Exploring Music and Technology through Code and Chords (resource exchange)

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I am a computer engineering student at the University of Saint Thomas and am a researcher at the Playful Learning Lab. I am passionate about educating and promoting self efficacy with the youth across all socioeconomic levels.

Dr. AnnMarie Thomas, University of St. Thomas

AnnMarie Thomas is a professor in the School of Engineering, and the Schulze School of Entrepreneurship, at the University of St. Thomas where she is the innovation director of the UST Center for Engineering Education. Her research group, the Playful Learning Lab, focuses on engineering and design education for learners of all ages.

Esmée Verschoor, Playful Learning Lab

Esmée Verschoor is a Communications and Journalism major at the University of St. Thomas in St. Paul, Minnesota. She is passionate about graphic design, visual communication and cultural studies. Currently, Esmée is the Visual Manager at the Playful Learning Lab, led by Dr. AnnMarie Thomas, where she creates, designs and implements educational materials focused on incorporating joy, whimsy and play into education.

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What is Code + Chords

Description: Code + Chords is a computer software that takes in audio and creates a real time visual display.

Broken Down Description:

1.) "a computer software": Code and Chords uses a computer program called Processing to run Code and Chords modules. These modules can all be accessed on Github. Modules were meant to be interactive for users, giving space to change the code and, in turn, change the presenting visual.

2.) "takes in audio": Code and Chords software can take in audio from one or more audio inputs. In our workshops, this often means singing into attached microphones that are connected to a soundboard and then to a main laptop to be projected for a group. It could mean anything from singing into a laptop microphone to using many attached microphones to connecting MIDI instruments.

3.) "creates a real time visual display": As the audio is being interpreted by Processing, it presents itself on your laptop as a changing, real time picture. Different aspects of the visual that Code and Chords interacts with includes shape, color, hue, height, width, speed, and more! Different modules are set up to explore different visuals.

Mission statement: Code + Chords aims to provide students from all backgrounds with an entry point to computer engineering through coding and its intersection with art and music. To do this, students learn how to create and edit their own code for future use with Code + Chords software. A visual as to how this activity supports the engineering design process is given below.

Why Use Code + Chords?

Code and Chords Software provides an exciting and interactive way for students to explore the interaction of coding, music, and visual art. It encourages cross-disciplinary learning and can use any of the three topics to introduce or further explore the other two. For example, students who love coding can engage with music using coding as an entry point. Code and Chords Software is customizable, playful, and has been successfully used by 2nd through 11th grade students!

Where you can learn more about Code + Chords

Explore Code and Chords Modules at: https://github.com/PlayfulLearningLab/

If you have questions, please email us at: CodeAndChords@gmail.com

Learn more about Code and Chords: https://www.youtube.com/watch?v=Y1x6bk8nvog&t=5s

Example Activity Used at a Code and Chords Workshop:

Colorful Poster to Code:

Recommended Grades: 5-6th

Time: 15 minutes

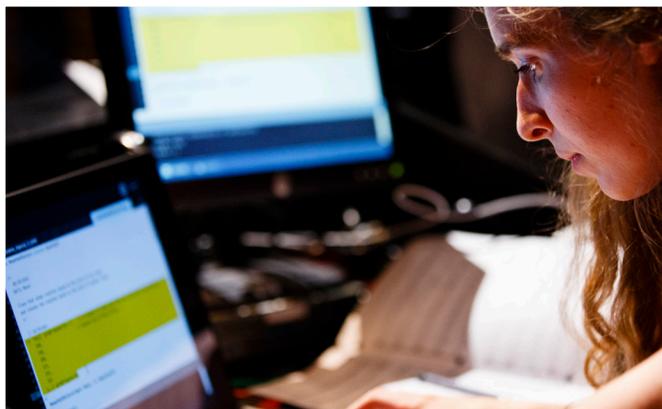**Materials:** Laptops/Computers, Microsoft Word, Processing, Worksheet (on last page), Pencils

Learning Objectives:

Students will be able to:

- Change the RGB values in Microsoft Word to make different colored letters!
- Design a color poster using RGB values!
- Code a color into Processing to fill a shape!

Activity

1. Hand out a color worksheet to each student. Ask each student to open Microsoft Word as you are doing this.

2. Students will notice a column that says "Letter" on their worksheets. Have each student choose and write a code name on their sheet, writing the word downwards vertically. Give letter restrictions depending on age to help the activity finish on time. Once they have written their word on their worksheet, ask them to type it into Microsoft Word their computer.

3. Ask students to highlight their text in Microsoft Word to change the font and size to something more visible and appealing to them. This is especially helpful in giving younger students space to practice highlighting with their cursor.

4. Have students then highlight one letter of their text. Students should then click on Home, the arrow just to the right of Font Color, and More Colors. This will open a pop-up with two separate tabs: Standard and Custom. Students should click on Custom and wait for their classmates to all get to the same place.

5. Ask students to either click and drag their cursor on the colorful box or bar, or to try typing in different numbers into the RGB box. Ask them to notice what else changes on the page when they do each action. Then, discuss as a class that RGB stands for Red, Green, Blue, and that a computer interprets each color as a different number of red, green, and blue combined. Explain that color ranges can only go from 0-255.

