



Project Summary: Geometric Tile Mosaics

Project: Geometric tile mosaics
School: North Eugene Academy of the Arts
Class: Geometry (2 classes of 30 students—a mix of freshmen, sophomores and juniors)
Product: 11x17 tiles that map the mathematical points representing the golden ratio

The goals of the project were to:

- Reinforce students' understanding of geometric concepts relating to polygons, ratios and scale
- Explore new geometric concepts (such as the golden ratio and the Fibonacci sequence) and relate them to broader course concepts;
- Deepen students' understanding of the history of geometry and its practical applications
- Foster habits of mind
- Work effectively in groups
- Use the habits of an artist to conceive of and realize a final creative piece
- Explore the aesthetics of sculpture and tile making

Cody Rosenberg thought the sidebar note on the golden ratio in his geometry text would be an interesting starting point for an integrated, multi-week project. "We had been studying similar polygons, relationships between shapes and ratios," said Rosenberg, "and those topics seemed like great lead-ins." But he wanted the topic to be engaging and relevant, and not seen by students as just one more thing they had to learn. Rosenberg collaborated with Kate Ali, a sculptor and teaching artist with ArtsWork in Education, to design a project that unpacked a variety of different geometry concepts by exploring the practical and aesthetic applications of the golden ratio in architecture, art and nature. The discussion of geometry's use today and over the centuries became a vehicle for Rosenberg and Ali to draw students into a deeper discussion of shapes and their relationships from both mathematical and artistic perspectives.

Ali introduced students to the work of Kurt Hoffstetter, a contemporary Austrian artist, who, in the 1990s, discovered a way to construct a line and its golden section points using only a compass to draw four circles. Students replicated this process and checked it for accuracy by calculating the necessary ratios. Using a printout of Hoffstetter's creation as a template, students worked in groups of four to plan a design for a tile that incorporated the outline of the golden section. The initial design was drawn on an 8.5x11 sheet of paper. When it was complete, students had to calculate its scale ratio to recreate the design on a slab of clay that was 11x17. They used a similar process to account for shrinkage once the tiles were fired. Following the axes lines of the Hoffstetter template, each tile was divided into four equal segments. Although the groups collaborated to determine the aesthetic for the tile as a whole, each student was responsible for executing the design on his/her portion. Throughout the process Rosenberg reinforced geometry concepts and introduced new ones (such as the Fibonacci sequence) and their relationship to the golden ratio. Ali provided ongoing instruction in sculpting techniques and demonstrated how artists use a variety of math skills to realize their creative visions. When the tiles were fired and glazed students used tacks to indicate the points of the golden section. As a culminating exercise, students wrote a research paper explaining the golden ratio, the different methods used to construct it and its application in different fields throughout history.

"I definitely heard some groans when I told the students I wanted them to write a paper. That's not something we generally do in math class. I gave them time to do research and they really got into it. The golden ratio is applied in so many

different ways and they were fascinated to learn even more than what we'd covered. Integrating the art built real interest in the topic. It was exciting for me to see that interest carry over to a new way of thinking about math."

—Cody Rosenberg

Rosenberg noted that it is sometimes difficult for students to see the relevance of learning math. "We tell them that math is used in different fields, but in this project they really experienced it for themselves," he noted. Through their work with Ms. Ali students had to apply existing geometry skills and learn new ones to ensure they could produce a product that accurately represented the math content covered and reflected their artistic ideas for the final tile.

This summary was produced in partnership with E3: Employers for Education Excellence (www.e3oregon.org).