



# Power of Music: Transforming Energy

## **The Power of Music - Teacher Notes**

Challenge Background:

We want to focus on the conversion of energy without teaching the deletion of energy, since energy cannot be created or destroyed. Using words such as “converting”, and “transforming” are very useful to get this concept across.

### **Challenge #1: String Phone (work in pairs)**

Here we are creating a string phone to examine how sound waves can travel through a medium and be reconverted into sound at the end. It is the cup that is picking up and amplifying the sound waves that are captured from the first cup and transferred over to the second cup via the string

### **Teacher Preparation:**

Materials Needed Per Pair:

- 2 styrofoam cups
- ~30 ft of string (can be precut or you can have them cut it themselves)
- Tape (optional)
- Pen

Hint: Try to make sure they do not pull the string through the hole in the bottom once the knot has been made. It will make it more difficult to both hold the string in place and to properly hear messages through the phone.

Waves move in an up-and-down motion or side-to-side motion to create vibrations to the molecules around it. Waves travel through gases, liquids, or even solids to create sound. A material that a wave travels through is called a medium.

### **Follow up questions:**

What is a wave?

Name a couple things that a wave can travel through?

What are some other types of waves you know about?

## **Experiment #2: Model Eardrum (work in pairs)**

The point of this challenge is to expose them to the ability to convert sound into energy. This is demonstrated by making salt jump on the model eardrum (movement = mechanical energy).

### **Teacher Preparation:**

Materials Needed Per Pair:

- 1 Styrofoam Cup
- Plastic/Seran Wrap
- Rubberband
- Salt
- Water (This will get messy)

It is useful to work in pairs because it is difficult to get the plastic wrap tightly over the cup. Make sure to secure it with the rubber band.

\*Note\* 2 eardrums can be made from a single cup if there are not enough for each person to get one.

## **Experiment #3: DIY Speaker (work in groups of 3)**

Speakers work because of the electromagnet within them. There is copper wire coiled around it and the magnet sits in the middle. As current flows through the copper wire, it creates a magnetic field with the magnet, causing it to vibrate up and down. These vibrations are then captured by the sound cone, in this situation that is the cup.

### **Teacher Preparations:**

Materials Needed per group:

- 5 ft copper wire
- 1 button magnet
- 1 styrofoam cup
- Tape (optional)
- 2 alligator clips

Overall Materials Needed for Class:

- ~3 Soldering Board
- ~ 4 9V battery

The soldering boards are used to draw a more powerful signal than from a regular headphone jack. It will also allow them to experiment with their new speaker using the potentiometer.

If someone's speaker is not working, recommend recoiling their copper wire more neatly, or try using 2 button magnets instead of 1.

The speaker will work best if the magnet is inside of the coils and not on top of it.