Exploring the Results of Computational Thinking at Torrey Pines High School

Abby Brown, high-school math teacher, is the kind of educator who wants to reach as many students as possible—even those outside of the math classes she teaches at Torrey Pines High School in San Diego, California. That's why she founded CT@TP (Computational Thinking at Torrey Pines), a computational thinking club geared toward offering students the skills to "[find] ways to ask questions and formulate problems in a way that you can tell a computer to solve them."

While reaching students outside of her own classes was Abby's primary goal, she also wanted to introduce freshmen and sophomore students to Mathematica, the primary tool used in Abby's math classes. Giving students a head start on learning the tool they would use as juniors and seniors while using that same tool to teach computational thinking killed two birds with one stone—especially considering other teachers didn't have the time to learn how to use Mathematica in order to implement it within their classes.

Abby has been a Mathematica user since 1992. She was inspired to start a computational thinking club after attending the Wolfram Technology Conference in 2016, where she saw the different and innovative ways in which the Wolfram Language could be used for computational thinking. The original club, called Wolfram Language Workshops, met informally approximately twice a month and used Stephen Wolfram's *An Elementary Introduction to the Wolfram Language* as their guide to the computational universe.

But between not having regularly scheduled meeting times and early senioritis plaguing the club's student leaders, Wolfram Language Workshops began to fizzle out. Abby found that she needed to provide a stronger structure and more motivation to the club than *An Elementary Introduction to the Wolfram Language* could offer. Students attending Wolfram Language Workshops needed to better understand the bigger picture of computational thinking in order to find inspiration in the examples offered by the book. To make this happen, Abby would have to essentially prep another class.

It just wasn't doable.

Because of those challenges, the club stayed dormant until Abby attended the Wolfram Technology Conference in 2017, where she gained the motivation and tools needed to restart the club. Under the new title "CT@TP," Abby knew that she had to make the club meet weekly, lest it fizzle out as it did the year prior. She categorized weekly meetings as "Activity" or "Explore" sessions to differentiate between the two types of meetings offered. To keep the ball rolling, she got new student leaders to help her plan and lead activities, as well as to support new students as they got started in the club.

Abby came up with her own new activities and took advantage of Computational Thinking Initiatives' AI Adventures to fill out the activity schedule. The club thrived through computational thinking conversations (covering topics such as machine learning, image processing, interactive animation, text analysis and 3D printing) and livecoding sessions. As attendance increased, members of the club began using their Mathematica knowledge in their math classes. Students began to invite their friends to join the club, and two club members even attended the Wolfram High School Summer Camp to further their involvement with Mathematica over summer vacation.

Belonging to CT@TP: Student Edition

Students in CT@TP Daneen, Shannon Rowarisa and Emily Clarae presenting at one's Wolfram Technology Conference.

