

Introduction to Computing Summer Camp

By Jessica and Sara Xiang

Among all the programs geared toward encouraging girls to study computer science, the AspireIT Middle School Outreach Program by the National Center for Women and Information Technology (NCWIT) differs in its aim to employ a "near-peer" approach that provides female high school and college computer science students the opportunity to lead computing-related outreach programs for middle school girls a few years younger than themselves. As Ohio Affiliate winners of NCWIT's Aspirations in Computing award, we applied for and received a \$3,000 grant to run such a program in Mason, OH, which we named Introduction to Computing.

We put together a team of six other high school students in our community—Tina Tang, Taylor Paschal, Audrey Moeller, Natalie Geraci, Priya Thomas and Priscilla Wu—to help us lead the camp. All the mentors had previously taken AP Computer Science, and many had also participated in paid IT internships at companies like GE Aviation and The Cincinnati Insurance Company.

We had four goals for our camp:

1. Introduce participants to the basics of computer programming
2. Educate participants about the wide spectrum of career opportunities available in IT
3. Create a strong support system that lasts between our participants and their mentors
4. Remind our student leaders why they became passionate about computer science in the first place.



Our group of high school mentors (left to right) Taylor Paschal, Audrey Moeller, Priscilla Wu, Jessica Xiang, Sara Xiang, Natalie Geraci, Priya Thomas, Tina Tang

From the outset, we wanted to capitalize on the fact that our camp was student-run and therefore had the power to not only spark an interest in computing within our participants, but also to empower the other high school students who ran it. We believe that the most effective approach to education involves fostering personal relationships between teachers and students, and hoped that the small age difference between our students and ourselves would make developing these relationships easier.

After weeks of discussion, we laid out how we planned on achieving our goals and what we wanted our participants to take away from the one-week camp.

Introduce participants to computer programming

- Create a pong game in Scratch, with their own creative variations
- Complete a final project in Scratch addressing a social issue
- Create an HTML webpage with some information about themselves

Educate participants on career opportunities in IT

- IT panel with college students and professors
- Field trip to Cintas

Create a strong support system

- Incorporate icebreakers and team building activities
- Work in teams of 3-4 with a high school mentor leading each team

Re-inspire our student leaders

- Involve student leaders in planning process
- Encourage communication with participants

Leading up to the one-week camp, we met frequently with Professor Maureen Doyle from Northern Kentucky University, who served as our fiscal partner and mentor. She brainstormed ideas with us and checked our progress. Her demonstrated commitment to our program motivated us to pay it forward.

We designed our curriculum around a basic programming language called Scratch¹, which is specifically designed to help younger students learn computational concepts, like loops and tests, while also learning to think creatively, reason systematically, and work collaboratively. We decided to introduce our students to Scratch by guiding them through the creation of a pong game. After we walked them through the basics of how to get the paddle to move with the mouse, and then how to get the ball to bounce off the paddle, we let the girls take the wheel and spice up their games as they wished. We saw a wide variety of ideas come to life, including games with multiple levels, balls that replicated every time they touched the paddle, and power-ups that changed the size of the ball.

¹ Scratch is developed by the Lifelong Kindergarten Group at the MIT Media Lab. See <http://scratch.mit.edu>.

In order to teach the girls about jobs in IT, we took them on a trip to Cintas® Corporations' headquarters in Mason, OH. Cintas is a company that provides specialized services such as uniforms, first aid supplies, and fire protection services to a variety of businesses. During the visit, the girls were able to meet women who worked in IT at Cintas, and listen to their stories. They were also introduced to how Cintas uses IT to help their customers, for example by creating an app that allows customers to design their uniforms digitally. Many of the girls' favorite part was getting a tour of the control center where we could see IT actually being utilized in Cintas' daily operations.



Field Trip to Cintas Corporation

The rest of the girls' instruction in Scratch consisted of a final project which they completed in small groups of three or four. Before they got started on their final project we wanted the teams to get to know each other a little better, so we planned a fun team building activity called the Balloon Tower Challenge. We gave the girls a pack of 30 balloons and a roll of Scotch tape, and gave them 20 minutes to build the highest tower they could with only the materials they were given. After 20 minutes, some of the towers were touching the ceiling! We hoped that the Balloon Tower Challenge not only taught the girls about problem solving and teamwork, but also gave them the opportunity to have a little fun. We also introduced our students to HTML by guiding them through the creation of their own "About Me" page, which they used to introduce themselves to parents before their final project presentations.

