

Broadening Horizons: Youth Technology Academy Helps Students Chart Their Future



Cuyahoga Community College

Cuyahoga Community College, known as Tri-C, has provided Cleveland, Ohio area residents with high-quality, affordable education and programming for more than 50 years. As part of its mission, the state's oldest and largest community college seeks to promote individual development and improve the overall quality of life in a multicultural community. Tri-C's Youth Technology Academy (YTA), a unique STEM⁸-focused program that has served thousands of disadvantaged urban students, is a highly impactful way to advance this mission. YTA enables underserved youth to earn college credits through Ohio's College Credit Plus (CCP) dual enrollment program, using an experiential, project-based technical curriculum delivered at their high schools and at Tri-C's Metropolitan campus. Students gain access to cutting-edge technology through the study of robotics, engineering and related domains, igniting a sometimes-newfound passion for learning and offering a platform for STEM career discovery and exploration. The opportunity to compete in prestigious robotics competitions and be mentored by NASA and other industry experts makes this an unparalleled opportunity for area teenagers.

How It Began

Created in partnership with the Cleveland Metropolitan School District, YTA launched in 2003 as a youth workforce robotics program serving a dozen students with federal Workforce Investment Act funding through the City of Cleveland. The program's goal was to expand equitable access to technology among the city's underrepresented youth, increasing their academic and technical skills and broadening their career prospects in a growing, marketable field. Its experiential learning design was based on research demonstrating that struggling urban students who were given hands-on opportunities to explore the concepts they were learning, such as building a robotic arm that lifts a weight, performed better in technology courses.

⁸ STEM is an acronym for Science, Technology, Engineering and Math.

The program grew exponentially to meet strong demand at area schools and widened its curricular and technological offerings to include unmanned aerial vehicles (drones) and single board computers. YTA students received subsidized tuition through Ohio's Post Secondary Enrollment Options Program, the precursor to CCP. Today, CCP funding provides the program's primary operating support, with supplemental resources from Ohio Means Jobs-Cleveland/Cuyahoga (via the federal Workforce Innovation and Opportunity Act), NASA, The George Gund Foundation and various charitable foundations and corporate sponsors.

The Approach

Recruiting underserved students

The program targets students in all high school grade levels for enrollment in CCP technology classes. In concert with school district officials, they conduct outreach to area administrators and community groups to publicize the opportunity and encourage students to apply. YTA staff begin recruiting students during the spring and summer before 9th grade. Publicity around YTA robotics competitions generates additional visibility and interest among potential

"The YTA program demystifies higher education for urban students through the provision of college-credit STEM courses within their home high schools. Through the study of complex concepts and mastery of technology projects, these bright, capable young people have a world of opportunity opened for them and develop a sense of their own abilities."

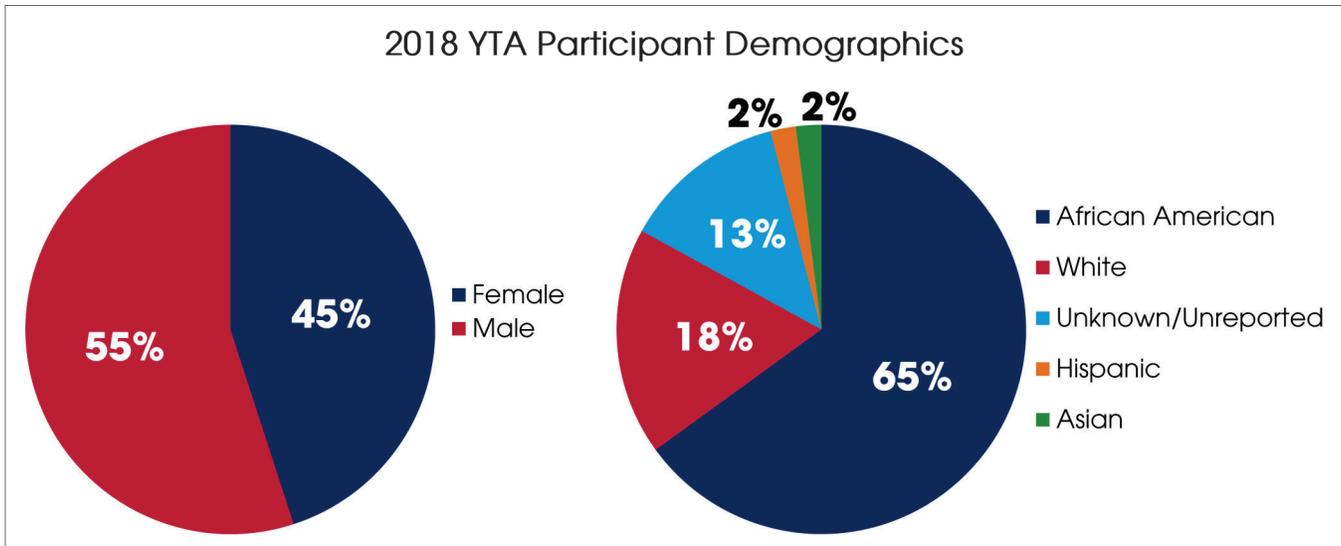
– Mary Kay Bitterman, Executive Director, Technology Academies, Cuyahoga Community College

