

Hearing: How the Ear Works

Grade Level or Special Area: 3rd Grade

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Length of Unit: Six lessons approximately 45 minutes each and one Culminating Activity approximately 60 minutes

I. ABSTRACT

In this Science unit, students will experience the journey of sound and understand how hearing works through hands-on activities, reading and experiences. Students learn the history of Alexander Graham Bell and relate their newfound knowledge to their own lives.

II. OVERVIEW

A. Concept Objectives

1. Students will develop an understanding of the basic principles of sound and how it travels.
2. Students will understand that information can be gathered through observation and experimentation.
3. Students will understand that people of varied backgrounds have made contributions to science throughout history.

B. Content from the *Core Knowledge Sequence*

1. Third Grade Science: The Human Body (p. 82)
 - 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. Third Grade Science: Science Biographies (p. 83)
 - a. Alexander Graham Bell

C. Skill Objectives

1. Students will identify the difficulties of hearing low vibrations through a whisper listening game of telephone.
2. Students summarize the basic sequence of events of how the ear collects and hears vibrations.
3. Students will identify the three parts of the ear including their major components through experimentation, reading and diagramming.
4. Students will identify the parts of the inner ear that effect balance.
5. Students will identify the inventor of the telephone and associate other important details to this historic event through reading and answering questions as a group.
6. Students will identify and list ways to care for their ears properly.

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. Cobb, Vicki, *Perk Up Your Ears*
2. Iveson, Joan, *Your Nose and Ears*
3. Showers, Paul, *Ears Are For Hearing*

B. For Students

1. Kindergarten Science: The Human Body: The Five Senses

IV. RESOURCES

None needed

V. LESSONS

Lesson One: Telephone (45 minutes)

A. Daily Objectives

1. Concept Objective(s)
 - a. Students will develop an understanding of the basic principles of sound and how it travels.
2. Lesson Content
 - a. Sound as vibration
3. Skill Objective(s)
 - a. Students will identify the difficulties of hearing low vibrations through a whisper listening game of telephone.

B. Materials

1. Class set of Sound Know-It-All tests (Appendix A)
2. Pencil for each student

C. Key Vocabulary

No new vocabulary words for this lesson

D. Procedures/Activities

1. Tell students, “We are going to learn about sound and hearing and how the ear works. First, we are going to play a game. Most of you have probably played it before but if you haven’t, it’s an easy game. It is called telephone. Raise your hand if you have played telephone before?” Wait for responses from students.
2. Tell students, “Here is how we play telephone. I am going to whisper a sentence in the ear of the first student. That student whispers the same sentence in the ear of the next student and so on and so on until the very last student who will stand up before the class and repeat the sentence they heard. The goal of the game is for the sentence I tell the first person to be the same sentence that the last person heard and repeats. You can’t repeat the sentence for anyone so you want to listen carefully. Do you think this will work?” Wait for student responses included yes and no. Further discuss this with students asking, “Why do you think this will work or why not?” Informally assess student responses to include issues with the difficulty of hearing a low whisper due to sound being created by vibrations, understanding accents and distinguishing between words that sound alike.
3. Tell students, “We are going to begin and once we start everyone needs to be quiet.” Whisper a sentence into the first student’s ear – it can be one you make up or “Mrs. Laughlin (or use your name) says *Little Women* is a super good book to read.”
4. Allow students time to whisper this sentence between one another making sure that they all participate only once and that students are quiet while this takes place.
5. Once the sentence has reached the last student, ask that student to stand up and repeat what they heard. Then have the first student stand up and repeat the sentence you told them – if they don’t remember it, you could repeat the first sentence.
6. Ask students, “What are the differences between the beginning and ending sentences? Why might there be differences?” Allow for a few minutes of discussion but do not direct students in any particular direction. Informally assess students’ current knowledge of sound and hearing.

7. Stop students' discussion and tell them, "You are all going to get to show me what you already know about sound and why the telephone game we just played worked or didn't work. I'm going to pass out a Sound Know-It-All paper and you are going to show me if you know it all about sound. Don't worry if you don't know the answers because by the time we are done learning about sound and hearing, you will all be know-it-alls."
 8. Pass out the Sound Know-It-All test (Appendix A) to students. Explain to students that, "This is to show your individual work so there is no talking."
 9. Allow students 10-15 minutes to complete the test. Collect the tests once students are finished and grade them for students' current knowledge of the subject using the pre-assessment answer key (Appendix G).
- E. *Assessment/Evaluation*
1. Students' pre-assessments of the Sound unit will be evaluated
 2. An informal evaluation will occur while the teacher is leading the class discussion regarding the telephone game.

Lesson Two: How We Hear (45 minutes)

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will develop an understanding of the basic principles of sound and how it travels.
 2. Lesson Content
 - a. Sound as vibration
 - b. Outer ear, ear canal
 - c. Eardrum
 - d. Three tiny bones (hammer, anvil, and stirrup) pass vibrations to the cochlea
 3. Skill Objective(s)
 - a. Students summarize the basic sequence of events of how the ear collects and hears vibrations.
- B. *Materials*
1. Class set of Sound Vocabulary sheet (Appendix C)
 2. Class set of Hear This packet (Appendix B)
 3. Pencil for each student
 4. Class set of Science folders
 5. White board or large chalk board with appropriate writing utensil
 6. Drum borrowed from the music department or a make shift drum
- C. *Key Vocabulary*
1. Sound is made by *vibration*, which is the movement of an object back and forth.
 2. The *ear canal* is a tunnel that is joined to the part of the ear you can see.
 3. The *eardrum* is a thin covering at the end of the ear canal.
- D. *Procedures/Activities*
1. Read the list of Sound vocabulary words that the class will be learning throughout the unit found in Appendix C.
 2. Explain that as the class encounters each vocabulary word they will be writing down the definition in the blank area provided next to the word. If your class does not know what a definition is, please instruct them that it is the meaning of a word.
 3. Hand out the vocabulary list to the class.
 4. Hand out the Hear This packet (Appendix B), have students write their name of the front cover and then turn to page 2.

