

# Activity 2: Designing a Four-String Musical Instrument

## Introduction

Have you been feeling bored or stressed because of staying at home due to COVID-19? Do you know that experiencing bad feelings for a long time may potentially lead to some mental health issues? Well, the “Cure it!” category highlights inventions that focus on healthcare issues, which include mental health. In this activity, you will work on a “Cure it!” invention project by creating your own musical instruments. Music can certainly help cure us! You will develop the hands-on skill of using common materials to create a string instrument. This activity will take about 30 minutes, or you can take as long as you want. Benefits to you: learning new things in STEM, creating your own music instruments, and having lots of fun!

## Activity Guide

### Materials

- Box with a lid, such as a shoe box
- Duct tape
- 4 popsicle sticks or pencils
- 4 rubber bands (various widths)
- Scissors

**Design Instructions** *(This is adapted from PBS Kids’ Design Squad activity [“Build an Instrument”](#))*

1. Before starting with the design work, think about string instruments you know and how they make sound (e.g., banjo, guitar, harp, violin). String instruments make sound with vibrating strings (i.e., moving rapidly back and forth), and the pitch is modified by the thickness, tension, and length of the string. Strings vibrating at a faster rate make a high-pitched sound. Strings that vibrate at a slower rate make a low-pitched sound.

Search online for more information about string instruments. For example, [this is a YouTube video](#) explaining how string instruments make sound.

2. Do you know that your vocal cords vibrate when you speak? Vibrations are what make sounds. The rapid vibrations of the vocal cords cause sound waves to travel out through the mouth and into the air. To feel your vocal cords vibrate, touch your throat with the tips of your fingers as you hum a song. Sing a loud

song and feel how the vibration movement changes.

3. Next, examine your materials to help plan what you can do. Inventors are knowledgeable about the properties of materials. Play with the thicker rubber bands and the thinner rubber bands. Compare the sounds they make. Which one makes a high-pitched sound? Which one makes a low-pitched sound?
4. Draw your ideas for your four-string instrument. Consider these design choices:
  - a. What four rubber bands will you choose as strings?
  - b. How are you going to secure the rubber band strings to the box?
  - c. Will the box be covered with the lid or not?
  - d. In what direction will your strings run across the box?
  - e. How are you going to make use of the sticks or pencils to create sounds with different pitch?
5. Start with your design. Choose the rubber bands you want to use as strings and attach them to the box.
6. You can slip rubber bands around the box or you can cut the rubber bands open to make strings: poke these through holes in the box or tape them on the outside of the box. If your rubber bands slip out of place, try taping them on the sides or bottom of your instrument.
7. Test the pitch of the rubber bands by sweeping your finger across each string. Modify the design if you don't hear a different pitch from each rubber band. You can slip pencils or craft sticks under the strings to raise them off the surface and make the bands tighter for higher-pitched sound.
8. Test and revise the selection of rubber bands and number of pencils/craft sticks under the strings to get different pitches. Testing and revising is part of the design process.
9. Now play your instrument and enjoy your music!

## **Resources**

- PBS Kids' Design Squad activity, [Build an Instrument](#).
- Interested in creating more musical instruments? Check out the Exploratorium's Science Snacks activities: [Pipes of Pan](#), [Organ Pipe](#), or [Water-bottle Membranophone](#).