Human Ear and Sense of Hearing

Lesson Overview
In this lesson, students will learn about the ear and the sense of hearing. Using Cyber Science 3D, students will learn about the parts of the ear. Students will conduct further research about the functions of its structures. Students will conduct several experiments about the sense of hearing (optional).

Objectives
- Learn how humans receive important information about their surroundings from the sense of hearing
- Conduct research about the parts of the human ear and their functions
- Carry out experiments to learn how the brain processes and responds to sensory information from the ear in different ways (optional)

Standards (NGSS and Common Core)
For state specific standards visit edu.zspace.com

Next Generation Science Standards
- Life Science – Structures and Processes
  - 4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Common Core Connections
- Language Arts
  - RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.
  - W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
  - W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
  - SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Differentiation
- Provide paper copies of diagrams to students to use as a reference

<table>
<thead>
<tr>
<th>Grade Level: 3rd - 5th</th>
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<tbody>
<tr>
<td>Lesson Time: 120 Minutes</td>
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<tr>
<td>Key Terms:</td>
</tr>
<tr>
<td>Cochlea</td>
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<tr>
<td>Cochlear nerve</td>
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<tr>
<td>Ear canal</td>
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<tr>
<td>Eardrum</td>
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<tr>
<td>Eustachian tube</td>
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<tr>
<td>Facial nerve</td>
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<tr>
<td>Semicircular canals</td>
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<tr>
<td>Vestibular nerve</td>
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Resources:
- Answer Key
- Froglet Human Ear worksheet
- Sense of Hearing Experiments worksheet (optional)

Classroom Setup:
- Research center on the human ear
- Center for sound experiments (optional)
- Bowl
- Plastic wrap
- Dry rice grains
- Cookie sheet
- Hanger
- String
- Metal spoon
- Balloon
- Ticking watch
Introduction

Students need a prior knowledge of the five senses and a basic understanding of the nervous system. The teacher will ask students what parts of the ear they already know. The teacher will explain that they will learn more about the parts of the ear and the sense of hearing today.

Activity – Human Ear and Sense of Hearing

1. Open the “Human Ear” session in Cyber Science 3D.
2. Click on the “Presenter” mode at the top left corner of the screen. This will display a list of slides along the left side.
3. Follow the presentation: Click on the “Play Slides” button to pause the session at the first slide. When you are ready for the next slide, click the next slide on the list. Follow the directions on each slide and explore at your own pace.
4. Using textbooks and the Internet, conduct further research about the functions of the ear’s parts.
5. Using the “Human Ear” worksheet, draw a cross section of the ear, label its parts, and record its functions.
6. Conduct several experiments about the sense of hearing and record your results using the “Sense of Hearing Experiments” worksheet (optional).
7. Research what caused your results and record this information on the worksheet.

Closing

After the students complete their research, they will discuss the parts of the ear and their functions. Students will make conclusions about how the brain processes and responds to the sensory information from the ear in different ways. They will discuss the following questions.

Questions for Discussion

1. Based on your research and experiments, you learned that the human ear has many important structures that help to hear important stimuli from the surroundings. What kind of things would be very important to hear for survival?
   
   Answers will vary. Sample: It would be very important to hear a car passing by, the sirens of an ambulance/fire truck/police car, a baby crying, for example.

2. There are many people who are deaf, having no sense of hearing at all. What kinds of activities or tasks would be difficult or impossible for someone who is deaf?
   
   Answers will vary. Sample: It would be hard to hear music or people’s voices, like at a concert or on the phone.
△ Investigate Further

**Extension Activity:** Students could learn basic sign language and try to communicate using only their hands.

**Extension Activity:** Students could take turns being blindfolded and go outside to identify sounds that they hear in their surroundings.

**Extension Activity:** Students could write a narrative describing what it would be like to be deaf. They could write about the events in their regular day and explain how being deaf would make these things a lot more difficult.