5. Explain to students, "This is a short play about sound and how we hear it. We need four students to volunteer to come up to the front of the class and read parts for the play while the rest of you follow along."
6. Assign four students the parts of students #1, 2, 3, and 4 in the play. Have those four students come up to the front of the class to read their parts. Remind them to read loud and remind the class to follow along as they read.
7. The teacher reads his/her part first and cues the students to begin. Informally assess students' participation in reading along with the play.
8. Once the class has completed reading the play you may chose four more students and re-read the play depending on informal assessment of students' participation and understanding.
9. Once the class has completed reading the play you may chose to have a student or two re-read the part of student #2's explanation of how the ear hears sound depending on your informal assessment of students' participation and understanding.
10. Ask students, "What is the first thing that happens in this sequence of events to hear a sound?" Wait for student responses including the correct being a noise happens or the drum was hit which made it vibrate. Informally assess students' participation and understanding of the sequence of events.
11. Write the sequence of events on the board for a visual listing of events for students to follow as each one is discussed.
12. Ask students, "What is the next thing that happens after the drum was hit?" Wait for student responses including the correct being that the vibrations move in all directions.
13. Ask students, "What is the next thing that happens after the vibrations are moving in all directions?" Wait for student responses including the correct being that the ear collects the vibrations.
14. Ask students, "What happens after the ear collects the vibrations?" Wait for student responses including the correct being that the vibrations travel through the ear canal to the eardrum.
15. Ask students, "What happens after the vibrations travel through the ear canal to the eardrum?" Wait for student responses including the correct being that the eardrum vibrates too.
16. Ask students, "What happens after the eardrum starts to vibrate?" Wait for student responses including the correct being that three tiny little bones move.
17. Ask students, "Then what happens after the three tiny little bones move?" Wait for student responses including the correct being that the movement is passed to a liquid in the inner ear (that is shaped like a snail).
18. Ask students, "What happens next?" Wait for responses including the correct being that tiny hairs move.
19. Ask students, "What finally happens to tell us we've heard the drum beat?" Wait for responses including the correct being that a message is sent along a nerve to the brain to tell you what you've heard.
20. Play a beat on a drum for the students and tell them, "Listen to the drum beat and imagine all the steps of hearing taking place in your ear. Go through each one that I have listed on the board in order in your mind and picture it happening." Play several more beats on the drum while observing students following the sequence of events on the board. You may choose to have students hit the drum as well.

21. Ask students, “Are there any sound vocabulary words we need to define today?” Wait for student responses including the correct being yes, vibrations, ear canal, and eardrum.
 22. Ask students, “What is a vibration?” Wait for student responses including the correct being that it is the movement of an object back and forth.
 23. Write the definition for vibration on the board and instruct students to write it on their sound vocabulary sheets allowing a few minutes for completion.
 24. Ask students, “What is the ear canal?” Wait for student responses including the correct being that it is a tunnel that is joined to the part of the ear you can see.
 25. Write the definition for ear canal on the board and instruct students to write it on their sound vocabulary sheets allowing a few minutes for completion.
 26. Ask students, “What is the eardrum?” Wait for student responses including the correct being that it is a thin covering at the end of the ear canal.
 27. Write the definition for eardrum on the board and instruct students to write it on their sound vocabulary sheets allowing a few minutes for completion.
 28. Have students put both their Hear This packet and their Sound vocabulary sheet in their science folder. If need be, collect their vocabulary sheet and check their work being sure to return them in time for the next lesson.
- E. *Assessment/Evaluation*
1. An informal assessment will occur while the teacher is leading the class discussion on the sequence of events.
 2. A formal assessment will occur during the students’ writing of the definitions.

Lesson Three: Say What? (45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will develop an understanding of the basic principles of sound and how it travels.
 - b. Students will understand that information can be gathered through observation and experimentation
2. Lesson Content
 - a. Sound as vibration
 - b. Outer ear, ear canal
 - c. Eardrum
 - d. Three tiny bones (hammer, anvil, and stirrup) pass vibrations to the cochlea
 - e. Auditory nerve
3. Skill Objective(s)
 - a. Students will identify the three parts of the ear including their major components through experimentation, reading and diagramming.

B. *Materials*

1. Class set of Hear This packet (Appendix B)
2. Class set of Sound Vocabulary sheet (Appendix C)
3. Pencil for each student
4. Class set of Science folder

C. *Key Vocabulary*

1. The *pinna* is the part of your ear you see in the mirror.
2. The *outer ear* is made up of the pinna and the ear canal.
3. The *middle ear* is made up of the eardrum, hammer, anvil and the stirrup.
4. The *inner ear* is made up of the cochlea and the auditory nerve.
5. The shell shaped *cochlea* is filled with fluid and lined with tiny hairs.

