Paper Cup Telephone

Description

A string pulled taut between two paper cups will allow what is whispered into one cup to be heard in the other, even when they are 20 feet away! This vintage low-tech "telephone" is a magnificent study of how sound travels, as well as how we use sound waves to communicate over distances.

Instructions

1. To make your child's paper cup telephone, use the compass or the tip of a sharp pencil to poke a small hole at the bottom of each of the cups.

2. Next, help your child thread the string through the hole of the first cup. Tie a knot in the yarn on the inside of the cup to keep it in place. Repeat this step on the second cup. If the string keeps slipping through the hole, you can tie it to a paper clip to help keep it in place.

3. When using your paper cup phones, the string needs to be kept taut. When your child whispers into their cup, the person with the other cup to their ear should be able to hear their voice.
    - Talk with your child about how this works. When you speak into the cup, the vibrations are transmitted to the string and travel through to the other cup if the string is held taut. The vibrations are transmitted to the air in the cup, which is around the listener's ear, allowing the whisper to be heard.
    - Because the cup and string are solid, and solids carry sound waves better than gasses such as air, the whisper can be heard much clearer than if you were to whisper into the air from that far away.

Materials Needed

- Two paper cups
- 20 feet of string or yarn
- Sharpened pencil or compass
- (Optional) Two paper clips

Why is this a great thing to do?

This activity will teach your child about physics, cultivates shared experiences, and enhances fine motor skills while they develop their understanding of cause and effect while experimenting.

Introduces children to physics.
Studying sounds waves and acoustics as they travel along a string are practical applications of the concept of physics.

Cultivates shared experiences.
Whispering into the paper phone for only your partner to hear is a fun way to share experiences and create memories. Additionally, if this is a project you or a grandparent remembers doing when they were young, it is a great connection to make with your child by recreating it now.

Enhances fine motor skills.
Holding and using a compass or pencil to poke a small hole, threading a string through that tiny hole, tying knots, and holding the string taut enough to communicate but not pulled so tight as to "break the connection" will build fine motor skills. Tools can begin to be held by older children between the thumb and index finger to develop strength and control in their pincer grasp, the talent needed to wield a pencil.

Develops their understanding of cause and effect.
Manipulating something to obtain different results in a way that is immediately seen is a great study in cause and effect.

Learns how to experiment.
Even if your child isn't quite ready for all five steps of the scientific method, doing simple experiments can get them used to the principles of making and testing hypotheses.

PROJECT STEM

Paper Cup Telephone

Make STEM Connections

Help your child develop a more in-depth understanding of how we communicate over distances using sound and receive messages through light and sound every day.

Communication devices master list.

You and your child each make a list of all the communication devices you can think of. Whoever has a longer list of items (without including any imaginary devices) wins! Do a Google search to research any items you didn't have on your lists. Which devices communicate using sound?

Animals use echolocation.

Echolocation is the way some animals, such as dolphins and bats, use sound to navigate. Look into this ability online, read books about it at your local library, or watch a video.

Time machine.

Pick a couple of different periods in history and find out how people communicated. How has the ability to communicate in modern-day times changed the world?

Ride the waves on YouTube.

Watch videos with your child on YouTube about the different kinds of sound waves (mechanical and electromagnetic.) There are many educational videos available, such as the Crash Course Physics video on traveling waves.

Next Generation Science Standards (NGSS) Correlation

1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

When your child constructs a paper cup telephone from two cups and a 20-foot piece of string, your child is observing that sound travels by the vibration of their voice through the cup, the string, and into the second cup at the opposing end of the string. This activity can be extended by using a tuning fork (found at any music store) and a ping pong ball to demonstrate how to see sound vibrate. Strike the tuning fork (it will vibrate) and touch one side of the fork to the ping pong ball. Watch the ping pong ball move away from the tuning fork. Discuss why the ping pong ball moves when the fork touches the ball.

1-PS4-4: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

When your child constructs a paper cup telephone from two cups and a 20-foot piece of string, your child is demonstrating an understanding that they can communicate over a distance by the vibration of sound waves through the materials they used to construct their paper cup phone. This activity can be extended by learning the American Sign Language (ASL) alphabet. Send messages to one another (without sound) by spelling words using ASL.

Talking Tips

"Do you think this "phone" will work?"

"Poke the hole very carefully, or it will be too big, and the string won't be able to stay in the cup when we pull it tight."

"What are you going to whisper about?"

"What helped you hear the other person more clearly?"

Tips & Extensions

Experiment with the length of and stress used on the string. How far away can you be to still hear your partner? How slack can the string be before the "connection" is lost? Does different string materials (thread, twine, etc.) conduct sound better?

Another fun sound experiment uses string and metal cutlery. Tie two pieces of string around the fork or spoon, then wrap the string around your child's fingers and place their fingers over their ears before hitting the cutlery against the table edge. They will hear a bell-like sound that has traveled up the string to their ears, while anyone in the room only hears the tap of the cutlery against the table. This effect is amplified to a gong sound if they use a larger metal object like a hanger!

PROJECT STEM

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Next Generation Science Standards (NGSS) Correlation (cont'd)

1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

When your child constructs a paper cup telephone from two cups and a 20-foot piece of string and watches a video about echolocation and the ways that animals communicate over a distance, your child is observing a connection and developing an understanding of the similarities between animals and humans and their solutions to communicating over a distance. This activity can be extended by playing "Marco Polo." Cover your child's eyes with a blindfold and instruct them to call out "Marco" and respond to your child with "Polo" to give them an auditory clue where they can find you by following your voice. Keep repeating "Marco, Polo" until your child finds their way to you. Switch positions on the following round of play and ask your child to give you auditory clues so that you can locate them by following their voice.