### Answer Key – Human Ear and Sense of Hearing

**Activity Questions From Hearing Experiments Worksheet (optional)**

1. In Experiment #1, what did you observe and what caused those results?
   *When you bang on the cookie sheet, the grains of rice will bounce on the plastic wrap. The plastic wrap represents the eardrum. Sound causes vibrations on the eardrum, which then sends messages to the brain about the sounds that you are hearing.*

2. In Experiment #2, what did you observe and what caused those results?
   *When you tap on the hanger, you can hear it louder when you have your fingers next to your ears. Sound travels better through most materials than through the air. The sound vibrations travel up the string, along your fingers, and into your ears.*

3. In Experiment #3, what did you observe and what caused those results?
   *When you tap on the balloon next to your ear, you can hear it loudly even though you are only tapping lightly. Again, sound travels better through the balloon and the compressed air inside than through the air around you.*

4. In Experiment #4, what did you observe and what caused those results?
   *Answers will vary. Sample: Each ear was able to hear better in certain directions, but not in others. Two ears were better than one for hearing the ticking watch at farther distances. By using two ears, we are able to hear things around us in all directions.*
Human Ear

Directions: Draw a cross section of the human ear and label its parts.
Directions: Research the parts of an ear and their functions.

<table>
<thead>
<tr>
<th>Parts of an Ear</th>
<th>Functions</th>
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<tbody>
<tr>
<td><strong>Outer Ear</strong></td>
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<td>Pinna</td>
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<tr>
<td>Ear Canal</td>
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<td><strong>Middle Ear</strong></td>
<td></td>
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<td>Ear Drum</td>
<td></td>
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<tr>
<td>Hammer (malleolus)</td>
<td></td>
</tr>
<tr>
<td>Anvil (Incus)</td>
<td></td>
</tr>
<tr>
<td>Stirrup (stapes)</td>
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<tr>
<td><strong>Inner Ear</strong></td>
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<td>Cochlea</td>
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<td>Facial Nerve</td>
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Sense of Hearing Experiment

Directions: Conduct the following experiments and record your observations. Research what caused the results in each experiment.

Experiment #1
(Need a large bowl, plastic wrap, grains of dry rice, tin cookie sheet)
1. Place clear plastic wrap securely on the top of the bowl.
2. Place 20-30 grains of dry rice on the plastic wrap.
3. Holding the cookie sheet close to the rice, bang on the cookie sheet.
4. Observe what happens to the rice.

What did you observe?

____________________________________________________________________

____________________________________________________________________

Based on your research, what caused this to happen? ______________________

____________________________________________________________________

____________________________________________________________________

Experiment #2
(Need a wire hanger, two pieces of equal length string, a metal spoon)
1. Tie a piece of string to each end of the hanger.
2. Twist the ends of each string around your fingers.
3. Have a partner tap the hanger with a metal spoon.
4. Repeat steps 2 and 3, but this time put your fingers against your ears.

What did you observe?

____________________________________________________________________

____________________________________________________________________

What caused this to happen?

____________________________________________________________________

____________________________________________________________________
Experiment #3
(Need a balloon)
1. Blow up a balloon.
2. Hold the balloon close to your ear.
3. Lightly tap the other side.

What did you observe?
____________________________________________________________
____________________________________________________________
____________________________________________________________

What caused this to happen?
____________________________________________________________
____________________________________________________________
____________________________________________________________

Experiment #4
(Need a ticking watch)
1. Blindfold your partner and have them cover one ear.
2. Holding the ticking watch and standing far away from your partner, slowly walk closer to your partner.
3. Have your partner tell you when he/she starts to hear ticking.
4. Repeat this same process from several different angles and record the distance when he/she hears the ticking.
5. Repeat steps #1-4 having your partner cover the other ear.
6. Repeat steps #1-4 having your partner cover both ears.

What did you observe?
____________________________________________________________
____________________________________________________________

What caused this to happen?
____________________________________________________________
____________________________________________________________