participants. Staff and student presentations and participation at both community and school-sponsored events effectively generate interest in program enrollment among both youth and parents. Students apply by selecting YTA Robotics as an option on the college's standard CCP application.

A CCP Innovative Program Waiver from the Ohio Department of Higher Education enables Tri-C to admit CCP students who score below the college-ready level on the Accuplacer exam.⁹ Importantly, these students go on to earn an aggregate 3.017 grade point average in their college-level YTA CCP courses—evidence that they can do the work with the right supports.

To date, YTA participant demographics closely reflect those of Cleveland Metropolitan School District students. Without the state waiver, however, Tri-C estimates that YTA would lose more than 90% of its enrollment—denying hundreds of students the opportunity to participate each year.

⁹ Tri-C has received a waiver of CCP college readiness requirements annually since the 2018-19 academic year. During the COVID pandemic, however, Tri-C and other colleges may admit CCP students who have a cumulative high school grade point average of 3.0 or higher, in lieu of a college-ready score on the Accuplacer exam.



Technical curriculum

In collaboration with Tri-C, YTA partner high schools determine which program courses to offer their students, selecting from options in electrical, mechanical and integrated systems engineering technology and construction technology. Program offerings allow students to explore various facets of technology and engineering, but are not a structured pathway to a particular degree, certificate or career.

Students earn between one and four college credits per course. Most begin with introductory electrical engineering technology robotics classes that build math competencies and feature both lecture and lab components. The courses are project- and teamwork-based; all participants are required to build and program a robot and use it in a local competition. Other courses teach students to: build a computer using a credit card-sized, single board computer known as a 'Raspberry Pi'; use this device to do physical computing with sensors utilizing Python programming language; and build and calibrate unmanned aerial vehicles (drones), learning to fly autonomous missions using GPS sensor technology. Students can apply this emerging technology in commercial settings in various industries upon graduation from high school and/or college.

Tri-C faculty preceptors are assigned to each participating high school, teaching classes on site and working with each school's schedule. High-school teachers can serve as adjunct instructors if they possess the requisite qualifications. The college maintains an inventory of technology tools to loan each school, including various robotics and computing platforms.

Students from any school may attend Tri-C's campus one evening each week to take optional supplemental technology classes of their choice with dinner provided, helping them acclimate them to campus life and access the many resources available through the college. Program coordinators and field specialists provide YTA students with direction, support services and assistance navigating enrollment, assessment and college planning.

Exciting extracurriculars

Interested students can join the YTA Varsity Robotics Club that meets on campus twice a week and each Saturday during robotics season. All are encouraged to participate in two prestigious annual international robotics competitions, the VEX Robotics Challenge and the FIRST Robotics Competition, in which students must design, manufacture, build and program robots to meet innovative, engineering challenges. Teams can advance through multiple levels of competition culminating in a world championship round. The program covers all costs to participate, from travel and uniforms to student stipends, competition entrance fees, learning materials, tools and more. Engineers and industry experts from NASA and leading technology companies mentor and train the student teams competing, enriching the experience immeasurably. YTA also offers student internships and other educational activities.

Impact

YTA serves up to 1,000 students per year. While most hail from the Cleveland Metropolitan School District, the program has expanded to serve several neighboring school districts and private and parochial schools. Participant results are strong:

- Students have achieved an aggregate grade point average of 3.017 in YTA CCP courses to date—despite testing below “college ready” prior to participating.
- Between Fall 2016 and Spring 2020, 87% of YTA students successfully completed their college-level technical courses.
- Every member of the 2020 YTA Varsity Robotics Team graduated from high school. Eighty-four percent went on to postsecondary enrollment; of these, 20% enrolled at Tri-C and 80% enrolled at 4-year institutions.

“YTA has made a dramatic difference in my life. By giving me the tools to succeed, such as understanding the importance of teamwork and the development of both technical and creative skills, my experience with YTA contributed to the selection of my STEM major in college. YTA opened so many doors for me.”

