

# RAFT IDEAS

**Topics:** Sound, Waves, Amplification

## Materials List

- ✓ Paper drinking cup
- ✓ 2.5 cm (1") square of brightly colored paper
- ✓ A partner to serve as "paper dropper"
- ✓ Scissors

This Activity can be used to teach:

Next Generation Science Standards:

- Sound (Grade 1, Physical Science 4-1; Grade 1, 4-4)
- Energy and sound (Grade 4, Physical Science 3-2, 3-4)
- Body structures and systems (Grade 4, Life Science 1-1; Middle School, Life Science 1-3)



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# A Drop in a Little Bucket

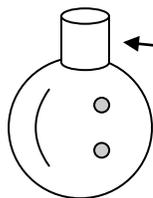
How Well Do Your Ears Work?



Could you hear a piece of paper if it was dropped into a cup? How small would the paper need to be for you to not hear it anymore? This quick and simple activity produces some amazing results!

## To Do and Notice

1. Guess (hypothesize) the smallest size paper that can be dropped into a cup and still be heard by the listener.
2. The listener tilts his head (as shown in the illustration) and holds the cup to his ear. The cup should be open-side-up.
3. The partner drops the 2.5 cm (1") square into the cup. The listener confirms that he could hear the paper drop.
4. Cut the paper in  $\frac{1}{2}$ .
5. Repeat steps 1-4 until the paper is too small to hear.
6. Discuss findings with other listeners. How well do your ears work?



- ✓ Listener should hold the cup against his/her ear.
- ✓ The open-side of the cup should be up.
- ✓ Listener should tilt their head so the partner can drop the paper into the cup.

## The Science Behind the Activity

This activity might seem silly and obvious at first, but students quickly become amazed at how small a piece of paper can be heard when dropped into the cup. The limiting factor is usually the ability to cut the paper rather than the inability of hearing the sound; at some point, it just becomes impossible to cut the paper any smaller! In most cases, no matter how small the paper is, the listener can still hear it hit the bottom of the cup. Since the solid cup is placed over the ear, the tiny sound of the paper hitting the cup travels quickly and efficiently into the ear. The shape of the cup also amplifies the sound.

Sound is caused by vibrations that travel in compression waves through the medium and into the ear. Once hitting the eardrum, the sound is sent to the brain's auditory cortex where it is analyzed and interpreted.

## Taking it Further

Encourage students to figure the fraction of the original piece they could still hear.

**Web Resources** (Visit [www.raft.net/raft-idea?isid=128](http://www.raft.net/raft-idea?isid=128) for more resources!)

For an excellent overview of hearing, visit How Stuff Works at: <http://entertainment.howstuffworks.com/hearing.htm/printable>

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