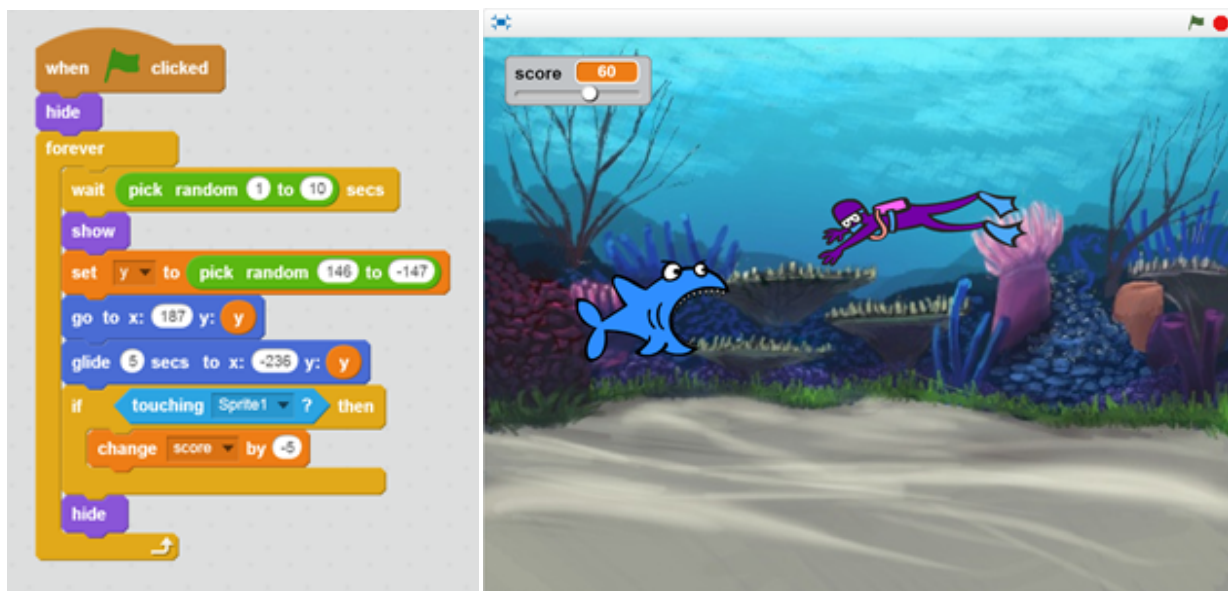


Balloon Tower Activity

Each of the final project groups was led by a high school mentor and was faced with the challenge of designing and coding a project in Scratch that addressed a social issue. We purposefully left their challenge open-ended and relied heavily on our high school mentors, all of whom had spent at least three weeks prior to the beginning of the camp learning Scratch, to provide individual instruction and guidance. Through our own experience in programming classes, we knew that the most exciting part of computer programming was having the freedom to be creative and innovative. We wanted to capitalize on the fact that computer programming, unlike many other subjects, allows even beginners to see the potential and power of a their own computer programs immediately.

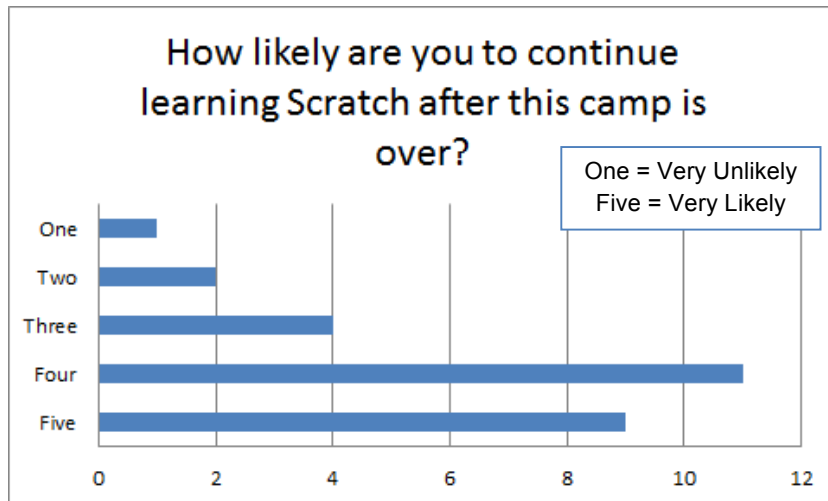
On the last day of the camp, we invited an IT panel consisting of two college computer science professors, two undergraduate computer science students, and a high school computer science teacher so the girls could ask any questions they still might have about IT. The girls asked some great questions, including “What real-life problems do IT professionals solve?” and “What challenges do you face in your job?” One of the panelists responded that in the computer science field, it’s important not just to have advanced technical skills, but also to be open-minded and to look at problems from various perspectives. For us, this really emphasized the reason we need to have more women in computer science. Women often have a different perspective, and confront problems in different ways than their male counterparts. Thus, in a team made up almost solely of guys, a woman’s contribution may be invaluable.