6. Messages are sent through the *auditory nerve* to the brain.

D. *Procedures/Activities*

1. Have students retrieve their Sound vocabulary sheet (Appendix C) and their Hear This (Appendix B) packet from their science folders and turn to page 3.
2. Read the first paragraph aloud or have a competent student read it aloud.
3. Have students perform the first experiment by putting their fingers in their ears and wiggling them around. Informally assess for student participation.
4. Once they have done this, ask students, “Can you hear your fingers wiggle in ears?” Wait for student responses.
5. Have students perform the second experiment by putting their fingers in their ears and saying, “Say what” and then removing their fingers and repeating the phrase.
6. Ask students, “Did you hear the difference when speaking between the time your fingers were in your ears and the time when they were out of your ears?” Wait for student responses.
7. Ask students, “Why do you think there is a difference?” Wait for student responses, which should include that the ear canal was blocked or the ears were clogged so no sound could go in, etc.
8. Read the second paragraph of page 3 of the Hear This packet (Appendix B) aloud or have a competent student read it aloud and have students follow along.
9. Ask students, “So what are the parts that make up the outer ear?” Wait for responses including the correct being the pinna and the ear canal.
10. Ask students, “Point to the pinna on your ear.” Wait for students to point correctly. Informally assess students’ comprehension and participation throughout this lesson.
11. Read the third paragraph of page 3 of the Hear This packet (Appendix B) aloud or have a competent student read it aloud and have students follow along.
12. Ask students, “So what are the parts that make up the middle ear?” Wait for responses including the correct being the eardrum, hammer, anvil and the stirrup.
13. Ask students, “What are those three tiny bones called again?” Wait for responses including the correct being the hammer, anvil and the stirrup.
14. Ask students, “Tell me a cool fact about these bones.” Wait for responses including the correct being that the stirrup is the smallest bone in the body, the stirrup is the size of a grain of rice, the three bones could vibrate for a lifetime without ever breaking. Continue to informally assess students’ comprehension and participation.
15. Read the fourth paragraph of page 3 of the Hear This packet (Appendix B) aloud or have a competent student read it aloud and have students follow along.
16. Ask students, “What are the parts that make up the inner ear?” Wait for responses including the correct being the cochlea and the auditory nerve.
17. Ask students, “Tell me a fact about the inner ear?” Wait for student response including the correct being that the cochlea is shell shaped, cochlea means “shell-shaped.”
18. Read the final paragraph of page 3 of the Hear This packet (Appendix B) aloud or have a competent student read it aloud and have students follow along.
19. Discuss with students the questions in this final paragraph. The rabbit has larger pinnas so it hears better and other animals with the same could include elephants, dogs, mice etc. Humans can cup their hands around the pinna of their ear to assist in making it larger and hearing more. Students can try this as time allows.
20. Have students turn to page 4 of the Hear This packet (Appendix B) and discuss the diagram showing all the parts of the ear mentioned on page three.

21. Ask students, “Draw a circle around the parts of the outer ear, middle ear and inner ear and label them.” Allow students a few minutes to complete this. Informally assess students’ comprehension by walking through the room assisting students who may require it.
 22. When students are finished, tell them, “In the box below the diagram of the ear, you get to draw a picture of the ear and all the parts we’ve talked about. You’ll include the pinna, ear canal, eardrum, hammer, anvil, stirrup, cochlea and the auditory nerve. You’ll also get to label the outer, middle and inner parts of the ear by circling like you just did. Don’t worry if you think you’re not a good artist, just use the diagram above to help you.” Write the parts of the ear mentioned on the board as well to remind students to include them in their drawing.
 23. Allow students approximately 10-15 minutes to complete this task. They do not need to color their picture, in fact, it will be easier to see the detail if they don’t.
 24. Once students have completed their diagram, have them look at their vocabulary sheet and ask them, “Are there any sound vocabulary words we need to define from our reading?” Wait for responses which should be yes, there are several.
 25. Go through the following vocabulary words with the students one by one remembering to write the definition on the board and allowing students a few minutes to write them on their sound vocabulary sheet. Informally assess for student participation and comprehension.
 - a. *Pinna* is the part of your hear you see in the mirror
 - b. The *outer ear* is made up of the eardrum, the hammer, anvil and the stirrup.
 - c. The *inner ear* is made up of the cochlea and the auditory nerve.
 - d. The *cochlea* is shell shaped and filled with fluid and lined with tiny hairs.
 - e. The *auditory canal* sends sound messages to the brain.
 26. Collect students Hear This packet (Appendix B) to formally assess their diagrams for accuracy and comprehension. Be sure to return them in time for the next lesson.
 27. Have students return their Sound Vocabulary sheet (Appendix C) to their science folder.
- E. *Assessment/Evaluation*
1. Informally assess students throughout the lesson and discussions for comprehension and participation.
 2. Formally assess students’ diagram of the ear including the identification of the inner, middle and outer ear components.

Lesson Four: Balance (45 minutes)

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will understand that information can be gathered through observation and experimentation.
 2. Lesson Content
 - a. Auditory nerve
 3. Skill Objective(s)
 - a. Students will identify the parts of the inner ear that effect balance.
- B. *Materials*
1. Class set of Hear This packet (Appendix B)
 2. Class set of Sound Vocabulary sheet (Appendix C)
 3. Pencil for each student
 4. Class set of Science folder

