
   a. The student will recognize that the study of sound is important for their daily lives.
   b. The student will be able to describe how Alexander Graham Bell contributed to their lives today.
   c. The student will listen to a story and draw conclusions from the story.

2. Materials
   a. Story of Alexander Graham Bell (the version in the bibliography is good)
   b. Large sheet of paper for recording student answers, divided into two sections. One side of the sheet has the title: Sounds We Hear; the other side has the title: Things that Use Sound
   c. Copies of Eletelephony

3. Key Vocabulary
   a. sound

4. Procedures/Activities
   a. Ask students if they have ever heard of Alexander Graham Bell. What is he famous for?
   b. Read story about Alexander Graham Bell. Discuss what he invented (telephone). Why is the telephone so important? How does it affect what we do today? If this idea is not brought up, introduce the term "sound."
   c. As a group, brainstorm list of sounds they hear every day, put that on the first half of the recording sheet.
   d. Brainstorm things (machines, instruments, etc.) that use sound. Items could include CD players, T.V.s, video games, telephones, musical instruments, people, etc.
   e. To conclude the lesson, read the poem, Eletelephony, as a whole class. Ask students to listen to the sounds of the words. If this has not come up earlier, remind students that we use sound every day when we talk.

5. Evaluation/Assessment
a. Evaluate class chart for a broad understanding of the idea of sound and instruments that use sound.

6. Standardized Test/State Test Connections
   a. Listening to the story and responding to it reinforces students' skills at getting information from text.

Note: The next six lessons can be considered activities. Sound is a topic that lends itself very easily to students' exploring and learning on their own. Therefore, these activities may be placed in different centers to have students explore themselves. Be sure to write detailed directions for the students (this gives them good practice in following directions!). If you do choose to do these lessons through centers, periodic follow-up discussion of what students have noticed is critical.

B. Lesson Two: Good Vibrations: Sound as vibration (can be done as a center)

1. Objective/Goal
   a. The student will identify sound as being caused by vibrations.
   b. The student will make and record observations and interpret them.

2. Materials
   a. tuning forks
   b. soft pads, such as computer mouse pads (preferred, although not required)
   c. cup
   d. water (and newspapers to clean up any spilled water)
   e. Good Vibrations recording sheet—Appendix A

3. Key Vocabulary
   a. vibration
   b. sound waves

4. Procedures/Activities
   a. For each small group of students, pass out at least two tuning forks and pads. Have the students hit the tuning forks on the pads (or the table). Ask them what they notice, record on recording sheet (Appendix A).
   b. After the students hit the tuning fork, have them touch it (lightly!!) to their chin. Record observations.
   c. Pass out cups with water in them, one to each group. Students hit tuning fork on pad and then put the fork in the water. Record observations.
   d. Discuss what the students noticed. What did the tuning fork do? How did it make the sound? Did it make any sound when it was not moving?
   e. Introduce the term "vibration" to refer to this rapid moving back and forth that the students observed. Share with the students the idea that sound moves in waves. Draw a picture of a wave on the board.
   f. Have the students work with a partner. One partner puts his/her ear on the table, the other one hits the tuning fork on the table and then places it carefully on the table. Ask students which way they heard the sound better.
   g. Have students record their findings on the Good Vibrations sheet. Have the students use the term vibration in a sentence describing what causes sound.

5. Evaluation/Assessment
a. Evaluate students' written observations for information on how tuning fork was moving back and forth.

b. Evaluate final student sentence for statement that vibrations are connected to sound.

6. Standardized Test/State Test Connections
   a. This activity builds science skills for observing, recording, inferring, and interpreting data.

C. Lesson Three: Ringing Loud: How Sound Travels through Solids (can be done as a center)

1. Objective/Goal:
   a. The student will identify sound as being able to travel through solids.
   b. The student will draw conclusions based on observations.
   c. The student will measure length.

