A PUBLIC + PRIVATE MASHUP
FOR COMPUTER SCIENCE EDUCATION

By Kevin Wang

Getting called into the boss’s office isn’t always fun. Memories of trips to the school principal’s office flash through your mind. But the day last year that I was called in to meet with our division vice president turned out to be a very good day.

In the mornings before I went to work, it was actually a very natural thing for me to spend my early mornings, it was enough appropriately trained teachers to do the program full-time, with backing from the company. Today, we identify schools that are committed to offering computer science instruction to their students but can’t find enough appropriately trained teachers to provide this instruction. We then work with the school administration, guidance counselors and teachers to develop a plan for offering first period CS classes. After a 100-hour, 12-week long summer training program taught by me and other professional educators, these volunteers begin their workdays by heading into the classroom to co-teach with certificated classroom teachers.

This school year, we have 110 TEALS volunteers—mostly from Microsoft, but with about 20 percent coming from other technology companies—working with teachers in 37 high schools to teach computer science to more than 2,000 students. Some 300 of those students are enrolled in Advanced Placement Computer Science (AP CS) classes.

The program operates primarily in Puget Sound-area schools, but now extends from coast to coast, with participating schools in California, Utah, Minnesota, Washington, D.C., Virginia, North Dakota and Kentucky.

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Half of our TEALS volunteers have graduate degrees, and 70 percent come from the top 20 CS programs in the country—places like UC Berkeley, Brown and MIT. Equally important, given the demographics of the technology industry, 25 percent of our volunteers are women or underrepresented minorities—figures well above tech industry employment averages. Seeing industry professionals who look like them in the classroom provides real-world inspiration to young people who traditionally have not pursued technology careers.

Even more exciting is that three schools have now “graduated” from the TEALS program and offer full-scale computer science programs to their students. This means that CS classes are offered during the entire school day by in-service teachers. Student demand for these classes almost always outstrips expectations. The experience at Mount Si High School, in the community of North Bend, east of Seattle, was typical. School administrators thought that about a dozen students would sign up for AP CS and around 18 would enroll in our introductory class. Instead, 29 students signed up for the AP
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Brad Smith, executive VP and general counsel, Microsoft: Four decades after Bill Gates and Steve Jobs were teenagers, we still live in a country where you have to be one of the fortunate few to be exposed to computer science at an early age … even though computer science is to the 21st century what physics was to the 20th.

Dennis Wright, Issaquah School District CTE director: As a result of our partnership with TEALS, Issaquah School District increased the number of students enrolling in computer science coursework … While partnering with industry is not a new educational concept, the timeliness of the TEALS program is clearly appropriate for our students, schools, communities and economies.

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Rubaiyat Khan, TEALS Intro CS teacher, Microsoft program manager: I have led a very blessed life, and the least I can do is give back by teaching some of the things I have learned. I also just really like it when a student’s eyes light up because they now know something about how the world around them operates that they didn’t know before.
abstraction, design, algorithms, computational thinking and programming. The course broadens students’ perspectives by showing applications of what they are learning and how computer science has changed the world. During the semester, we have readings and discussions on social implications of computing, as well as current, relevant topics about the technology environment that students live in.

In addition, the course uses a graphical programming language where programs are “written” visually by putting blocks together. This allows students to focus on the big ideas without worrying about programming syntax.

For example, one TEALS teacher introduced the concept of abstraction by first showing students various art masterpieces and how great artists abstract ideas and then demonstrated how computer scientists do the same. The rest of his class was taken up by discussion on building functions as a way to abstract away layers in programs. To finish the class, the teacher had students apply these concepts to a program they have been working on.

AP CS is a more intensive, year-long course equivalent to a first-semester college CS course for CS majors. Over 75 topics are covered in a span of 30 weeks. The concepts in AP CS are actually relatively easy compared to other AP science courses like physics or calculus; the key is that students invest the time needed to adapt to how computer scientists think. The class is heavily project-based, and during second quarter, students have the chance to build the very first killer app for the PC, a spreadsheet called VisiCalc.

In addition to purely academic topics, both classes also invite industry experts to come in and talk about majoring in CS in college, internships, and various career paths they have taken during and after college in the tech sector. We also host field trips to the Microsoft campus so students can see for themselves how fun and interesting working in technology can be. The AP CS students even spend an afternoon in mock interview sessions with industry software engineers to prepare them for their own internship and job interviews.

Our immediate goal is to increase the number of high school students who are able to take a CS course; the longer-term goal is to build a sustainable CS program at all our partner high schools. While we are teaching the students, the partner in-service teacher is also learning along with the students. As time goes on, in progressive iterations of the course, the in-service teacher takes on more and more of the curriculum and teaching responsibility.

The first step is to take on the role of a lab TA, then a co-teacher, and finally teaching on their own while the TEALS teacher’s role fades into that of a lab TA, before the entire CS curriculum is handed off.

A Look Ahead
If there’s one thing my experience in education and my tenure in the technology industry have taught me, it is that complex problems need to be attacked from many different angles. Accordingly, TEALS and Microsoft are a part of a consortium of like-minded organizations that has actually started policy discussions about high school computer science education at the national and state levels.

We can’t let another generation of students move through high school without exposure to computer science. That’s why career and technical educators must play a key role in giving every high school student the opportunity to take a computer science class. It’s also why dedicated TEALS volunteers will continue playing a role in high school classrooms across the country and why we will continue to grow the program as quickly as we can while maintaining the quality of the experience for the volunteer, the classroom teacher and the students.

TEALS works because the entire school ecosystem comes together to make computer science classes available to students. It requires supportive administrators, counselors and in-service teachers committed to developing these critical skills in their students. It also requires a flexible employer and a volunteer who is willing to dedicate at least 300 hours per year for an experience that they will carry for the rest of their lives, and at the same time, become an advocate for CS education.

I look forward to the day when computer science is offered at every single high school in the U.S. That day is still somewhere in the future. But it’s getting closer.