

Sound Waves Design Challenge: String Telephones

Primary Audience: Elementary and Middle School

Description: Make a telephone with string and cups, and use what you have learned about sound and vibrations to explain how these simple telephones work. Then, take the experiment to the next level with a design challenge!

Materials:

- Two plastic, paper, or tin cups or cans
- String
- Scissors
- Thumbtack



Instructions

Part 1 – Make a Basic String Telephone:

1. First, cut a length of string. Make sure you are able to stretch it tightly between the two people who will be on either end of the telephone!
2. Use a thumbtack to carefully poke a hole in the bottom of each cup.
3. Poke the string through one of the holes, and tie a knot so that the knot sits on the inside of the cup. Do the same with the other side of the string in the other cup. You should now have 2 cups connected by a string.
4. Test it out – stretch it between two people and see if you can talk to one another! How can you get the best sound out of the telephones? Why?

Part 2 - Design Challenge: Based on what you learned, design the BEST telephone. What does *best* mean to you? Maybe you want your telephone to be more stylish, or you want to try to be able to talk to more than one person. Maybe you want the clearest sound possible. It's up to you!

- **Design**

- First, decide on your constraints. What exactly are you trying to build? What materials are available to you to make it?
- Knowing the materials you have available, brainstorm how you can create the *best* telephone. Feel free to use other available supplies from around the house!
- Draw out your design before you do anything. Make sure you have all the supplies you need.

- **Build, Evaluate, Redesign**

- Using your design, build the first telephone prototype.
- Once it is complete, test it out. Is it working the way you had hoped? Are there any ways you can improve upon it? If something *isn't*

- working, how could you fix it?
 - Redesign, and rebuild to improve upon your telephone
 - Repeat the Build, Evaluate, Redesign steps as much as possible until you are happy with your product.
- **Share your results!** Take a picture and share with friends, family, and COSI! Just tag us at @cosi (Twitter) or @cosiscience (Instagram and Facebook), and we'll share it with our followers too!

What's Going On?

To have a sound, you must have something that vibrates. For example, when sound travels through the air, it vibrates the molecules in the air. In this case, air is the *medium* sound is traveling through. A medium can be any matter that a sound wave travels through. Sound can travel through all different mediums, but cannot travel in a **VACUUM** (an area where there is no matter).

Your telephone is directing the sound waves. The first person's voice causes molecules in the air near their mouth to vibrate, which causes the first cup to vibrate, which causes the string to vibrate, which causes the other cup to vibrate, which causes the air near the second cup to vibrate! Those vibrations are picked up by the ear of the second person.

Additional Resources:

- COSI Department of Science Content – ScienceQuestions@cosi.org
- Scientific Thinkers™, u.osu.edu/cemscientificthinkers

Show us your completed Science Challenge! Just tag us at @cosi (Twitter) or @cosiscience (Instagram and Facebook), and we may share it with our followers too!