by Amanda Lattimore,
Dulaney High School

Computer Science Education Beyond the Classroom

Do you want to work with students outside of the constraints of the classroom? Do you want to see them explore their own interests in Computer Science (CS)? As awareness and demand for CS education increase, the opportunities for extra-curricular activities for students also increase. It is extremely important that high school teachers offer these opportunities for their students to support students who are interested in pursuing a CS degree in college and to provide opportunities to students who aren't currently in a CS course but are interested in CS outside of the classroom.

There are a multitude of CS clubs available to start in schools. Some are national with curricula and guidelines and others are school-based. The high school in which I teach has three CS-related clubs. That may be a lot but we have over 1850 students and 300 of them were enrolled in a CS course in 2016/2017. The school is suburban and is 58% white with a large Asian and Indian population. Over half of the students take at least one AP course and nearly all are involved in sports or clubs. Teachers are strongly encouraged by the administration to sponsor a club or coach a sport and students are constantly coming up with new ideas for clubs and organizations.

The Dulaney High Programming Club was started three years ago. We have a peer tutoring program in the library but because of the lack of CS courses that were offered and because most CS students were seniors, there were no students to tutor CS. Two sophomores asked me if they could start a club where students could come and get help with their class projects or learn CS for the first time. They started meeting once a week and while often there were only three or four students meeting, eventually more students started to come. The two co-presidents of the club helped AP CS A students with their Java projects and helped students with HTML, JavaScript, C++ and a few other languages. Between the two co-presidents, they were proficient in close to 10 languages. They invited their friends who weren't currently in programming classes to come to the club. This in turn helped increase course enrollment the following year. I am always excited to see new students come to the club and watch them explore CS, especially when the students are female or underrepresented minorities.

This club now has new presidents and the focus has shifted a bit. One of the presidents is very involved in CS programming competitions and uses the meeting time to teach prospective competitors basic algorithms and to work on released practice questions. They have also used the club time this year to participate in the American Computer Science League (ACSL) competition. This is a competition that every student can participate in and you send in your best three or five scores depending on the division you select to join. There are several students who come who aren't currently taking CS courses but want time to work on personal projects. Often, students have already taken the AP courses or don't have room for a CS course in their schedule, but providing the time and place for them to keep learning CS allows them to bridge any gap between
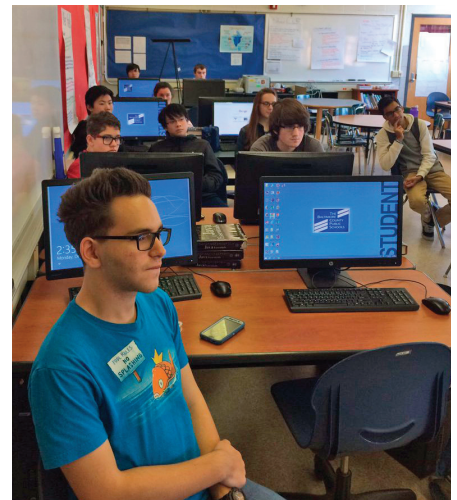

Figure 1: Programming Club listening to a presentation

courses or to stay prepared to major in CS in college.

Teachers are often too busy to sponsor a new club but as a faculty sponsor for this club, I just need to be present in the room. I don't have any specific responsibilities or paperwork to fill out. It is a welcoming, open club with no dues or agenda and is well attended on a weekly basis. If you can only initiate one new opportunity beyond the classroom this is the type of club that I would suggest.

The second club is Girls Who Code that is a national initiative started by Reshma Saujani to help close the gender gap in technology. The club focuses on creating a secure space for girls to learn CS and aims to foster a sisterhood among the students. I was a bit hesitant to sponsor this club in the beginning because I didn't like its exclusive nature. For a while it separated

the girls from the boys and my programming club became essentially "boys who code." In 2015-2016 we had a college professor facilitate the meetings and I was the faculty sponsor. This was ideal because I just needed to make sure the students weren't being disruptive and the room was closed when they left. It is difficult to find a college professor or someone in the workforce to come in the afternoon once a week for an hour and a half so this past year I was both the club sponsor and the facilitator. There is a lot of paperwork involved with this club. Participants need to be registered in a portal and attendance is recorded. Students access a lot of the curriculum online and as a facilitator you need to be prepared each session with a lesson plan. I think that the idea is great and the summer workshops that are provided to students are wonderful opportunities, but as a full-time teacher it was overwhelming to have to prepare for an extra activity each week.

By the end of the year the club had dissolved. There was a lot of interest even from students outside of my school at the beginning of the year, but we finish school at 2:15 and the middle school and private school students couldn't meet until 3:30. The curriculum is rather basic so girls in the AP courses are less likely to enroll. The students at my school are also involved in so many activities after school that it becomes difficult for them to attend every meeting. I lost my last two girls to the school play because they oversaw the lighting and sound. There were still some girls attending the programming club so I didn't lose all the girls. Some Girls Who Code clubs meet at a local library or business which may also help increase enrollment. As an educator and advocate for females in CS, I was sad to see the club break up. I think this club works best at schools without a strong CS program or without the multitude of clubs and activities that my school offers.

The third club is not just CS based but is a science, technology, and math (STEM) club that is focused on teaching middle-school girls about STEM. The club is also a non-profit organization named STEMpower Girls [2]. The members teach lessons to middle-school girls at an

Figure 2: Girls Who Code Club

inner-city school on Monday afternoons. They also interview women in STEM fields about their passions and share the interviews on their website [1]. Three of the founding students will be freshman in college next year but the remaining student is hoping to keep the club running with new members and more chapters. The founders of the club hope to create chapters in schools in California and Singapore soon.

As the faculty sponsor, I didn't have to do much for this club. The students plan all their lessons, coordinated with the middle-school at which they were teaching and conducted their own interviews. To be a recognized school club, the students need someone to sponsor them even though they don't meet in our building. I helped print posters and signed

any forms they needed for National Honor Society points. I also have written college recommendations for two of the students who are planning on majoring in CS in college. It's a wonderful opportunity to see students collaborate to create and maintain the club and website. Sometimes all the students need is a faculty member to support them and I am glad to play that role.

Clubs are one of the easiest ways you can increase CS opportunities for students beyond the classroom. They often don't require much extra work on the part of the sponsor and can provide leadership roles that students seek. Whether it is a casual programming club, a structured club like Girls Who Code, or a specialized student-created club, all of them are valuable in providing students with a well-rounded and CS rich education. ❖

References
1. p of .java with Amanda Lattimore; http://stempowergirls.org/amandalattimore.html; Accessed 2017 May 8.
2. STEMpower Girls; http://stempowergirls.org/. Accessed 2017 May 8.

Amanda Lattimore
105 W. Chesapeake Ave
Jefferson Building, 3rd Floor
Towson, MD 21204 USA
alattimore@bcps.org

Figure 3: STEMpower Girls teaching programming