



INTRODUCTION

Music is a tremendously important part of our lives. It inspires, it heals, and it brings people together as a community. Music is even essential to our spoken communication – nearly every language on earth is based on a foundation of musical sounds.

As we will learn through this project, there is much more to music than meets the ears. Science and mathematics reveal to us the true nature of sound as well as what makes some sounds beautiful and others disturbing. Even though music is as old as civilization, advanced technology and engineering methods are used to produce all of the music and instruments available to us today.

As you work through this unit, reflect on how much math, science, technology, and engineering must go into producing your favorite songs.



Making lots of music.

Project Description

Using only items commonly found around the house, construct a simple musical instrument. You may create a string, woodwind, or percussion instrument, but the instrument must:

- **Be completely home-made**
- **Play at least five distinct notes**
- **Play two different harmonies (an octave and a perfect fifth)**
- **Have two configurations or playing styles that produce different timbre**

The final project will include:

- **A demonstration of your completed instrument playing the five notes, two harmonies, and two timbres**
- **A written description of how you created your instrument**
- **Written answers to the four essential questions below**

Making Music

MODULAR



ESSENTIAL QUESTIONS

To successfully complete this project, you will need to be able to answer the following questions:

EQ 1: What frequencies of sound waves are used in music?

- Explore what is meant by “frequency of a sound wave.” (<http://bit.ly/SYJrlf>)
- Test your hearing to see what range of frequencies you can perceive. (<http://bit.ly/9maxEi>)
- Watch this video to see how particular frequencies are used in music. (<http://bit.ly/TrEfmq>)

EQ 2: Why do some notes sound good together and others sound bad?

- Select “Listen to Intervals” and decide which ones sound best/worst. (<http://bit.ly/Bni32>)
- Watch this description of why octaves sound particularly pleasing. (<http://to.pbs.org/PegWy7>)
- Use this page to learn how Pythagoras created harmonies with strings. (<http://bit.ly/5Gh0C>)

EQ 3: How do instruments produce sound waves?

- Read what factors influence the pitch of musical instruments. (<http://to.pbs.org/TtSuH4>)
- Watch how this artist makes instruments from recycled materials. (<http://bit.ly/ODXeXF>)
- Explore the six easy-to-make musical instruments on this page. (<http://bit.ly/OFNeTR>)

EQ 4: How can two instruments play the same note yet sound different?

- See how a guitar produces complex sine waves when playing music. (<http://bit.ly/T0kR3i>)
- Explore the sound waves of multiple instruments playing the same note. (<http://bit.ly/QVNVGg>)
- Compare the shape of the wave to the timbre of the sound you hear. (<http://bit.ly/S3soNT>)

GOING FURTHER

You may choose to explore some of these resources to gain a deeper understanding of the topic.

- Explore the science of how AutoTune makes singers sound better. (<http://to.pbs.org/dldB27>)
- Listen to the first 10 min to learn how spoken language is very musical. (<http://wny.cc/cTwj0r>)
- Watch this video to see a day in the life of an audio engineer. (<http://bit.ly/P9LzHv>)
- Use this powerful audio program to record and manipulate sounds. (<http://bit.ly/EPina>)