The STEAM Journal

Volume 1
Issue 2 *The Quantified Self*

Article 23

February 2014

# The Sound of STEAM

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STEAM is a bi-annual journal published by the Claremont Colleges Library | ISSN 2327-2074 | http://scholarship.claremont.edu/steam

# The Sound of STEAM


## Abstract

This field note describes how teachers and students developed an integrated STEAM unit around sound. The project involved dynamic interactions between concepts in math, science, and music.



## Keywords

Frequency, IPAD, STEAM

# The Sound of STEAM

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I am in my 18th year of teaching music, but have also taught ETTA (Education Through the Arts), a program piloted by our county Curriculum Specialist; it was essentially STEAM before its time. Teachers of each grade level from 3rd through 6th grades identified students that excelled in arts. All selected students were put in one homeroom and targeted for ETTA services. Working with the classroom teacher, we were able to create integrated thematic units. The students painted murals, created tile mosaics, and sang songs about oceans, for example, when the 4th grade teacher was teaching the oceans unit. While I did not fully recognize it at the time, this was the beginning of my dabbling in the concept of STEAM.

Years later, my wife and I began talking about our lessons and discovering the tremendous amount of overlap that exists between the arts and science. Together, we have made a practice of creating STEAM lessons for teachers who are interested in STEAM. Recently, my wife conducted a workshop focused on developing content knowledge of science teachers. In addition to the science component, she addressed the concept of introducing a motivational factor by recruiting an Arts teacher to help supplement science understanding in a real-world scenario.

A colleague approached me about building an integrated STEAM unit around sound. In this unit, our students were able to develop an understanding of the scientific characteristics of sound, as a disturbance moving through a medium. In their science and music classrooms, students conducted experiments with sound moving through various media (solid, liquids, and gases), and were able to see how variables affect the sound waves. Mathematics concepts were employed with students working on calculations of wavelengths and frequency. The concept of frequency was then solidified in music class by teaching students that pitch and frequency are the same concept, but are called different names by different disciplines. This means that every unique note in a composition is unique because of its frequency. Students who mastered this concept easily were provided with extension activities calculating octave frequencies with a 2:1 ratio formula.

The learning was further enhanced through an engineering exercise, which required students to create their own instrument. Students could either create a string instrument or a pitched percussion instrument. Students who chose strings used a broom handle, scrap wood, and fishing line and wire of different strength and diameters. During the activity the students were able to experiment with their instrument, tweaking the instrument to hear what they wanted. The sound the students wanted to hear from their instruments had to be envisioned and then executed into a real goal. Through hearing the subtle or extreme changes that occurred when a single variable was eliminated, adjusted or added, the students could see and hear the outcome. Students who chose to create wind instruments filled different size glasses or bottles with varying amount of water and had to either recreate “Mary had a Little Lamb” or construct their own original melody.

Finally, in groups, students were given four bottles and a computer tablet. They had to figure out how to play along with a pre- selected programed melody that was playing on the tablet by striking the sides of the bottle. The challenge in this task was to calculate the exact amount of water necessary to produce the correct frequency or pitch that went with the melody

on the tablet. This was done by filling bottles with water up to various heights. They then analyzed the resulting sound that emerged when students played by striking the side of the bottle. Extensions were provided for students who mastered this task easily. These students engaged in small group discussions about rhythm, patterns, and pitch with specific focus on how these variables affect the musicality of a piece. Assessments were given in both music and science classes. Results were staggering. Ninety-six percent of students tested proficient in their grade level standards for both music and science. These results are a true testament to the power of STEAM in the classroom!