5. Open area for students to spin in circles (if time allows)
- C. *Key Vocabulary*
1. The part of the inner ear that contains the body's ability to balance is the *semi-circular canals*.
- D. *Procedures/Activities*
1. Have class retrieve their Sound Vocabulary sheet (Appendix C) and their Hear This packet (Appendix B) and turn to page 4.
 2. Read the first paragraph of the Hear This packet page 4 aloud or have a competent student read it aloud to the class.
 3. Ask students, "Take a look at the picture of the inner ear below and put your finger on the *semi-circular canals*." Wait for student participation. Informally assess students' accuracy.
 4. Ask students, "So what is in the *semi-circular canals* that tells the body whether it is standing up straight or spinning around or hanging upside down from the monkey bars?" Wait for student responses including the correct being fluid and hairs.
 5. Read the second paragraph of the Hear This packet page 4 aloud or have a competent student read it aloud to the class.
 6. Ask students, "How many of you have spun in circles for so long that when you were done you felt like you were still spinning even though you'd stopped?" Wait for affirmative student responses. Informally assess students' participation.
 7. Ask students, "So, what happened in the inner ear that caused your brain to think it was still spinning even though you'd stopped?" Wait for student responses including the correct being that the fluid in the *semi-circular canals* was still moving which moved the hairs, which sent the message to the brain that the body was still moving. Informally assess for student participation, accuracy and vocabulary word usage.
 8. Ask students, "Is there a vocabulary word on this page that we need to define and if so, what is the word?" Wait for student responses including the correct being yes, the *semi-circular canal*.
 9. Ask students, "What is the *semi-circular canal*?" Wait for student responses including the correct being that it is the part of the inner ear that contains the body's ability to balance. Write this definition of the board and allow a few minutes for students to write this definition on their Sound vocabulary sheets. Formally assess students' participation, accuracy and completion of the vocabulary word definition.
 10. If time allows, have students go outside and spin in circles for a few minutes. Once all students have had a chance to do this, return to the classroom, sit in a circle, or pair students up to share with each other and discuss what is happening to the inner ear that prevents them from standing up straight after they've finished spinning. Informally assess student participation and use of vocabulary words.
 11. Instruct students to return their Hear This packet (Appendix B) and their Sound vocabulary sheet (Appendix C) to their science folder.
- E. *Assessment/Evaluation*
1. An informal assessment will occur while the teacher is leading the class discussion on balance and the *semi-circular canal*.
 2. A formal assessment will occur during students defining *semi-circular canal*.

Lesson Five: Mr. Watson, come here. I want you. (45 minutes)

A. *Daily Objectives*

1. Concept Objective(s)
 - a. Students will understand that people of varied backgrounds have made contributions to science throughout history.
2. Lesson Content
 - a. Science Biographies: Alexander Graham Bell
3. Skill Objective(s)
 - a. Students will identify the inventor of the telephone and associate other important details to this historic event through reading and answering questions as a group.

B. *Materials*

1. Class set of Hear This packet (Appendix B)
2. Class set of Sound vocabulary sheet (Appendix C)
3. Pencil for each student

C. *Key Vocabulary*

1. *Alexander Graham Bell* invented the telephone in March 1876.

D. *Procedures/Activities*

1. Have students retrieve their Sound vocabulary sheet (Appendix C) and their Hear This packet (Appendix B) and turn to page 5.
2. Have students fold the page up to the dotted line so they hide the information on the page.
3. Read the information above the line on page 5 of the Hear This packet (Appendix B) aloud to the class or have a competent student read it aloud.
4. Tell students, “We are going to answer the questions on this page before reading the information to see what we already know. Then we’re going to read and answer the questions again to make sure we learned all the information. So, who said, “Mr. Watson come here. I need you?” Wait for student responses. The correct answer is Alexander Graham Bell. Write some of the responses on the board in front of the class – do not focus on a correct answer yet.
5. Ask students, “Who invented the telephone?” Wait for student responses. The correct answer is Alexander Graham Bell. Write some of the responses on the board in front of the class – do not focus on a correct answer yet.
6. Ask students, “What was his assistants’ name?” Wait for student responses. The correct answer is Mr. Watson. Write some of the responses on the board in front of the class – do not focus on a correct answer yet.
7. Ask students, “Where was the inventor of the telephone born?” Wait for student responses. The correct answer is Scotland. Write some of the responses on the board in front of the class – do not focus on a correct answer yet.
8. Ask students, “What month and year was the telephone invented?” Wait for student responses. The correct answer is March 1876. Write some of the responses on the board in front of the class – do not focus on a correct answer yet.
9. Have student unfold their paper and read the following tow pages aloud to the class or have a competent student read them aloud.
10. Once the reading is completed, ask students, “On the bottom of page six there are some questions. Who thinks they can answer these questions now that we read about Alexander Graham Bell?” Wait for positive student responses.
11. Tell students, “Go ahead and take a few minutes to answer these questions. If you need to look back at the reading, go ahead and do so. That way you can be sure to spell everything correctly.” Allow 5-10 minutes for students to complete

the questions. Formally assess student participation and accuracy of answers. Guide students toward the correct answer if you notice they have written an inaccurate answer on their paper. Encourage students to re-read parts of the story to gain the proper answer.

12. Once students have finished ask them, “So, who said, “Mr. Watson come here, I need you?” Wait for student responses including the correct being Alexander Graham Bell. If this answer was guessed originally, circle it on the board. If it was not an original guess, write it on the board and circle it. . If this answer was guessed originally, circle it on the board. If it was not an original guess, write it on the board and circle it. Have students verify they’ve written the correct answer to this question in their packet. Informally assess student participation and accuracy.
13. Ask students, “Who invented the telephone? Wait for student responses including the correct being Alexander Graham Bell. If this answer was guessed originally, circle it on the board. If it was not an original guess, write it on the board and circle it. Have students verify they’ve written the correct answer to this question in their packet. Informally assess student participation and accuracy.
14. Ask students, “What was his assistants’ name?” Wait for student responses including the correct being Mr. Watson. . If this answer was guessed originally, circle it on the board. If it was not an original guess, write it on the board and circle it. Have students verify they’ve written the correct answer to this question in their packet. Informally assess student participation and accuracy.
15. Ask students, “Where was the inventor of the telephone born?” Wait for student responses including the correct being Scotland. If this answer was guessed originally, circle it on the board. If it was not an original guess, write it on the board and circle it. Have students verify they’ve written the correct answer to this question in their packet. Informally assess student participation and accuracy.
16. Ask students, “What month and year was the telephone invented?” Wait for student responses including the correct being March 1876. If this answer was guessed originally, circle it on the board. If it was not an original guess, write it on the board and circle it. Have students verify they’ve written the correct answer to this question in their packet. Informally assess student participation and accuracy.
17. If need be, collect the packets and check their work being sure to return them in time for the next lesson.
18. Ask students, “Is there a word on our Sound vocabulary sheet (Appendix C) that we need to define?” Wait for student responses including the correct being yes, Alexander Graham Bell.
19. Write the definition on the board: Alexander Graham Bell invented the telephone in March 1876. Tell students, “Write this definition on you Sound vocabulary sheet.” Allow a few minutes for students to complete this. Informally assess student participation and accuracy.
20. If time permits, conduct a class discussion regarding the information shared on pages five and six of the Hear This packet (Appendix B) informally assessing student participation and interest level.
21. At a later date, obtain books from the library on Alexander Graham Bell to provide to the students who want to continue their learning of this man.

