

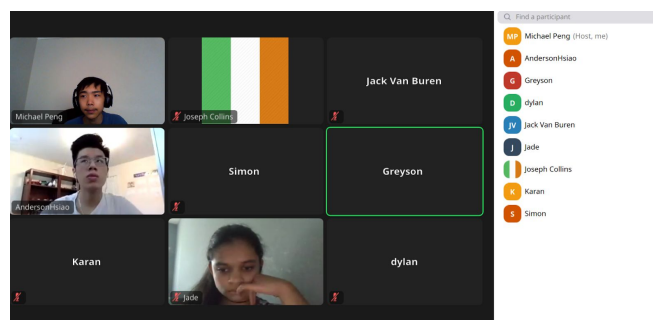
# Let technology serve for the public good!

By Michael Peng

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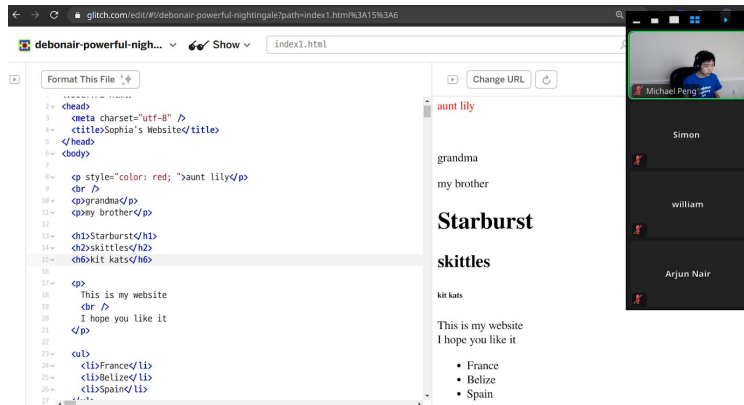
Back in April, the unexpected school closures suddenly landed me with a lot of free time, and one day I was contacted about the possibility of teaching programming to local middle school students through Andover Youth Services. The main intent of this initiative was to help train more incoming students for my high school's competitive robotics club, and it reaffirms my belief regarding the importance of computer science education. I have never formally taught programming after doing it for nearly 8 years, and I was very interested in its pedagogy. As a result, I eagerly signed up to teach for the program and met with three other members of Andover Robotics Club to construct a plan.

On April 14, 2020, after weeks of thorough curriculum preparation and review, we officially kicked off the first Python Pilot class with an excited cohort of students. The class met twice each week on Zoom for one hour each, with 8 class sessions in total. During the course, we introduce our students to basic programming concepts such as variables, conditionals, loops, and functions. We guide the students through a custom curriculum and encourage them to experiment by teaching them Python syntax, monitoring their progress through a CS education platform called Codio, at which I interned last summer. The Python Pilot course featured one lead instructor, three teaching assistants, and six students, enabling us to pay more attention to each student and personalize our teaching. Although we sometimes ran into minor issues as a result of teaching the course for the first time, the Pilot course was very successful, with a proud group of students showing their own calculator project to their parents on presentation day. The model worked, and the program was quickly gaining momentum.



By the time the summer began, the joint teaching program between Andover Robotics Club and Andover Youth Services had expanded to four subjects: programming in Python, programming in Java, web design, and mechanical computer-aided design (CAD) with Onshape. With a total of 16 club members serving as mentors for these courses, the program had expanded from a single pilot program to an elaborate system of courses, further lowering the barrier to technological creativity within Andover and fostering a group of qualified candidates for Andover Robotics Club. Right now, I lead the programming with Java class and assist in teaching the

Web Design class, eager to refine our curricula and teaching style to maximize efficiency and success. So far, the results have been very promising, and many of the students' parents have expressed satisfaction with the quality of our individualized teaching.



While the parents may feel satisfied with the quality of our teaching, I believe we can do better. After all, high school students tend to have a lot less knowledge, pedagogic wisdom, access to resources, and teaching experience than professional teachers in high schools and professors in colleges, and this insufficiency shows. When running our own Java curriculum for the first time, we encountered technical issues, factual inconsistencies, and insufficiently clear explanations that hindered our students' ability to grasp the concepts and syntax intuitively. When setting up the students' development environments for the web design course, we dedicated much more time than is appropriate to troubleshooting installation issues. Different class leaders pursue different philosophies on the demand for memorization versus practice, as a total duration of eight hours for instruction and practice is woefully insufficient to achieve absolute proficiency in programming. Furthermore, students in the same course have very mixed levels of prior experience with programming, making group instruction not ideal. When a student frequently misses courses because they forget or have conflicts, they fall behind the group and require special attention and curriculum personalization to ensure that they end up with a presentable final project. With our experience, it has become clear that these classes are inherently deficient in rigor compared to computer science classes taught at school, and no amount of pedagogic improvement can solve that. Nevertheless, I am keen on improving the way we form expectations, teach and assess student progress over time so that we can take full advantage of this opportunity and enhance our impact.

Overall, I'm thrilled to lower the entry barrier to computer science and help foster the next generation of technologists. As we continue to refine our teaching, it would be awesome to see this program continue at full velocity after my graduation—even better if we can expand it to Kindness Matters, Inc. and IFSI in the next few years.