



When Matt Shields started teaching engineering at Charlottesville High School, he set himself a challenge: stop lecturing. Rather than tell students which leg of an LED connects to the positive end of the battery, he decided to let students make mistakes.

“Day One, you plug it in wrong and it turns black or it pops, and you realize that you did that wrong, and that’s usually the last time you do that,” Shields said.

This project-based teaching style, combined with the engineering lab Shields designed for CHS, has attracted attention from schools as far away as China and France. Schools frequently ask Shields, after a tour of the lab, to help them build their own.

“Sorry, my plate’s full. Good luck. Take all the pictures you want. Email me if you have questions,” Shields would respond.

Then, after giving four tours of the lab in one week, Shields went to a conference on entrepreneurship in education. An LED of sorts blinked in his mind. He decided to create Shields Lab to market his curricula and lab-designing expertise to other school systems.

There was one big hurdle. Because he had created the curricula and lab design as a CHS employee, those materials were city school property.

“I was a little nervous there, but I met with [Superintendent Rosa Atkins], and she was immediately

supportive,” Shields said.

On May 3, Shields presented his case to the Charlottesville School Board and was granted a copyright waiver for his research.

Jeff Faust, director of technology for the city school division, said the waiver process is meant to protect teachers from conflicts of interest and increase transparency.

“The challenge is if a teacher would make something and sell it, all of a sudden the perspective from the community could be that that teacher is collecting a paycheck while they’re really working on a side business at school,” Faust said.

Two other teachers asked for waivers at the School Board meeting to publish or sell materials from their curricula. Faust emphasized that Charlottesville City Schools benefits from this kind of employee entrepreneurship.

“If Dr. Shields is running a business where he’s acting as an expert and consultant for STEM (science, technology, engineering and math) and STEM practices, then he’s got to be on the cutting edge,” Faust said.

Faust said Shields’ research into best practices would then help the city division to build and improve its programs. When Shields sells those best practices to other school systems, the school division would benefit from that connection, as well.

“By building relationships with other school systems, we have the opportunity for collaboration. Our students get to work with students from other schools and other school systems. There’s always opportunity to see the world through different lenses,” Faust said.

Allowing teachers to build businesses helps students learn about the changing economy, Faust said.

“When our students grow up, they are likely to have multiple sources of income. They’re likely to have a career path that changes. They’re likely to have employers that allow them to work remotely,” he said. “If we want our teachers to prepare kids for that tomorrow, we also want our teachers participating in that reality.”

Clara Stelow, an 11th-grader at CHS, took engineering for the first time last year.

The class was different from her honors-level, 10th-grade classes. It was more diverse and, of course, there was the Day One LED challenge.

“It was incredibly terrifying at first to come in and not be told how to do something,” Stelow said. “It’s taught me a lot of really valuable skills that have been applicable in my other classes, as well. It requires a lot of self-motivation, learning how to stick to a deadline — create a deadline to begin with — and to figure out in your own head what’s achievable for you.”

Lately, Stelow has been figuring out whether building a robot that walks on two legs and can pick up objects is too ambitious. But she said that regardless of the outcome of this project, taking the engineering course has shaped her thinking.

“The other day I was thinking about traffic patterns and how navigation systems could be bettered if

they had ... a way to tell when you were going to have a red light and give you a route based on your lowest chance of having to sit at red lights," Stelow said.

"Obviously, I am not at that level in terms of my coding ability, but I just find myself thinking about the mechanisms in our ordinary lives a lot more," she said.