- E. *Assessment/Evaluation*
1. An informal assessment will occur while the teacher is leading the class questions on their knowledge of Alexander Graham Bell.
 2. A formal assessment will occur during the student's final answering of the questions about Alexander Graham Bell.

Lesson Six: Take Care of Your Ear (45 minutes)

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. Students will understand that information can be gathered through observation and experimentation.
 2. Lesson Content
 - a. Outer ear, ear canal
 3. Skill Objective(s)
 - a. Students will identify and list ways to care for their ears properly.
- B. *Materials*
1. Class set of the Hear This packet (Appendix B)
 2. Pencil for each student
- C. *Key Vocabulary*
- No new vocabulary words for this lesson
- D. *Procedures/Activities*
1. Have students retrieve their Hear This packet (Appendix B) and turn to page 7.
 2. Read the page aloud to the class or have a competent student read it aloud.
 3. Pause at each question on the page and lead a class discussion. Informally assess students' participation during the discussion in this lesson.
 4. The first question to discuss with the class is "What are some loud jobs that you should wear earplugs for?" Wait for student responses, which may include: airport workers, construction works, printers, etc.
 5. Continue to read the page aloud to the class or have a competent student read it aloud.
 6. The next question to discuss with the class is "What are noises that make us put our hands to our ears and cover them?" Wait for student responses, which may include, sirens passing by, loud construction trucks or machines, screeching tires, etc.
 7. Once the reading is completed, ask students "List five things you can do to care for your ears? Who knows something we should do to care for our ears?" Wait for student responses which may include:
 - a. Don't poke sharp objects in our ears.
 - b. Cover our ears from loud noises.
 - c. Have a doctor remove the earwax build up.
 - d. Don't listen to loud music.
 - e. Don't stand close to loud noises.
 8. Have students list as many of these items as a class as you feel necessary or have students list them individually. Formally assess student participation and accuracy.
 9. If need be, collect the packets and check their work.
- E. *Assessment/Evaluation*
1. An informal assessment will occur while the teacher is leading the class discussion on the care of our ears.
 2. A formal assessment will occur during the students' listing of five ways to care for their ears.

VI. CULMINATING ACTIVITY

- A. The final culminating activity will consist of students creating a model of the ear, labeling all the parts previously learned about and the post-assessment (Appendix D) which has students describe how sound is heard and share important facts about the invention of the telephone. This exercise can be done over two class periods if necessary or one extended class period depending on time availability.
- B. Materials used for the creation of the model of the ear can be a multitude of supplies including a variety of shapes of uncooked pasta, pipe cleaners, buttons, shells, paper, rice, etc. Have these items available for all students to use as well as one piece of 8 ½ X 11 piece of construction paper (variety of colors) and one glue bottle per student.
- C. Pass out a piece of construction paper (8 ½ x 11) to each student, have them retrieve their glue bottle, pencil and have supplies available for them to use.
- D. Ask students, “What are the parts of the ear that we learned about during this lesson and defined?” Wait for student responses including the correct being, ear canal, eardrum, pinna, outer ear, middle ear, inner ear, cochlea, auditory canal, semi-circular canals, hammer, stirrup, and anvil. Write these parts of the ear on the board for students to reference while making their model of the ear.
- E. Tell students, “You will be making a model of the ear with the supplies provided. You must include parts that look like all the parts listed on the board and you must label them. In addition, you need to put a circle around all the parts of the inner, middle and outer ear. Before you begin, put your name on the back of your paper and then you can begin. We are working individually so do your own work.”
- F. Allow students 30-40 minutes to complete this activity. This is a fun way for students to recall the information they’ve learned during the unit. Once completed, allow them the time to dry and grade them using the Ear Model Answer Key (Appendix H) and the Ear Model rubric (Appendix E).
- G. The second part of the culminating activity is the post-assessment (Appendix D). Pass out one per student and be sure each student has a pencil.
- H. Allow 15-25 minutes for students to complete the post-assessment (Appendix D). Collect them and use the post-assessment answer key (Appendix F) to correct them.
- I. If time allows, ask students, “What is the coolest part about the ear that you learned?” Wait for responses and continue discussion with students regarding positive learning moments from the Hearing unit as long as time will allow.