Emily Zhang, a member of CT@TP, was introduced to Mathematica through Abby's calculus class. She decided to use the computational thinking and Wolfram Language skills she learned in CT@TP for her senior project.
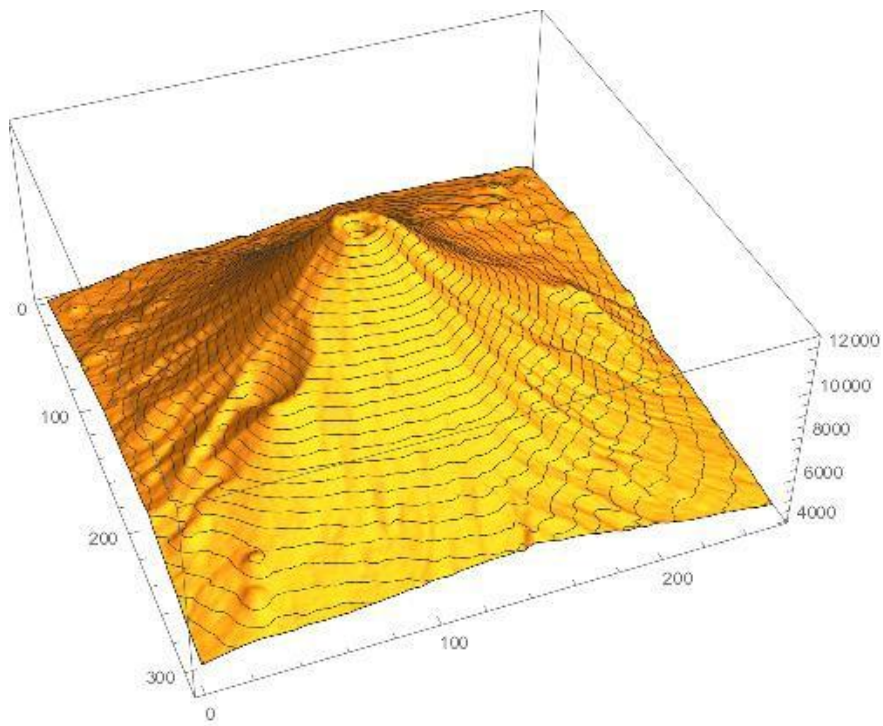
Emily wanted to involve triple integrals within this project. In the end, she wound up modeling mountains. She created different 3D models of Mount St. Helens, Mount Everest and Mount Fuji.
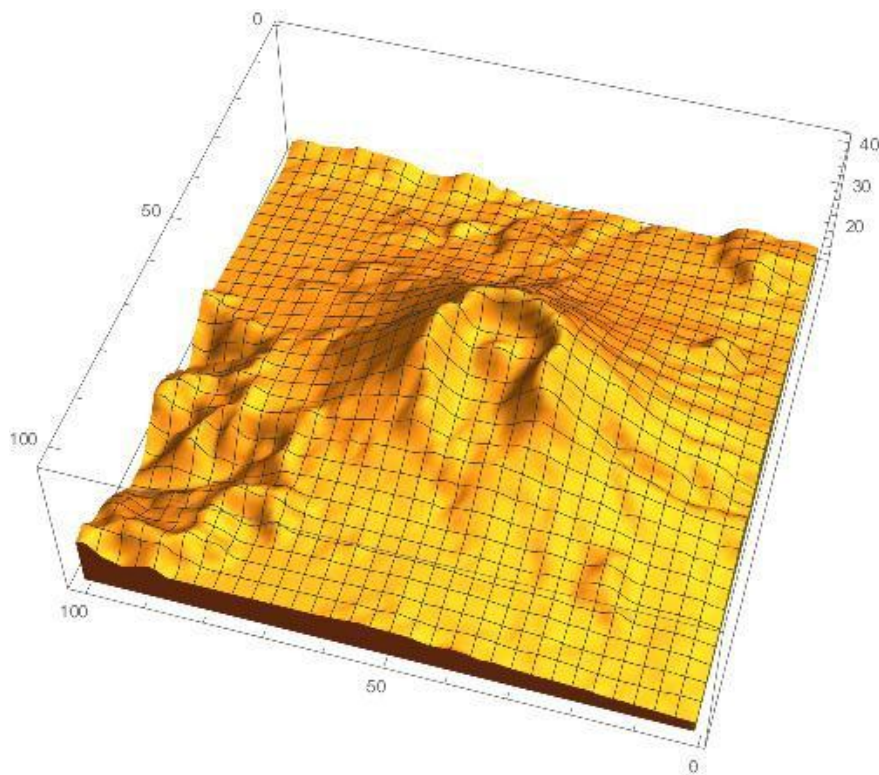

