3D Dreams and Arduino Adventures: A Summer to Remember

By Capital Youth Outreach Club (CYOC) Member: Ruichen Feng

This summer, as members of the Capital Youth Outreach Club (CYOC) and passionate STEM enthusiasts, my friends Evan Chen, George Wang, and I decided to give back to the community by organizing a free STEM enrichment program focused on 3D printing, electric circuits, and Arduino programming. With experience in these areas—mine in 3D design and printing, Evan's in electronics and programming, and George's in robotics—we felt confident that we could create a fun and educational experience for younger students. We named it the CYOC Summer Engineering Workshop, and it brought together 15 curious and creative middle schoolers for a week of hands-on learning and innovation.

My primary responsibility was teaching 3D design and printing using Onshape, while Evan led the instruction on electric circuits and Arduino programming.As the Onshape instructor, one of the biggest challenges I faced was pacing. Onshape is a powerful 3D modeling and CAD tool, but it can be tricky for beginners—especially younger students—to grasp. At the same time, some students had prior experience and could finish the basic lessons in just a few hours. Finding a balance that supported beginners while still challenging more advanced learners was no easy task.

We kicked off the first day by introducing students to Onshape basics like sketching, extruding, and assembling. Their first project was designing personalized name tags—a fun and rewarding way to bring their digital work into the physical world right away. From there, students advanced to more creative designs such as swords, cups, bells, and eventually a treasure chest. Each project built on the previous one, gradually increasing in complexity. Seeing their designs come to life on the 3D printers was incredibly motivating—many campers eagerly asked for their next project to be printed.

After wrapping up the Onshape portion, we transitioned to Arduino—a segment that quickly became the highlight of the week. Over the next three and a half days, students learned to wire circuits, connect sensors, and program interactive electronic systems. Their first Arduino project was a simple blinking light controlled by a button, which introduced them to basic wiring and user input. Next, they built a musical instrument using potentiometers (dials), servos, and a buzzer—learning how various components interact within a circuit.

The final and most exciting project was building a small car that could detect and avoid obstacles using a distance sensor. This challenge combined coding, sensors, and motors, allowing students to see how real-world technologies come together to solve problems. George's help with this project was incredibly valuable—his background in robotics allowed him to assist students more deeply and troubleshoot complex issues with confidence.

The final day of camp was reserved for finishing touches and preparing for a student exhibition. After a nice pizza lunch which Danial Guo's family donated to our workshop, every camper completed their Arduino project and proudly presented their work to their peers, parents, and CYOC advisors. Watching them explain how their creations worked—and seeing their excitement and pride—was one of the most rewarding moments of the entire workshop.

Reflecting on the week, I was truly impressed by how quickly and enthusiastically the students embraced challenging tools like Onshape and Arduino. Their creativity and determination were inspiring, and I have no doubt that many of them could become the engineers and designers of the future. Another key takeaway from this experience was the value of teamwork. Collaborating with Evan and George made the entire workshop not only more manageable but also more enriching. We each brought our own strengths—whether in CAD, programming, or robotics—and combined them to create a well-rounded, engaging learning experience for the campers. We constantly communicated, divided tasks efficiently, and supported each other when unexpected issues came up. This teamwork reminded me how powerful collaboration can be, especially in STEM, where sharing knowledge and working toward a common goal can lead to incredible results. Importantly, this workshop was offered completely free of charge, ensuring that every student—regardless of background—could participate. We strongly believe that opportunities like this should be open to anyone with curiosity and a passion for learning.

Of course, none of this would have been possible without the incredible support from our parents and the CYOC community. Evan's mom, Dr. Fanyuan Wen, played a key role in preparing instructional materials and sourcing hands-on project supplies. Several other parents volunteered their time daily to help in the classroom, ensuring everything ran smoothly. We're also especially grateful to our CYOC adult advisors, Dr. Ping Lu and Dr. Tao Chen, who visited the workshop to offer encouragement and celebrate the students' achievements. Dr. Ping Lu's presence on both the first and last days of the camp meant a great deal to us—it was a meaningful show of support and motivation.

In the end, the **Capital Youth Outreach Club Summer Engineering Workshop** was more than just a success—it was a truly unforgettable experience that sparked creativity, confidence, and curiosity in everyone involved.

Fourteen-Year-Olds Create Their Own STEM Camp!

By CYOC member Evan Chen
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This summer from July 7th to July 11th, rising 9th grader Evan Chen along with Ruichen Feng created and taught a STEM summer camp called CYOC 2025 Summer Engineering Workshop with slideshows they made themselves and Arduino robot Evan designed. Special thanks to rising 8th grader George Wang coming by on Thursday to help. The workshop concluded on Friday with proud smiles, working prototypes, and a strong sense of accomplishment among campers, parents, advisors and instructors alike.

What was taught at the camp?

Onshape

On Monday and Tuesday, Ruichen Feng taught CAD in Onshape. By the end of the Onshape/CAD unit, the campers were proficient enough at these skills to design and 3D print either a miniature sword or treasure chest.

Arduino

On Tuesday and Wednesday, Evan Chen taught circuitry with sensors and LEDs, and programming with Arduino. During the Thursday and Friday following the Arduino unit, campers could make a robot car that could either spin in circles, avoid obstacles, or follow you around.

"This week was fun! I learned 3D design, printing and build an Arduino robot!" said Daniel.

"We learned to make something from scratch—it's challenging but we made it work." added Mason Zhou.

"Look, my robot can follow my hand!"said Steven.

"My robot can turn around when my feet is close to it!" said Angela.

Fun times!
Games!

With few participants who wanted to play four square during outdoor breaks and recess, campers invented two squares, a spin on the game four square with their own rules. Eventually, the game gained traction and became a popular choice among the campers to play during breaks.

Pizza!

After the majority of people had finished wiring and coding of their robot cars on Friday, the people at the camp had a pizza party donated by one student Daniel's father Mr. Chunhua Guo. Near the end of the pizza party, CYOC advisors Drs. Ping Lu and Tao Chen came in to congratulate the campers on their progress, encourage them to keep learning, and introduce CYOC to those who did not already know what it was. Afterwards, they hosted a show-and-tell where the campers proudly showed the CYOC advisors their swords, chests, and robot cars they had made over the past week. The creativity, problem-solving, and enthusiasm on display were truly inspiring.

Closing notes
Motives

According to Evan Chen, one of the main reasons he dedicated so much effort to this workshop was because his dissatisfaction with how some STEM camps were run. Specifically, he disliked how in some of the STEM camps he felt like he barely learned anything, even though the camp was week-long and labeled "STEM". Because of this, Evan created this summer camp with his friend Ruichen and George to offer a more impactful experience—one where kids could truly learn STEM concepts through hands-on projects, while he also challenged himself to grow as a teacher and engineer, work alongside friends, and give back to the community. Evan feels proud seeing the campers grow, collaborate, and gain confidence through the experience.

With exciting new topics like Arduino robotics and drone engineering on the horizon, Evan is already planning future workshops—and he and friends are looking forward to continuing this journey of innovation and discovery with you!

Thanks to:

Evan and his friends Ruichen, George are grateful to CYOC advisors Drs. Ping Lu, Tao Chen and Yuxiang Xie for their help and advice in making this camp. Without them, they wouldn't have been able to make this camp. They also appreciate parent volunteers Mrs. Fayuan Wen, Chuanfeng Wu, Shanyi Jiang, Bo Chen, Minna Ng for their generous time and support throughout the workshop.