6. Ask students to highlight each letter in their code name, go to the Custom color screen, and choose a color they like for each letter. When they have found a color they like for a given letter, they should right down the RGB numbers that make that color on their worksheet in the corresponding columns next to the corresponding letter. After they have written their RGB values down, they should write a description of that color so they remember it in the "Describe this Color" column. For color blind students, ask them to pick RGB values that appear to them as different hues and have them write down the degree of darkness instead of the color name.

7. Once every student has a colorful word with specialized font, size, and colors on their screen, tell students that they will be using the colors from their poster to code some colorful shapes in Processing! Have each student open Processing and type in "size(500,500);". This will give them a larger window to see shapes in.

8. Ask students to go to line 3 and type in "rect(15,15,200,200);" This will give them a shape to fill with color. If students know how to code this or other fillable shapes, they can code that shape into line three instead.

9. Explain to students that we want to fill the shape with color, so to do so we need to go to line 2 and first type "fill". Then, tell students that we need to give the computer the RGB values (in that order) for their favorite color or hue from their color worksheet. To do so, students should type "fill(R,G,B);". For example, my Processing screen might look like this

size(500,500);

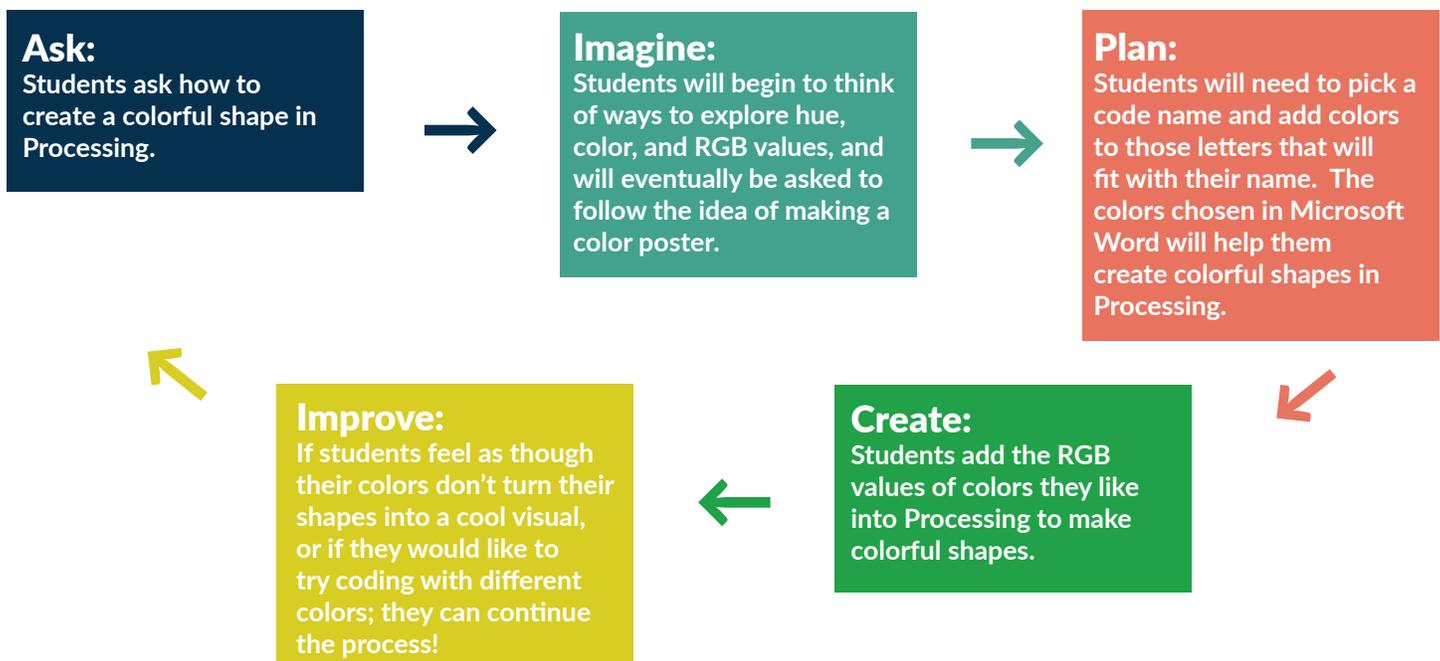fill(200,50,4);

rect(200,200,15,15);

Every student should have a shape on Processing with their favorite color or hue filling it in. This is a way for students to see if they are coding colors correctly. If students finish early, they can add more shapes and more colors before each shape; they will see that each shape can then be filled in with different colors!

Purpose

Students can connect this activity to the engineer design process as seen below:

Ask:
Students ask how to create a colorful shape in Processing.

Imagine:
Students will begin to think of ways to explore hue, color, and RGB values, and will eventually be asked to follow the idea of making a color poster.

Plan:
Students will need to pick a code name and add colors to those letters that will fit with their name. The colors chosen in Microsoft Word will help them create colorful shapes in Processing.

Create:
Students add the RGB values of colors they like into Processing to make colorful shapes.

Improve:
If students feel as though their colors don't turn their shapes into a cool visual, or if they would like to try coding with different colors; they can continue the process!

COLOR POSTER

Letter	Red	Green	Blue	Describe this Color