

# Make Beautifully Engineered Music!

**Estimated Time: 45 minutes**

## **SUMMARY:**

Test out your engineering design skills and create some musical instruments. Create maracas, tambourines, kazoos, and then change the design to get the most consistent sound.

## **WHAT YOU'LL LEARN**

- Identify characteristics of your design that create the best musical sound
- Constraints versus Criteria for engineering design

### **Materials Used**

- Recycled materials including
  - 4 plastic spoons per set of maracas
  - wax paper
  - 2 plastic or paper plates per tambourine
  - rubber bands (at least two)
  - Sound makers: Dried beans, peas, peppercorns, rice, in any combination
  - cardstock or cardboard tube
  - masking or duct tape
  - plastic drinking straws
  - other recycled or found materials for prototyping (balloons, beads, plastic bottles)
  - Markers, stickers, sequins, washi tape, etc., for decoration

## **WHAT TO DO**

1. For this activity, there are things you have to do and things that you have to use. In engineering and design, we refer to the things you have to do as the criteria. For the Music Design Challenge, the criteria are to design three musical instruments and pick the one instrument design that makes the most consistent sound. The things you have to use (the materials used) are the constraints and in this challenge the constraints are the recyclable materials listed above.
2. Start by creating a pair of maracas. Take two spoons and line them up so that the bowls of the spoons form a compartment. Put any combination of sound makers (see above) in the compartment and tape the entire thing shut so that the sound makers do not fall out or stick to the sides of the spoons. This is your basic maraca design.
3. Next, craft your tambourine. This is created similarly to the maracas, using two paper or plastic plates lined up to create an open space between the plates. Put any combinations of sound makers on one plate and tape it completely to the other plate so that no sound makers can fall out.
4. Last, create your kazoo. This instrument creates music a little differently than the others. The sound created by this instrument relies on the vibration of your voice. Cut a piece of wax paper into a 5 inch square. Decorate your cardboard tube or create a tube out of cardstock.

5. Use your rubber bands to secure your wax paper to the end of your cardboard tube. Check the placement of your rubber bands on the tube - does the distance from the end of the tube to the rubber band affect the vibrational quality of the kazoo?
6. Now that you have three musical instruments, evaluate their sound. Which can you get the most consistent sound from?
7. If you have three excellent musical instruments, just choose your favorite. What is something you can do to change the instrument to make it better? What can you do to change the pitch (how high or low the sound is)? What is something you can do to change the volume?
8. Create a new prototype based on your design. Ask a family member or friend to test it out for you and give you feedback on the ease of use, quality of sounds and the volume.

#### **TIPS**

- This is an activity that is best done outside or in a room without any echo.
- Think you have a truly innovative design? Share it with us! Email your design pictures to [stem.siue@gmail.com](mailto:stem.siue@gmail.com).
- HINT - if you are unable to generate a sound on your kazoo, consider moving the rubber bands further away from the covered end of your tube
- HINT - if you vary the shape and size of your sound makers, you can get a more consistent sound.