VII. HANDOUTS/WORKSHEETS

- A. Appendix A: Pre-assessment: Sound: Know it All (Lesson One)
- B. Appendix B: Sound vocabulary sheet (Lessons Two-Five)
- C. Appendix C: Hear This packet (Lessons Two-Six)
- D. Appendix D: Post-assessment (Culminating Activity)
- E. Appendix E: Ear Model Rubric (Culminating Activity)
- F. Appendix F: Post-Assessment Answer Key (Culminating Activity)
- G. Appendix G: Pre-Assessment Answer Key (Lesson One)
- H. Appendix H: Ear Model Answer Key (Culminating Activity)

VIII. BIBLIOGRAPHY

- A. Bellis, Mary <http://inventors.about.com/library/inventors/bltelephone2.htm> About, Inc. 2005
- B. Cobb, Vicki. *Perk Up Your Ears*. Brookfield, CT: The Millbrook Press, 2001. 0-7613-1704-X
- C. Ferguson, Beth. *The Ears*. Tarrytown, NY: Benchmark Books, 1968. 0-7614-1592-0

- D. Iveson, Joan. *Your Nose and Ears*. New York: The Bookwright Press, 1985. 0-53118042-5
- E. Mallinson, George G., Jacqueline B. Mallinson, Lindsa Froschauer, James A. Harris, Melanie C. Lewis, Catherine Valentino. *Science Horizons*. Morristown, NJ: Silver Burdett Ginn Inc., 1993. 0-382-31835.
- F. Showers, Paul. *Ears Are For Hearing*. New York: Thomas Y. Crowell Junior Books, 1990. 0-690-04720-7
- G. Suhr, Mandy. *Hearing*. Minneapolis: Carolrhoda Books, Inc., 1993. 0-87614-833-X

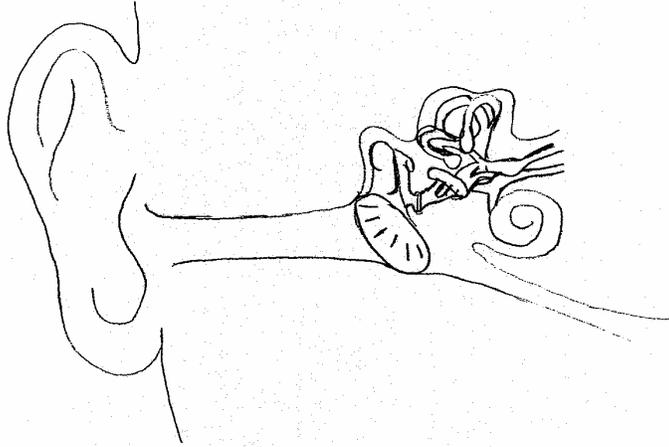
Appendix A

SOUND: KNOW-IT-ALL

1. Explain how sound is made. _____

2. Explain how your ear hears the sound. _____

3. Label the parts of the ear.



4. What are the three main sections of the ear called? _____

5. How do we keep our balance? _____

6. Who is Alexander Graham Bell? What did he do that made him famous? _____

HEAR THIS!

HEARING: HOW THE EAR WORKS

NAME: _____

WHAT'S MAKING THAT SOUND?

A short play

Teacher reads: "Four third grade students are standing at the bus stop waiting for the school bus having a conversation.

Student #1 "Do you hear that? What is that sound?"

Student #2 "It sounds like someone is hitting a big drum in a band."

Student #1 "What is sound anyway?"

Student #3 "Well, sound is a form of energy that you hear. But what I want to know is how do we actually hear sounds?"

Student #2 "I know that one. When that big drum gets hit, it vibrates, which means it moves back and forth. All sound is made by vibration."

Student #1 "Okay smarty pants, so the drum vibrates, how come I can hear it?"

Student #2 "Well, when the drum is hit and it vibrates it creates sound waves which move in all directions so you can hear it."

Student #1 "Oh, so the noise is made by the vibrations and my ear hears it."

Student #2 "Not exactly. Your ear can't really hear noise - it hears the vibrations. Your ear collects vibrations and they travel through the ear canal to the eardrum, which vibrates too. There are three little tiny bones in there that begin to move and they pass the movement to a liquid in the inner ear, which is a part that's shaped like a snail. The moving liquid makes tiny hairs move too, which sends a message along a nerve in each ear that goes to your brain to tell you what you heard. Cool huh?"

Student #1 and 3 "WOW! That is cool!"

Student #4 "Did he just say I have a snail in my ear?"

The End

The facts contained on this page come from *Science Horizon* published by Silver Burdett Ginn Inc.

Say What?

Stick your fingers in your ears and wiggle them around. What do you hear? You hear your fingers rubbing in your ears. What don't you hear? You don't hear the sounds outside the entrance to your ears. Put your fingers back in your ears and say "Say what?" Now take your fingers out and say "Say what?" again. Can you hear the difference?

The part of your outer ear that you see in the mirror is called the pinna and it's like a funnel collecting the sound. The pinna leads to a tunnel called the ear canal. That's the outer ear - the pinna and the ear canal. Easy, right? Speak up, my pinna can't collect the sounds your saying!

On to the middle ear. The ear canal leads to the eardrum, which is where the middle ear starts. The eardrum is thin piece of skin stretched tight across the tunnel, just like the skin on the top of a drum. When the sound hits the eardrum it vibrates and makes three tiny bones move. The three tiny bones are called the hammer, the anvil and the stirrup. Did you know that these three bones can vibrate for a lifetime without breaking! Also, the stirrup is the smallest bone in the body and it's about the size of a grain of rice. Ears are so cool!