Mount St. Helens
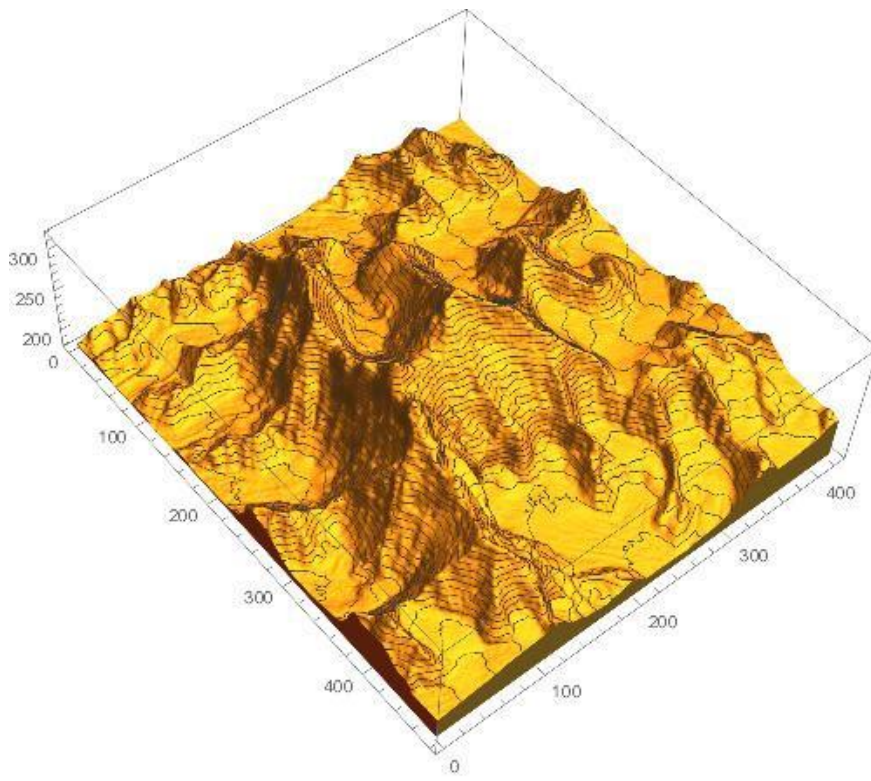
Mount Everest

Mount Fuji

Shannon Brownlee was originally a member of Girls Who Code, but she got bored with the club and left. She started learning about Mathematica during her junior year while taking Abby's math class, and decided to try to learn how to code again by joining CT@TP.

Learning how to code through Mathematica went so well that Shannon used the program for her final project for Calculus III. Instead of finding an existing problem to solve, Shannon wanted to create her own. This resulted in the creation of a Mathematica-derived Candy Land.

Shannon Brownlee's Candy Land
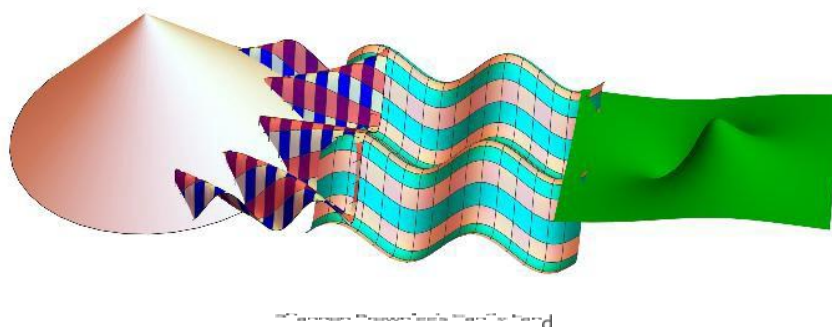
Even after the school year ended, Shannon wanted to continue learning how to code. Clearly, she had escaped from the doldrums of her previous club! Over the summer, she continued to code with Mathematica using Augment. Shannon is now a student leader at CT@TP and helps run activities in the club.

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Abby, Emily and Shannon all share a similar story: each found a way to use computational thinking to explore their personal interests, and each was motivated to do so through CT@TP. If you're looking to start your own computational thinking club, check out the resources offered by Computational Thinking Initiatives to get started—and good luck!

About the blogger:

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Chapin Langenheim is an editor at Wolfram Research. They hold a BFA in Creative Writing, with their passion for writing leading to projects such as publishing a (now banned) novel at age seventeen. When they're not editing, you can find them stuck in a Google wormhole researching obscure topics or laughing at The Chicago Manual of Style*'s monthly Q&A.*