2. Materials
   a. 1 3-foot piece of string for each group of two students
   b. 1 wire coat hanger for each group of two students.
   c. 1 measuring tape for each group of two students
   d. 1 spoon (or other metal object) for each group of two students

3. Key Vocabulary
   a. solids and gases

4. Procedures/Activities
   a. Divide students into pairs. Pass out a string for each group and a hanger for each group.
   b. Have students measure the string to make sure it is 3 feet. Ask students how many inches are in 3 feet. Have them divide the string exactly in the middle. Have them figure out how many inches would be in each half (students may do this in different ways). Allow students to share how they figured this out.
   c. Have students tie the middle of the string to the hanger. Let the hanger swing. Hit the hanger with the spoon. Talk about what the students hear.
   d. Have one student hang one end of the string over one ear and the other end over the other ear so that the hanger swings free. Have the partner hit the hanger. Discuss the difference between what the students heard with the hanger just swinging loose and what they heard when the strings were over their ears.
   e. Students should realize that the sound is traveling through the string. Ask students the difference between the string and the air (solid vs. gas). Ask students how this is connected to what they heard the other day with the tuning fork on the table. Lead students to the conclusion that sound travels better through a solid than a gas. (Teacher note: This is because the molecules in a solid are closer together than in a gas. It is therefore easier for one molecule to pass the vibration on to the next molecule.)

5. Evaluation/Assessment
   a. Evaluate students' discussion for an understanding of how to find the middle of a distance.
   b. Evaluate students' discussion for an understanding of sound being able to travel through solids.

6. Standardized Test/State Test Connections
a. Measuring the string reinforces measurement and applied math skills.
b. Discussion of observations reinforces science process skills (observing, interpreting).

D. Lesson Four: Buzzzin' Around: Sound as Vibration (can be done as a center)

1. Objective/Goal:
   a. The student will identify sound as being caused by vibrations.
   b. The student will develop an experiment to test how different variables affect sound.
   c. The student will describe how insects create sound.
   d. The student will follow directions.

2. Materials
   a. The Very Quiet Cricket by Eric Carle.
   b. popsicle or craft sticks—1 for each student
   c. plain pencil erasers (the kind with the flat head)—2 for each student
   d. 3 x 5 index cards, cut in half widthwise—1 for each student
   e. rubber band (not really thin ones)—1 for each student
   f. string, cut into about 2 foot lengths—1 segment for each student (see Test Connections)
   g. markers or crayons, scissors
   h. one or more staplers
   i. Buzzzin' Around worksheet-Appendix C

3. Key Vocabulary
   a. no new vocabulary

4. Procedures/Activities
   a. Read The Very Quiet Cricket. Ask students if they know how the cricket made his sound.
   b. Remind students that they have already noticed that sound is caused by vibrations. Tell them that animals make sounds with vibrations as well.
   c. Each student gets a popsicle stick, two erasers, a rubber band, an index card and a length of string. Have students draw a picture of any insect that makes noise on their index card.
   d. Put an eraser on each end of the popsicle stick so that the flat sides of the two erasers are facing the same way.
   e. Staple one end of the index card to the stick such that it is not touching the erasers. Tie the string to one end of the popsicle stick, near one of the erasers. Cut the short end of the string off, leaving just one long piece coming off the knot.
   f. Put the rubber band around the stick so that it goes around the two flat ends of the eraser. IMPORTANT: Make sure the rubber band is not twisted or touching anything or this will not work!
   g. Your insect should look like the picture in Appendix B. Now hold on to one end of the string and swing the insect around in a circle (make sure your students have plenty of room for this). What do they hear? What happens?
   h. Challenge your students to design and carry out an experiment to find out ways of changing the sound. Remind them that they can only change one variable at a time. (You can shorten the length of the string, change the rubber band, etc.) Have them record their observations.
   i. Helpful hints: If the insect does not make a buzzing noise like a real bee or wasp, then check to make sure the rubber band is not twisted or that it is not touching the string. It
must be free to move to make the noise. Many students will assume that it is the index card flapping that is making the noise. Have them try it without the rubber band and see if the sound is different.

j. Have students fill in Buzzzin' Around worksheet (Appendix C)

5. Evaluation/Assessment
   a. Evaluate students' insects for correct construction (i.e., they work).
   b. Evaluate Buzzzin' Around worksheet for ability to identify cause of sound, changes made, and the effect of those changes on the sound.