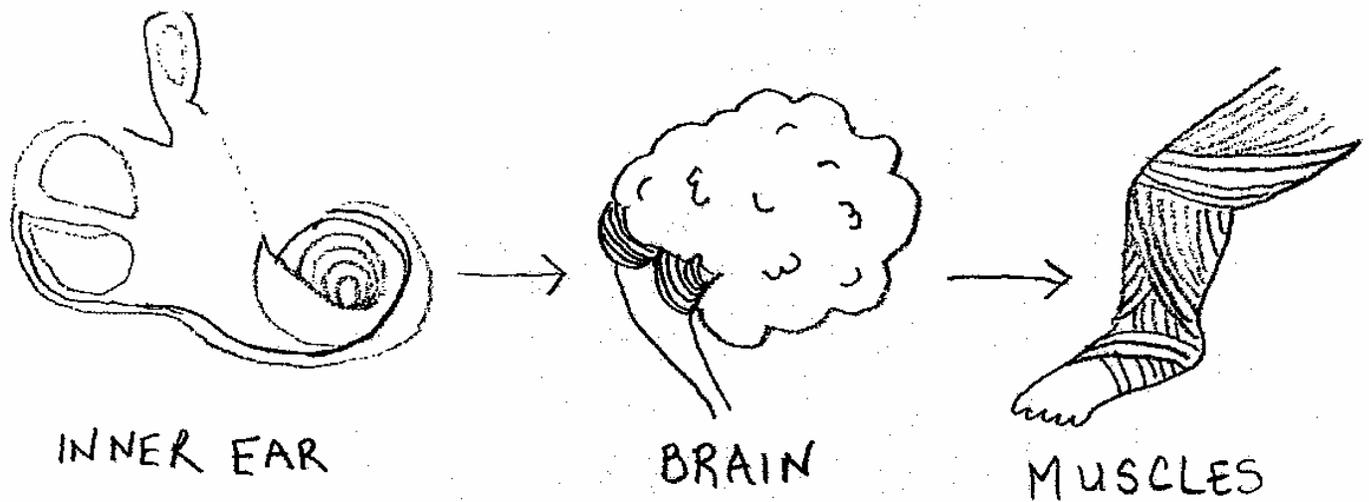
Last we have the inner ear. On the other side of the three tiny bones is the cochlea, which is shaped like a snail's shell, in fact cochlea means "shell-shaped." The cochlea is filled with fluid and lined with tiny hair cells that pick up the vibrations. The vibrations are sent as messages through the auditory nerve to the brain telling your brain what sound you've just heard.

Some animals can hear better than people. Rabbits can hear very well, but I guess that makes sense since their pinnas are so large. What other animals have large pinnas? How can we make our pinna's bigger to hear better?

The facts contained on this page come from *Perk Up Your Ears* by Vicki Cobb and *Hearing* by Mandy Suhr.

BALANCE

Did you know, that without your ears it would be difficult to keep your balance? If you turn in circles your eyes and muscles tell the brain which way you're are going, but so do your inner ears! Remember your cochlea (it looks like a shell)? Another part of the inner ear, near the cochlea are three canals called the semi-circular canals, which are lined with fine hairs and filled with liquid. When you move your head the liquid rushes through the semi-circular canals, moving the hairs around. Nerves send this information to the brain. If you were about to fall over, the nerves would send a message to the brain to stop the fall.



Ever turn in circles so many times that you still felt dizzy once you stopped? That's because your brain is confused by the signals it's receiving. Your legs may be standing still, but the liquid in the semi-circular canals in your ears is still moving around!

The facts contained on this page come from *Your Nose and Ears* by Joan Iveson-Iveson and *Ears are for Hearing* by Paul Showers.

How big is your brain? Fold this paper in half at the line to cover up the information below and see if you can answer these questions:

Who said, "Mr. Watson, come here. I want you?"

Who invented the telephone?

What was his assistants' name?

Where was the inventor of the telephone born?

What month and year was the telephone invented?

How did you do? If you didn't know all the answers, don't worry you can learn them right now!

Alexander Graham Bell invented the first telephone in March 1876 but a lot happened before that. Alexander Graham Bell was born in Scotland on March 3, 1847. His grandfather and father were teachers of correct speech and Alexander started teaching speech and music at the age of sixteen. He taught deaf children and children who could not speak.

He researched and studied two problems related to sound. First, he studied the ability to send electrical current through something that could change in strength. Second, he studied finding material that could catch vibrations while sending and receiving. Sounds like he was working on the telephone for a while! In fact, he began working on the telephone construction with another famous inventor, Thomas Jefferson, in Boston, Massachusetts!

On June 2, 1875, Bell and his assistant Watson were experimenting with their telegraph. In those days, steel rods were used to carry vibrations. One of these rods was stuck so Watson plucked it with his finger. In the other room, Bell heard a reed in his instrument vibrate as if he had plucked it himself. This intrigued Bell to investigate further.

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Nine months later, in March 1876, the first telephone was invented with the first words being spoken in it. These words were, "Mrs. Watson, come here. I want you." Spoken by Alexander Graham Bell himself. Bell invented the telephone when he was thirty years old. For the next forty-five years of his life, he worked in many fields, including airplane flights, heredity and working with the deaf and mute communities.

Now how big is your brain? Answer the following questions based on the reading above:

Who said, "Mr. Watson, come here. I want you?" _____

Who invented the telephone? _____

What was his assistants' name? _____

Where was the inventor of the telephone born? _____

What month and year was the telephone invented? _____

The facts contained on this page come from <http://inventors.about.com/library/inventors/bltelephone2.htm> by Mary Bellis.

TAKE CARE OF YOUR EARS! BUT HOW?

There are many things we can do to take care of ears. Never poke sharp objects into your ear. You wouldn't want to accidentally make a hole in your eardrum!! Ouch!! Sometimes, earwax can build up in the auditory canal and it's best to let a doctor remove it.

WHAT ABOUT LOUD NOISES! Loud noises can damage your hears and cause hearing loss if you listen to them for a long time. Think about the people that work in very noisy places or with noisy machinery. They have to wear hearing protectors, like earplugs and earmuffs, to keep their ears from being hurt. What are some loud jobs that you should wear earplugs for?

