How the Ear Works

Description:
Students will make a model ear using common materials. They will then make different sounds to test out how the ear works.

Objectives:
• To demonstrate how the ear works and to show how sensitive the ear is to stimulus
• To make students aware of the effects sounds and noises can have on the ear

Vocabulary:
Vibration, Parts of the ear

Recommended for:
1st – 8th grade students

Materials:
• Cake pans with plastic wrap (or a drum)
• Thin poster paper or construction paper
• Straws
• Ping-pong ball or balloon
• Container of water
• Tape
• Sound meter (optional)
• Drawing of activity and ear (for reference)

Background Information:
Loud sounds and noises can cause physical damage to different parts of the ear and may lead to hearing loss.

Method:
• With students, introduce and discuss all of the different parts of the ear and their functions (See Parts of the Ear Chart below).
• Explain to students that they will make a model of the ear that will allow them to see how it works.
• Split the students into groups.
• Have each group assemble a model using the diagram and instructions provided.

Assembly:
• Remove the bottom of the cake pan, so that only the edges remain. Tightly secure plastic wrap on the now removed bottom. This will function as the outer ear. Ask students: What part of the ear do you think this represents and why?
• Cut the poster paper into a triangle with one long side and fold it in half. The paper should now be shaped like a “V.” Attach the paper to the center of the plastic wrap with tape. This will function as a stand for straw to rest on.
• Attach the straw to the poster paper, in the center of the “V.”
• If the straw does not naturally bend, cut the edge of another straw to connect two together. The straw(s) should be at an angle with one end angled toward the water. This will function as the ear canal.
• Attach a ping-pong ball to the end of the straw and set it so that it floats in the water. This will function as the ear drum.
• Sounds made near the outer ear (the plastic and cake pan) should result in vibrations on the water. This will serve as the cochlea.

Hearing with the Model
• Test out the model by making a variety of sounds and noises at different levels near the plastic wrap.
  o Remind students to examine how each sound affects the straws, ping-pong ball, and water surface.
• Have students create a chart and record the effects of sound and noise levels on their model.
  o Students should note the sound, sound level, and impacts on the model.

• Optional: You can use a sound meter to test how loud your sounds are and see what happens to the model when you make loud versus soft sounds.

Discussion:
• What happened when you made sounds near the cake pan?
• Did the model react differently when you made loud sounds versus soft sounds?

• What parts of the ear might the different parts of the model represent?
• Imagine the small parts in your ear that this model mimics. If a similar reaction can occur inside your ear when you hear loud sounds, could this cause a problem? Why?
• Look at the sound level chart. What were some of the sounds you made that are equivalent to sounds you hear in everyday life?

Extension:
• Have students read the article “No Hearing Aid? Some Gizmos Offer Alternative to ‘Speak Up!’” and discuss.

For more information contact:

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Also visit DEP’s website at:
www.nyc.gov/dep
Ear Model:

Poster paper "V" connects outer ear to the straw/ear canal

Straw, functioning as the ear canal

Ping pong ball, functioning as the ear drum

Container, functioning as the cochlea

Cake pan, functioning as the pinna/outer ear

Plastic wrap, functioning as the pinna/outer ear

Water, functioning as the cochlea

Diagram of the Human Ear:
# Parts of the Ear Chart

<table>
<thead>
<tr>
<th>Part of the Ear</th>
<th>Description</th>
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<tbody>
<tr>
<td>Ear</td>
<td>The sense organ that detects sounds</td>
</tr>
<tr>
<td>Outer Ear/ Pinna</td>
<td>Acts as a funnel on the outside of the ear that directs sound into the ear</td>
</tr>
<tr>
<td>Ear Canal</td>
<td>A tube running from the outer ear to the middle ear to transmit sound</td>
</tr>
<tr>
<td>Inner Ear/Cochlea</td>
<td>A hollow tube in the inner ear of higher vertebrates, usually coiled like a snail shell where sound waves are transformed into electrical impulses which are sent on to the brain</td>
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