6. Standardized Test/State Test Connections
   a. Students can measure the string themselves to reinforce math skills.
   b. When directions are written in a center, this gives students great practice at reading practical texts.

E. Lesson Five: The Human Voice: Sound as Vibration (can be done as a center)

1. Objective/Goal:
   a. The student will identify that the larynx works by vibrations.
   b. The students will change one variable at a time to change sounds.

2. Materials
   a. 1 plastic cup for each pair of students (the cup needs to have a slight indent in the bottom so the rubber band can vibrate freely)
   b. rubber bands of varying widths
   c. 2 straws for each pair of students
   d. Human Voice Recording sheet (Appendix D)

3. Key Vocabulary
   a. larynx
   b. vocal cords

4. Procedures/Activities
   a. Remind students of what they have learned about how sound is made and how insects make sounds. Ask them how they think we make sounds.
   b. Pass out cup, rubber band, and straw. Have students place the rubber band around the cup and blow on it with the straw. What happens? Tell students that the rubber band is similar to your vocal cords and how you talk.
   c. Discuss how this is similar to the human larynx (your larynx vibrates to create sound). Have the students feel their Adam's apples as they make sounds. Discuss what this feels like.
   d. Repeat the experiment with different size rubber bands. Does this change the sound? Have the students record their observations on The Human Voice Recording Sheet (Appendix D)
   e. Discuss how fatter ones create deeper sounds.

5. Evaluation/Assessment
   a. Evaluate recording charts for students' ability to fill in chart with observations.

6. Standardized Test/State Test Connections
a. You can do a more formal experiment with changing the rubber bands focusing on the students’ ability to control variables.

F. Lesson Six: Animal Sounds: Sound as Vibration (can be done as a center)

1. Objective/Goal:
   a. The student will identify sound as being caused by vibrations.
   b. The student will identify that the size of the container affects the noise.
   c. The student will use adjectives and descriptive words to write about their animals.

2. Materials
   a. Various plastic containers, such as cups, yogurt containers, milk jugs, etc.
   b. Knitting needle or something sharp for poking holes in the containers
   c. A large needle (you only need this if you are using milk jugs)
   d. String
   e. Paper clip
   f. Scissors

3. Key Vocabulary
   a. Adjectives

4. Procedures/Activities
   a. Before class, poke a single hole in the bottom of each of the containers. (If you trust your students with sharp objects, they can do this.)
   b. Remind students that they know vibrations cause sound. People, animals, and insects make sounds with vibrations. Review what they have done with the larynx.
   c. Pass out different plastic containers, string, and paper clips. Students can work in partners or individually, depending on the number.
   d. Have the students cut about 40 cm of string. Tie one end of the thread to a paper clip. Put the other end through the inside of the container so that the paper clip is inside the container and the long end of the string is coming out of the bottom of the container. (A large needle is necessary to get it in the milk jugs.)
   e. Have the students wet one hand, hold onto the container with the dry hand and rub the wet hand along the string. They should get a nice vibration sound.
   f. Ask students what is causing the noise. How can they use what they already know about sound to figure out what is making the noise? Discuss how the different container sound. Tell the students that mammals use vocal cords to change sounds. They can also change the shape of their vocal cavity to change sounds.
   g. Have students decorate their “animals” depending on the sound of the string vibrating.
   h. Review what an adjective is. Brainstorm a list of interesting adjectives that could be used to describe sounds animals make. Have the students write a description of their animal and the sound it makes, using some interesting adjectives.

5. Evaluation/Assessment
   a. Student discussion of what is making sound.
   b. Evaluate student writing for use of adjectives.

6. Standardized Test/State Test Connections
   a. Revise the animal stories, adding details for more elaboration.
Lesson Seven: Loud Mouth: What makes sound louder and softer? (can be done as a center)

1. Objective/Goal:
   a. The student will identify volume as being affected by the intensity of the vibrations.
   b. The student will record observations.

