



Code + Chords: Engaging with Coding, Music, Art, and Technology (Resource Exchange)

Alyssa Marie Eggersgluss, Playful Learning Lab

Alyssa Eggersgluss is a K-12 Vocal Music Education Major from the University of St. Thomas. Passionate about interdisciplinary learning, she works as a part of Dr. AnnMarie Thomas' Playful Learning Lab to create educational opportunities for students. She is currently focused on exploring different ways to engage students with sound.

Dr. AnnMarie Thomas, University of St. Thomas

AnnMarie Thomas is a professor in the School of Engineering and the Opus College of Business at the University of St. Thomas where she is the 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.

Dr. Deborah Besser P.E., University of St. Thomas

Dr. Besser, PE, ENV SP, holds a PhD in education and MS and BS in civil engineering. Currently, she is civil engineering chair and Center for Engineering Education director. Previous experience includes faculty positions in diverse universities where she has taught a variety of coursework including steel, timber, concrete and masonry design, construction, engineering economy, engineering graphics and engineering education. Prior to teaching, Dr. Besser, a licensed engineer, was a design engineer with HNTB-CA, where she worked on seismic retrofits and new design of high profile transportation structures.

Dr. Jeff Jalkio, University of St. Thomas

Jeff Jalkio is currently a physics professor at the University of St. Thomas. Jeff worked for thirteen years in industry in the fields of optical sensor design and process control. In 1984, he co-founded CyberOptics Corporation, where he led engineering efforts as Vice President of Research. In 1997 he returned to academia, joining the engineering faculty of the University of St. Thomas and has taught courses in electronics, digital system design, mathematics, physics, circuit theory, electromagnetics, statistical process control, computing, mechatronics, control theory, metrology and design.

Mr. Cullen Charles Kittams, University of St. Thomas

Grace Kubista

Rachel Farah, University of St. Thomas

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.

CODE + CHORDS. (RESOURCE EXCHANGE)

Here we see coding and art interacting with each other, bridging the gap between technology and art. This helps students with low self-efficacy in one area and high self-efficacy in the other to feel more confident in the field they are less comfortable with. Using interdisciplinary learning to build confidence will support students to become life-long learners and creators in STEAM fields.

BACKGROUND:

Code + Chords has worked with various music groups including the men's a capella group Cantus to produce visuals that help engage listeners both visually and audibly. This creates a multi-sensory experience that is more meaningful for the audience. Code + Chords also has been introduced to the educational sphere through educational Code + Chords based workshops held at MN SE A Capella festival, Glacier Hills Elementary, the Minnesota Children's Museum, St. Paul public library, and Metro Deaf School. It has even been featured on the PBS Kids show SciGirls! These experiences show Code + Chords' adaptability and potential to be used to support the growth of underrepresented populations within STEAM fields.

OBJECTIVES:

Students will be able to:

Code triangles and rectangles in the Code + Chords software

Design an image of a house in the Code + Chords software

Understand scaling and creation of shapes in the Code + Chords software

STANDARDS APPLIED:

NGSS: ETS1.B: Developing Possible Solutions

NGSS: ETS1.c: Optimizing the Design Solution



GRADE LEVEL

Designed for 5th - 6th grade students.



GOAL

Understand scaling and creation of shapes in the Code



ESTIMATED TIME

15 minutes - 30 minutes.

MISSION:

Code + Chords aims to combine art and technology to engage many types of learners. It hopes to encourage students that love coding to engage with music and visual art and vice versa! Interdisciplinary exploration through Code + Chords is a tool to support student engagement and build student confidence and excitement in STEAM fields to promote a life-long love for learning.

MATERIALS/RESOURCES

Laptops/Computers

Code + Chords Software (on our website)

Shape Reference Worksheet (on last page)

Graph paper (preferably with large squares)

Pencil

Code + Chords Youtube Video: Coding a Shape*

*Note: Code + Chords videos are meant to be watched in sequential order, and this activity should only be used after watching the previous videos.

LESSON PLAN.

- 1 Show students the Code + Chords video: Coding a Shape. This video will cover the basic shapes of the Code + Chords software and how to create them.
- 2 Hand out the shape reference worksheet and graph paper to each student. Let students know that before they code their shapes in the Code + Chords software, they will first practice on paper to better understand the coordinate system.
- 3 Discuss with students the basics of the coordinate system they see on their worksheet. Make sure to explain the ordering of the (x,y) system: x is the number of boxes (distance) across the graph paper and y is the number of boxes (distance) up the graph paper. This will be helpful for students to understand scaling of the objects when they code their shapes into the Code + Chords software.
- 4 In front of the class, write out the shape commands discussed in the video. These are also included in the shape worksheet for reference. This will be a nice review for students in the next step.
- 5 Next, tell students they will be drawing a triangle shape on their graph paper. Ask students to choose three coordinates, draw them on their paper and connect the dots with straight lines. Help them to see that the distance (closer or farther) between the points corresponds with the size of the triangle.
- 6 Ask students to then create a rectangle. Remind them that this shape differs from the triangle as the coordinate selected places the top left corner of the shape and the second two inputs control the length and width of the shape.
- 7 Show students that the process to draw a circle is similar to the process to draw a rectangle. Circles are more challenging to draw on a graph, so you should decide if you would like to demonstrate this process or ask students to draw a circle on their graphs with you. Explain that the first two numbers in the command are where the center of the circle will be. The third number in the command will be how wide the eclipse is and the 4th will be how high it is
- 8 Encourage creativity by asking students to draw an image using three shapes they know how to code on a graph paper, such as a house. Afterwards, allow them to write out the commads they would code on the computer in order to create their imag
- 9 Then, tell students to open the Code + Chords software and try programming their shapes into it using the shape menu! As an extra challenge, ask them if they can use a rectangle and triangle shape to build a house or three ellipses to make a snowman!

LEARN ABOUT CODE + CHORDS:

Explore Code + Chords Modules at:

<https://github.com/PlayfulLearningLab/>

If you have questions, please email us at:

CodeAndChords@gmail.com or

Hello@codeandchords.org

Watch the SciGirls Episode:

<https://pbskids.org/scigirls/videos/?keyword=show505>

Learn more about Code + Chords:

www.codeandchords.org

REFERENCE SHEET

```
Fullscreen( );
```

```
Fill (R,G,B);
```

```
Rect (x,y,w,h);
```

```
Triangle (x1,y1,x2,y2,x3,y3);
```

```
Ellipse (x,y,r,r2);
```