Students have also achieved impressive success in regional, national and international robotics competitions, drawing welcome interest to the program and college. Tri-C’s YTA Varsity Robotics Team is one of only ten NASA-sponsored teams nationwide. Together with three school partners, the YTA team bested 640 teams to win the 2016 FIRST Robotics Competition. This was an impressive feat with over 75,000 high school students from 24 countries competing in that competition season. Soon after, a student on that team traveled to the White House to serve as one of only 12 “Kid Science Advisors” to President Barack Obama. YTA student teams have realized successes the past several years in competitions, and in 2019 the YTA Varsity Robotics Team

were Finalists in the Ohio Buckeye Regional FIRST Robotics competition and won the Industrial Design Award sponsored by General Motors.

YTA was featured in an article in the peer-reviewed International Journal of Advanced Research in Education & Technology examining how urban students' experiences in a technology program impacted their skills, self-efficacy and postsecondary plans. Study authors found that participation in a structured, project-based STEM program like YTA broadens students' perceptions about their abilities and options for post-secondary education and careers, countering the negative effects that structural factors such as poverty have on these views.¹⁰ While initially skeptical of their ability to succeed in STEM courses, YTA students in the study sample believed the program's hands-on approach increased their self-esteem, self-efficacy and critical-thinking skills. It also boosted confidence in their preparedness for college.

Lessons and Recommendations

Given the number of students it serves, the program's impact is far-reaching, changing both individual lives and benefiting the community as it generates positive social impact and shapes Cleveland's future technical workforce. Colleges interested in launching a program like YTA should consider the elements Tri-C deems critical to success:



Strong partnership. Tri-C has a longstanding partnership with Cleveland Metropolitan School District, spanning a variety of initiatives. This relationship offered a solid foundation on which to build and scale an intensive program like YTA that involves many stakeholders and logistics. The buy-in of school administrators and teachers is vital.



Early recruiting and planning. Recruiting middle school students before they enter high school ensures that they derive maximum benefit by participating in as many program offerings as possible. Colleges must have a plan to administer required college-readiness assessments, which can be challenging to deliver at scale to students from a multitude of schools. The collection and review of students' transcripts—an alternative to testing during the COVID-19 pandemic—requires similar focus.

¹⁰ Giraldo-Garcia, Regina, Lisa Suarez-Caraballo and Mary Kay Bitterman. "Urban Students' Views about Technology: Academic Skills, Career Interest, and Post-Secondary Choices." International Journal of Advanced Research in Education & Technology. Vol. 6, Issue 1 (Jan. – Mar. 2019). Available at https://www.researchgate.net/publication/332877404_Urban_Students'_Views_about_Technology_Academic_Skills_Career_Interest_and_Post-Secondary_Choices_Cuyahoga_Community_College. Accessed November 19, 2020.



Innovative Program Waiver to serve underrepresented students. The state waiver from CCP's college-readiness requirements allows the college to serve its target YTA population: disadvantaged students who could benefit from the program's structured, hands-on approach despite scoring below the readiness benchmark. Tri-C's successful results with such students demonstrate that test scores are not always predictive of student performance. With the right supports and effective pedagogy, underprepared students can achieve at a level that surpasses their own expectations—and others' as well.



Applied learning. Experiential, project-based learning boosts student engagement, capturing and sustaining their interest and enabling them to practice and develop skills that will open doors to myriad opportunities in postsecondary education and STEM careers. Particularly for disadvantaged students, this program design can be a lifechanging launching pad.



Collaboration across the college. The YTA program is housed in the Workforce Community and Economic Division and is fully integrated into the college. Tri-C leaders at all levels are committed to and engaged with the program, promoting it in the community, participating in student activities and providing space and resources—including a new robotics and innovation lab—to support its growth. Functional units across the college also provide helpful support, from the CCP staff, engineering department, enrollment and recruitment offices to government affairs staff and the foundation office.

Next Steps

YTA leaders continually explore ways to broaden their reach to disadvantaged, underrepresented students who could benefit from this innovative, one-of-a-kind technology program. Though remote learning has temporarily diminished the experiential learning component, YTA staff will continue the new practice of curating technology kits and sending them to students at home to keep them engaged. The YTA team welcomes and encourages any interested local school district or school to become a YTA partner and to provide equity in access to technology for all students through program participation. While the COVID-19 pandemic has temporarily dampened participation and complicated the program's core hands-on approach as learning shifts online, the college's mission to serve is stronger than ever.