2. Materials
   a. 1 plastic cup for each pair of students
   b. 1 piece of plastic wrap for each pair of students
   c. 1 rubber band for each pair of students
   d. a small amount of cereal or rice for each pair of students
   e. 1 piece of construction paper for each pair of students.
   f. Loud Mouth Recording Sheet (Appendix E)

3. Key Vocabulary
   a. volume
   b. intensity

4. Procedures/Activities
   a. Pass out 1 cup, plastic wrap, cereal or rice, and construction paper to each pair of students. Have the students cover the open mouth of the cup with the plastic wrap and secure in place with the rubber band. Place the cereal or rice on the plastic wrap.
   b. Have the students make a megaphone out of the construction paper by rolling a cone with a slightly open end. (This is a good review of what a cone is.)
   c. Have the students yell through the megaphone onto the plastic wrap. What happens to the cereal? Students should record their observations on the Loud Mouth recording sheet (Appendix E).
   d. Have them speak softly through the megaphone. Have them record their observations.
   e. Discuss the difference between what the cereal did when students were yelling and when they were talking softly.
   f. Introduce term "volume." Discuss how the volume depends on the "intensity" of the sound waves (of how big the vibrations are). If the vibrations move further up and down, the sound will be louder. If they don't move as much, the sound will be softer.

5. Evaluation/Assessment
   a. Evaluate students' observation sheets for ability to observe results.

6. Standardized Test/State Test Connections
   a. This experiment enhances students' ability to collect and interpret data.

Lesson Eight: Longing for a Pretty Voice: Pitch

1. Objective/Goal:
   a. The student will identify pitch as being connected to the length of the vibrating object.
   b. The student will record observations on a chart.

2. Materials
   a. Xylophone or similar instrument
   b. Plastic rulers
   c. geoboards
d. rubber bands

e. recording sheet (Appendix F)

3. Key Vocabulary
a. pitch

4. Procedures/Activities
a. In front of the whole group, play a xylophone. Have students identify which notes are higher and which are lower. Introduce the term pitch: we use pitch to talk about how high or low notes are. Ask students what they notice about the parts of the xylophone that played higher notes (they were shorter) versus the lower notes (they were longer).

b. Pass out the recording sheet (Appendix F) and a plastic ruler to each pair of students. Have one student hold the end of the ruler at the 6 inch (15 cm) mark with his/her hand on the edge of the table such that half of the ruler hangs off the edge of the table. Make sure the 12 inch mark is on the table and the 1 inch mark is hanging off in the air. Have the other student pluck the ruler so that it vibrates. Listen to the sound. This is going to be the middle sound. Next to the 6 on the recording chart, have the students write "medium."

c. Have the students move the ruler one inch in either direction, recording the measurement at the edge of the table and whether or not it is higher or lower than the 6 inch—"medium"—sound. They may need to come back to that sound.

d. Ask students to share what they noticed about the part of the ruler hanging off the desk. When did it make a higher sound? When did it make a lower sound? Why do you think this happened?

e. Discuss how the shorter an object is, the faster it vibrates and the higher the pitch is. The longer an object is, the slower it vibrates and the lower the pitch.

f. Challenge the students to repeat the same experiment with geoboards and rubber bands. String the rubber bands around the spikes on the geoboard to make different line segments. (This is a good review of the difference between line segments and shapes.) Discuss which line segments make the highest pitch and which ones make the lowest.

5. Evaluation/Assessment
a. Evaluate students' sheets for ability to fill in a chart properly and for understanding of relationship between length of vibrating ruler and pitch.

6. Standardized Test/State Test Connections
a. Spend time discussing the recording chart. This increases students' abilities to read and interpret data in charts.

I. Lesson Nine: Far, Far Away: Light Waves and Sound Waves

1. Objective/Goal:
   a. The student will identify sound waves as traveling slower than light waves.
   b. The student will listen to and interpret a story.