After the panel, the girls presented their final projects. Most teams made games that taught players about a social issue. For example, one team made a game that emulated the popular mobile game Jetpack Joyride: players could choose the endangered animal they wanted to be, and had to guide their animal past a variety of obstacles that “swam” across the screen toward them. If they hit an obstacle, they had to answer a question about their chosen endangered animal to move on. Another team created a virtual world that required players to make eco-friendly decisions to move on. Another team made a game that required players to guide a scuba diver through a maze to find an endangered animal on the screen. After each team demoed their game, they explained their code to their parents using terms that we taught them throughout the week, like loops, tests, and variables. It was incredibly exciting and fulfilling for us to see all the girls had accomplished in just one week.



Screen shot of one group's final presentation, along with a code sample in Scratch.

It is our hope that teaching these students about computer science and careers in IT is just the beginning. We hope that the friendships they've made among themselves, as well as with the mentors that they've had the opportunity to work with, have inspired them to continue learning about computer science. The relationships and support system that we've fostered through our camp offers a personal touch that we think is lacking from many educational programs. As high school students only 3-6 years older than most of our students, we hope that they view us as both more approachable and more relatable than the IT professionals they met. Our goal is to provide them with a consistent source of support and encouragement as they progress through their high school careers; we hope that, in a few years, some of our participants will themselves become mentors at the camp that inspired them to pursue computer science.



At the end of the camp, one of the parents told us that, "If this wasn't an all girls camp, my daughter wouldn't have agreed to come. But because it was by girls, for girls, she said yes." When we went back to school in the fall, a friend came up to us and told us that she knew a girl who had attended our camp, who was now learning HTML

on her own. It's comments like these that make the months of time we spent organizing our camp all worth it.

In addition to the myriad of ways that we hope our camp has encouraged our students to consider careers in IT as they grow up, the camp has also solidified our own decisions to study computer science. Our fellow high school mentors, too, have expressed similar sentiments and regard the camp as a great learning experience. From day one, we were amazed by the amount of support we received from Professor Maureen Doyle, NCWIT, and our community. The female IT professionals that we've gotten the chance to meet along the way have also provided nothing but encouragement. The community of women in tech is definitely one we want to continue to be a part of in the future. The professionals whom we've met and worked with, as well as the freedom and responsibility we were given to run such a large project, have empowered us and reminded us of the power of computing to improve the world.

About the Authors



Jessica Xiang

Jessica is a member of the Class of 2015 at Mason High School. At school, she is the Co-President of Science National Honor Society (SNHS), and an Event Leader in the Science Olympiad team, which is currently ranked 4th in the state of Ohio. She is also a member of the Math Team, National Honor Society (NHS) and Spanish National Honor Society. Outside of school Jessica teaches piano, is a member of the INTERalliance Leadership Council of Greater Cincinnati, and volunteers at the local library and hospital. The summer after her junior year, Jessica got the opportunity to intern at

GE Aviation. Jessica is a 2013 NCWIT Award for Aspirations in Computing Ohio Affiliate Winner, a National Merit Semifinalist and an AP Scholar with Distinction.

Email: xiangjessica@yahoo.com



Sara Xiang

Sara is a senior at Mason High School. She has wanted to major in computer science since her freshman year, and since then has taken a variety of computer science courses both in and out of school. She has experience with Java, C/C++, Visual Basic 6, .NET, HTML, CSS, Python, PHP, SQL and JavaScript. In addition, she was a National runner up and Ohio winner of the 2013 NCWIT Aspirations in Computing Award, is an IT Director of

the Integrated Media Team at her high school, where she's leading the release of a new school website, and is currently serving as the Director of Emerging Programs for the INTERalliance of Greater Cincinnati, where she leads the IT Academy, job shadowing program, and college student shadowing program. She also plays volleyball, is an impromptu speaking event leader on Mason's Varsity Speech and Debate team, regularly volunteers at Bethesda North Hospital and the Mason Public Library, and is a member of both NHS and SNHS. This past summer, she was an INTERalliance intern at KnowledgeWorks.

Email: xiangsara@yahoo.com