Students use 3-D printers to transform mathematical equations into art

June 29, 2016 / by Michele McDonald

December 8, 2016

Students in Evelyn Sander's math class get to turn mathematical equations into 3D representations using coding and a 3D printer. Photo by Evan Cantwell.

Forget standing in front of the class at the white board—3-D printers are putting math equations into the hands of students.

3-D printers are giving students another way to look at math by making the equations into something real, said Evelyn Sander, a mathematics professor in George Mason University's College of Science, who is teaching a new class called "Mathematics through 3-D Printing."

“Once you’re able to use an iPhone, you can make a 3-D print,” Sander said.

Hope Roberts, junior math major, displays one of the equations printed in Sander's class. Photo by Evan Cantwell.

Students write code that enables the printers to transform equations into alien topographies, graceful planes, mythical snail-like creatures, and tile patterns that would liven up any room. Examples can be seen on Sander’s Math Makerbot Lab site.

“I think it’s especially good for visual learners,” said Hope Roberts, a junior from Petaluma, Calif., and a math major.

“I wish I’d taken this class before Calculus III because it would have helped me to understand the equations,” added Anneliese Slaton, who graduated in May but is continuing her graduate studies in math at George Mason.

This class is a great example of a flipped classroom with its emphasis on hands-on, individualized teaching, because students are working on their projects while the teacher navigates the room, said Conor Nelson, who hails from Springfield and graduated this spring. “It’s nice to actually view and feel what you’ve created,” he said.

The approach also could help non-math majors become interested in math or better understand it, said Jonathan Tarr, a senior math major from Stafford, Va., who plans to teach math. His favorite is the snail shell design. The approach also was used last summer during math camps at Mason.

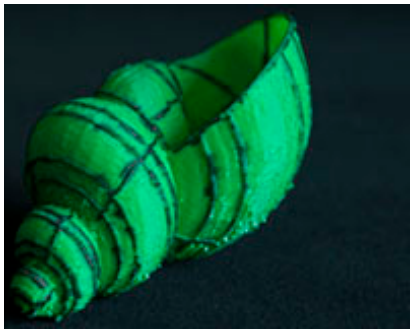

Photo by Evan Cantwell.

For math majors, the class goes beyond memorizing formulas. Seeing an equation become real made Henry Delgado dig deeper into understanding the underlying theories. New York native Delgado plans to pursue a master's degree in data analytics after he graduates later this year.

In Sander's class, Delgado worked on Taylor's theorem and cosine function, which looks like a white wavy object when held in your hand.

For Nicole Van Oort, a sophomore math major from Albany, N.Y., it took about two hours of coding and the 3-D printer nearly four hours to make an object that looks like two interconnected surfaces—one straight and the other curved.

Henry Delgado shows one of the equations he printed using the 3D

printer in Evelyn Sander's Math 493
class. Photo by Evan Cantwell.

“The class made me more interested in real-world applications of math,” said Van Oort, who said she’s thinking about becoming a teacher or doing statistical analysis.

Students learn about the unforgiving nature of computer coding when they translate equations into code. Results can be unintentionally blob-like, said Ratna Khatri, who transferred to Mason from her native Pakistan and is the learning assistant for the class.

“If there is a problem with the code, the printer still will do what you tell it to,” she said.

For many students, the class was their first time coding, said Khatri, who may go into industrial math or in academia after she earns her graduate degree from Mason.

“Using the 3-D printer makes you feel empowered—with some basic tools you can do so much,” Khatri said.