2. Materials
   a. Thunder Cake
   b. whistle
   c. brightly colored piece of fabric
3. Key Vocabulary
   a. sound waves  
   b. light waves

4. Procedures/Activities
   a. Remind students that sound travels in waves. Tell them that light also travels in waves.  
   b. Read Thunder Cake. Discuss why you could see the lightning before you could hear the thunder. Collect students' ideas. Lead them to realize that light travels faster than sound.  
   c. Follow-up Activity: On the playground, have one student stand as far away as possible. Take predictions on which they will notice first: the whistle or cloth. The student drops the cloth and blows the whistle at the same time. Discuss what the students notice first.

5. Evaluation/Assessment
   a. Evaluate students' discussion of book.  
   b. Use students' predictions for what they will notice first (whistle or cloth) as indicator of understanding.

6. Standardized Test/State Test Connections
   a. Ask students to share the main idea of the story.

J. Lesson Ten: Hearing Aids: How the Ear Works

1. Objective/Goal:  
   a. The student will be able to describe how an ear works.  
   b. The student will read and interpret information.

2. Materials
   b. How We Hear (Appendix G)-1 copy for each student

3. Key Vocabulary  
   a. cardrum  
   b. hammer  
   c. anvil  
   d. stirrup  
   e. cochlea  
   f. auditory nerve

4. Procedures/Activities
   a. Ask students how they hear sound. Discuss why people have ears.  
   b. Pass out the How We Hear sheet (Appendix G) to each student. Ask them to read for answers to the following questions (place on board): What are the parts of the ear? How does sound travel through the ear? Where do the vibrations from the sound finally end up? Students should record answers on a piece of paper.  
   c. As students finish, place the color transparency on the overhead. If they need additional help, they can use the overhead.  
   d. Go over the answers to the questions.

5. Evaluation/Assessment
   a. Evaluate students' answers for correctness and completeness.
6. Standardized Test/State Test Connections
   a. Students practice reading for information.

K. Lesson Eleven: Outside the Ear: How Ears Funnel Sound

1. Objective/Goal:
   a. Students will describe how the ear funnels sound to the ear canal.
   b. The student will measure distance using a measuring tape.
   c. The student will record information on a chart.

2. Materials
   a. Alarm clock or other thing that ticks or makes a quiet noise
   b. For each child—2 pieces of construction paper (any size)
   c. Recording sheets (Appendix H)
   d. Measuring tapes

3. Key Vocabulary
   a. Outer ear

4. Procedures/Activities
   a. Remind students about how animals make different noises. Tell them that they also hear
      in different ways. Some animals, like bats, have very sensitive hearing. They move by
      "echolocation" or sending out sound waves that bounce back. They can hear very well.
      How do you think they can hear so well? Have students brainstorm ideas. Share that
      one of the ways they do that is to have larger outer ears.
   b. Have students work in partners. Hold up clock. Have one student stand just until they
      can no longer hear it. The other student measures the distance from the feet to the clock,
      records it on the recording sheet (Appendix H).
   c. Have students cup their hands behind their ears and move until they can no longer hear
      the clock. Partner measures and records distance.
   d. Have students use the paper to make a cone for each ear. Have students move until they
      can no longer hear the clock. The partner measures and records the distance.
   e. Discuss what students noticed about this experiment. How were they able to hear better?

5. Evaluation/Assessment
   a. Evaluate students' sheets for ability to measure, to fill in a chart properly and for
      understanding of function of external parts of ears.

6. Standardized Test/State Test Connections
   a. This is a great lesson for practicing math skills: measurement, recording and interpreting
      data in a chart.

L. Lesson Twelve: The Sound Museum: Reading about Sound

1. Objective/Goal:
   a. The student will read and interpret information.

2. Materials
a. 1 copy of *Magic School Bus in the Haunted Museum* for each student (if done in reading groups)
b. video: *Magic School Bus in the Haunted Museum*

3. Key Vocabulary
a. no new vocabulary.

4. Procedures/Activities
a. In reading groups (partners or guided reading with a small group), have students read *The Magic School Bus in the Haunted Museum*.
b. Have students read for answers to the following major questions: How do musical instruments work? How does Carlos use what he knows about sound to make his musical instrument work? Have students record their answers on a sheet of paper.
c. Show the video. Have students evaluate their own answers based on the information in the video.