What about the noises we hear everyday? Some noises don't hurt our ears, like cars passing by or animals or the telephone ringing. But what are some noises we hear that make us put our hands to our ears and cover them? Can you think of any?

List three things you can do to care for your ears

1. _____

2. _____

3. _____

List three things you shouldn't do to your ears.

1. _____

2. _____

3. _____

The facts contained on this page come from *The Ears* by Beth Ferguson and *Your Nose and Ears* by Joan Iveson.

Appendix C

Sound Vocabulary

Vibration: _____

Ear Canal: _____

Eardrum: _____

Pinna: _____

Outer Ear: _____

Middle Ear: _____

Inner Ear: _____

Cochlea: _____

Auditory Canal: _____

Semi-Circular Canals: _____

Alexander Graham Bell: _____

Appendix D

SOUND: KNOW-IT-ALL

1. Explain how sound is made. _____

2. Explain how your ear hears the sound. _____

3. What are the three main sections of the ear called? _____

4. How do we keep our balance? _____

5. Who is Alexander Graham Bell? What did he do that made him famous? When did this take place? _____

6. List three ways to keep your ears safe and healthy.

1. _____
2. _____
3. _____

Appendix E

Building A Structure: Ear Model Rubric

Student Name: _____ Date: _____

CATEGORY	4	3	2	1	POINTS
Construction - Materials	Appropriate materials were selected and creatively modified in ways that made them represent key parts of the ear.	Appropriate materials were selected and there was an attempt at creative modification to make them represent key parts of the ear.	Appropriate materials were selected.	Inappropriate materials were selected and contributed to a product that poorly reflected the key parts of the ear.	
Scientific Knowledge	All 12 parts of the ear were identified clearly and accurately.	Nine-eleven parts of the ear were identified clearly and accurately.	Six-eight parts of the ear were identified clearly and accurately.	Five or less parts of the ear were identified clearly and accurately.	
Spelling	The student has labeled the ear model with no misspelled words.	The student labeled their ear model with only two misspelled words.	The student labeled their ear model with no more than three misspelled words.	The student labeled their ear model with more than four misspelled words.	
TOTAL SCORE:					POINTS: _____ / 12 _____ % Letter Grade _____

Appendix F

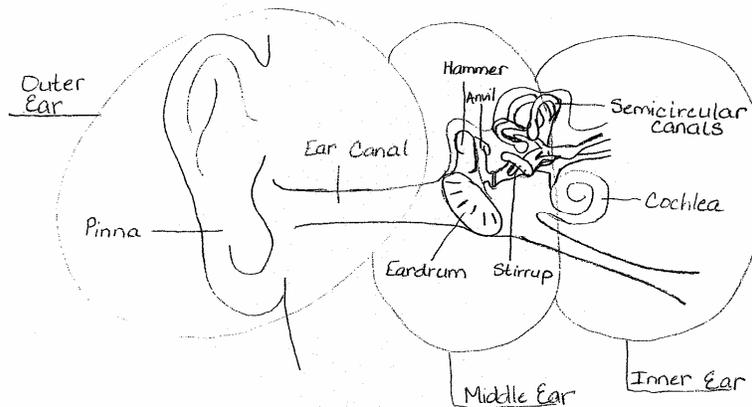
SOUND: KNOW-IT-ALL Post-Assessment Answer Key

1. Explain how sound is made.
All sound is made by vibration, which is the movement of an object back and forth. Sound waves are vibrations that move in all directions.
2. Explain how your ear hears the sound.
The ear collects the vibrations, which then travel through the ear canal to the eardrum, which vibrates too. Three tiny little bones, the hammer, anvil and stirrup, move and pass the movement to a liquid in the inner ear. Tiny hairs then move sending a message along a nerve to the brain to tell you what you heard.
3. What are the three main sections of the ear called? The inner, middle and outer ear.
4. How do we keep our balance?
In part of the inner ear, near the cochlea are three canals called the semi-circular canals, which are lined with fine hairs and filled with liquid. When you move your head the liquid rushes through the semi-circular canals, moving the hairs around. Nerves send this information to the brain. If you were about to fall over, the nerves would send a message to the brain to stop the fall.
5. Who is Alexander Graham Bell? What did he do that made him famous? When did this take place?
Alexander Graham Bell invented the telephone in March 1876. He was born in Scotland and his assistant was Mr. Watson.
6. List three ways to keep your ears safe and healthy.
 - 1) Don't put sharp objects in them
 - 2) Stay away from loud noises
 - 3) Have the doctor remove earwax build up.

Appendix G

SOUND: KNOW-IT-ALL Pre-Assessment Answer Key

1. Explain how sound is made.
All sound is made by vibration, which is the movement of an object back and forth. Sound waves are vibrations that move in all directions.
2. Explain how your ear hears the sound.
The ear collects the vibrations, which then travel through the ear canal to the eardrum, which vibrates too. Three tiny little bones, the hammer, anvil and stirrup, move and pass the movement to a liquid in the inner ear. Tiny hairs then move sending a message along a nerve to the brain to tell you what you heard.
3. Label the parts of the ear.



4. What are the three main sections of the ear called? The inner, middle and outer ear.
5. How do we keep our balance?
In part of the inner ear, near the cochlea are three canals called the semi-circular canals, which are lined with fine hairs and filled with liquid. When you move your head the liquid rushes through the semi-circular canals, moving the hairs around. Nerves send this information to the brain. If you were about to fall over, the nerves would send a message to the brain to stop the fall.
6. Who is Alexander Graham Bell? What did he do that made him famous?
When did this take place?
Alexander Graham Bell invented the telephone in March, 1876. He was born in Scotland and his assistant was Mr. Watson.

Appendix H

Use this diagram for ear model (culminating activity) label accuracy.

