Engaging girls in computer science: an interdisciplinary approach

Revelations about the low percentage of women in technical positions at companies like Google — coupled with reports about the decline in numbers of women majoring in computer science — have educators wondering how to reverse a discouraging trend. How can schools help inspire and sustain interest in computer science among girls? Castilleja School (California), an all-girls 6–12 school in the heart of Silicon Valley, is taking an innovative approach to “cracking the code.”

Our program is designed to engage every girl with computer science early, often, and in a variety of contexts. Beginning in sixth grade, projects incorporating computer science are integrated throughout the curriculum in required content areas. Girls who are interested in digging deeper can take computer science-focused electives or participate in cocurricular activities such as competitions, internships, and mentoring of younger students. Our goal is both to stimulate new interest and to support existing interest in computer science by framing computer science as a discipline with broad, creative, and interdisciplinary applications.

“We want each girl to understand how computer science can be a versatile tool in her arsenal across disciplines,” explains Castilleja Head of School Nanci Kauffman. “While some girls will come to school excited about coding and deeply interested in the technical aspects of the field, many of their peers are missing a huge opportunity to harness computer science to serve other passions and to meet other goals.”

Middle school students experience computer science projects in nearly every required subject. In history, girls use the program Scratch to design interactive presentations of their research on early European explorers. Students also program Mother’s Day e-cards that animate original artwork and poetry and build Scratch “instruments” that emit notes in response to sensory input from a camera or a PicoBoard.

The integrated approach continues in the upper school in required subjects. In visual arts, students program interactive kinetic sculptures, such as a wind chime that rings when someone walks by. In geometry, students program computer models — such as the mansion in the TV program Downton Abbey — that can be fabricated on our 3D printer. Meanwhile, in advanced physics, students write programs to model physical phenomena such as the motion of a mass oscillating at the end of a spring.

Elective courses in computer science also expose girls to its breadth and interdisciplinary applications. Students create iPhone apps that relate to a diversity of personal passions, from creating a dinner menu with ingredients on hand to competing in robotics tournaments. They prototype user interfaces, such as an iPad-based adaptation of a graphic history book, or an app to help a local nonprofit raise funds for nursing students in Malawi. Teams also explore entrepreneurship by designing a business “pitch” for their apps and delivering it to venture capitalists for feedback.

Cocurricular activities enable girls to engage with computer science beyond the classroom. In recent local and international competitions, several girls gained recognition for their solutions to real-world challenges. In the 2013 Technovation Challenge, one Castilleja team was among the top ten finalists with an app that helps match teen volunteers with local service opportunities. And last spring, a Castilleja team won the House Student App Challenge for the 18th Congressional District for an app that provides automatic location check-in for teens and parents.

By engaging every girl with computer science early, often, and in a variety of contexts, we hope to inspire each girl to incorporate computer science into her arsenal, or undertake it with focus, in whichever capacity will serve her passions and help her achieve her goals.

Ann Greyson is the computer science and engineering department chair and middle school STEM coordinator at Castilleja School (California).