5. Evaluation/Assessment
a. Evaluate students' sheets for their connection between what they have learned about sound and musical instruments.

6. Standardized Test/State Test Connections
a. The questions in this lesson involve higher-order thinking skills for interpreting what students read. Evaluating their own answers also foster higher order thinking skills.

M. Lesson Thirteen: Making Music: How Musical Instruments Work (several days)

1. Objective/Goal:
   a. Students will be able to describe how a musical instrument works.
   b. Students will make their own musical instruments applying what they have learned about sound.
   c. Students will write a factual piece about their instrument.

2. Materials
   a. sample musical piece (Beethoven's Fifth and Peter and the Wolf work well)
   b. sample musical instruments, one from each family—strings, wind (brass, woodwinds) and percussion.
   c. CD-ROM on musical instruments (see bibliography)
   d. various books on musical instruments (see bibliography for suggestions)
   e. miscellaneous materials for making a musical instrument: rubber bands, empty containers, flat boards, nails, string, tubes, toilet paper rolls, straws, etc.
   f. Musical Instrument Evaluation Matrix (Appendix I)

3. Key Vocabulary
   a. strings
   b. percussion
   c. wind instruments

4. Procedures/Activities
   Day 1:
a. Listen to Beethoven’s Fifth and then Peter and the Wolf. What different sounds can you hear? What instruments are playing?
b. Share some of the instruments you have with the students. Ask them to look at the instruments and describe how they make different sounds.
c. Go over the different families of instruments: strings, wind instruments (brass, woodwinds), and percussion.
d. Review what students have learned so far about sound: sound as vibrations, pitch as determined by length of object and rapidity of vibration, volume as determined by intensity of vibration.
e. Tell students that this is their chance to make a musical instrument. There is one requirement, however, the instrument must be able to change pitch 3 times.
f. Share resources with students to help them in designing their instruments (the CD-ROM and various books).
g. Provide students with materials and have them begin designing instruments.

Day 2:

a. Continue to work on creating instruments. Students who have finished their can write about their instruments. In their writing, they should answer the following questions: What is the name of your instrument (they should make up a name for it)? What family does your instrument belong to? How does your instrument work (what vibrates)? How does your instrument change pitch?

Day 3:

a. Complete instruments and writing assignments.

5. Evaluation/Assessment

a. Use Musical Instrument Evaluation Matrix (Appendix I) for giving a grade for this project.

6. Standardized Test/State Test Connections

a. Stress to students in making their instruments that they can use resources for ideas. This reinforces reading for information.

VI. CULMINATING ACTIVITIES

Note: This unit has two culminating activities to allow students to show what they have learned in a variety of ways.

Activity 1: Set up your own Sound Museum in the classroom. Have the students display their musical instruments and writings. You can also have them compose their own music using their homemade instruments.

Activity 2: Have students design a Hyperstudio stack that shares what they know about sound, hearing, voice, and musical instruments. Encourage them to draw comparisons between a musical instrument and a voice, for example. Although Hyperstudio is relatively sophisticated, most third graders can work with it quite well. Give them plenty of time to experiment first. You also need to be comfortable with it yourself.

VII. HANDOUTS/STUDENT WORKSHEETS
VIII. BIBLIOGRAPHY

Resources on Sound


Sound-Off. Unit from the Museum of Life and Science, Murray Avenue, Durham, NC 27704. For more information, call (919) 220-5429, ex. 373.

Video: Magic School Bus In the Haunted Museum--can be taped off of PBS for classroom use only.


Resources on Ears, Hearing, and Your Voice Box


Resources on Music and Musical Instruments


Appendix A

**GOOD VIBRATIONS**

Name: __________________________

What happened when you hit the tuning fork? ____________________________________

Draw a picture of what happened when you put the tuning fork in the water:

Circle the way you heard the tuning fork best.

   in the air       on the table

What do you think causes sound? ________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________
This is what your insect should look like:
Appendix C

*BUZZZIN' AROUND*

Name: ______________________

Draw a picture of what you made:

How did your insect make a noise? ______________________

____________________________________________________

____________________________________________________

Did you get the noise to change? ______________ If so, how did you get it to change? ______________________

____________________________________________________

____________________________________________________

____________________________________________________
<table>
<thead>
<tr>
<th>The sound it makes:</th>
<th>The sound it makes:</th>
<th>The sound it makes:</th>
<th>The sound it makes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>My picture:</td>
<td>My picture:</td>
<td>My picture:</td>
<td>My picture:</td>
</tr>
</tbody>
</table>

Draw a picture of each larynx you make with different size rubber bands. Write down the sound your model larynx makes.

Name: ________________  

Human Voice Recording Sheet

Appendix D
Appendix E

Loud Mouth Recording Sheet

<table>
<thead>
<tr>
<th>Picture of what happened when I yelled loud.</th>
<th>Picture of what happened when I spoke softly.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name: __________________

What happened to the cereal when you yelled loudly? _______________

_________________________________________________________________

What was the difference between when you yelled and when you spoke softly? ____________________________________________________

_________________________________________________________________

_________________________________________________________________
Appendix F

Pitch Recording Sheet

<table>
<thead>
<tr>
<th>Length of Ruler</th>
<th>Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6 inches</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What happens when the ruler is longer? ________________________________
Appendix G

How We Hear

Touch your ears. Do you feel the outside part? This is called the outer ear. The outer ear funnels noise to the parts of your ear that do all the work. After the outer ear catches the noise, the sound goes down the ear canal. Look at a friend's ear. See the dark hole that goes into his or her head? That is the ear canal. At the end of the ear canal is the ear drum. The sound causes the ear drum to vibrate. The vibrations from the ear drum are picked up by three small bones on the other side of the ear drum: the hammer passes vibration on to the anvil, which passes them onto the stirrup. The stirrup sends the vibrations onto the cochlea, which is a passage filled with fluid. The vibrations move through the fluid and affect little hairlike things. They send these vibrations through the auditory nerve to the brain. The brain then makes sense of everything that you are hearing. It's a complicated trip for the sound vibrations, but all of this is what helps you hear sounds. What do you think would happen if any part of your ear was damaged?
Appendix H

Outside the Ear Recording Sheet

<table>
<thead>
<tr>
<th>Distance from Object</th>
<th>What you needed to hear (only your ears, your hands cupped behind your ears, or &quot;bat ears&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What helped you hear the best?

________________________________________________________________________________________
________________________________________________________________________________________

Why do you think it helped you hear the best?

________________________________________________________________________________________
________________________________________________________________________________________
## Appendix I

### Musical Instrument Grading Matrix

<table>
<thead>
<tr>
<th>Activity</th>
<th>Possible Points</th>
<th>Points received / comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument is created.</td>
<td>25—Instrument is created and student clearly spent time on it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15—Instrument is mostly completed but student could have spent more time on it.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10—Instrument is not finished.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0—No instrument made.</td>
<td></td>
</tr>
<tr>
<td>Instrument permits a change in pitch.</td>
<td>15—Instrument plays at least 3 different pitches.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10—Instrument plays 2 different pitches.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5—Instrument plays 1 different pitch.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0—Instrument does not change pitch.</td>
<td></td>
</tr>
<tr>
<td>Report is written.</td>
<td>25—Report (of any caliber) is written.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0—No report written.</td>
<td></td>
</tr>
<tr>
<td>Report answered all the required questions.</td>
<td>25—Report includes all information: name of instrument, family of instrument,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>description of how instrument works and how it changes pitch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20—Report is missing answer to one question.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15—Report is missing answer to two questions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10—Report is missing answer to 3 questions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0—No questions answered.</td>
<td></td>
</tr>
<tr>
<td>There are no spelling or grammatical errors.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1 for each error</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

90-100--A  60-69--D  
80-89--B  Below 60--E  
70-79--C  

**Comments:**