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COLLABORATIVE NETWORK FOR ENGINEERING AND COMPUTING DIVERSITY
Feb 20-23, 2022
New Orleans, LA

Paper ID #35606

Retaining a diverse group of undergraduate students in Engineering Technology Majors

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Melanie Villatoro, Chair of the Department of Construction Management and Civil Engineering Technology at NYC College of Technology, is a licensed Professional Engineer in the State of New York. Prof. Villatoro is passionate about student retention and performance, as well as STEM Outreach in K-12. She has served as Project Director for the National Transportation Summer Institute sponsored by the Federal Highway Administration multiple years. Prof. Villatoro leads a STEM outreach project at Daniel Hale Elementary School which provides civil engineering lesson plans, afterschool programs, family workshops and field trips. Prof. Villatoro is the Project Director for the Peer Advisement program sponsored by Perkins and designed to increase retention of females across the School of Technology and Design.


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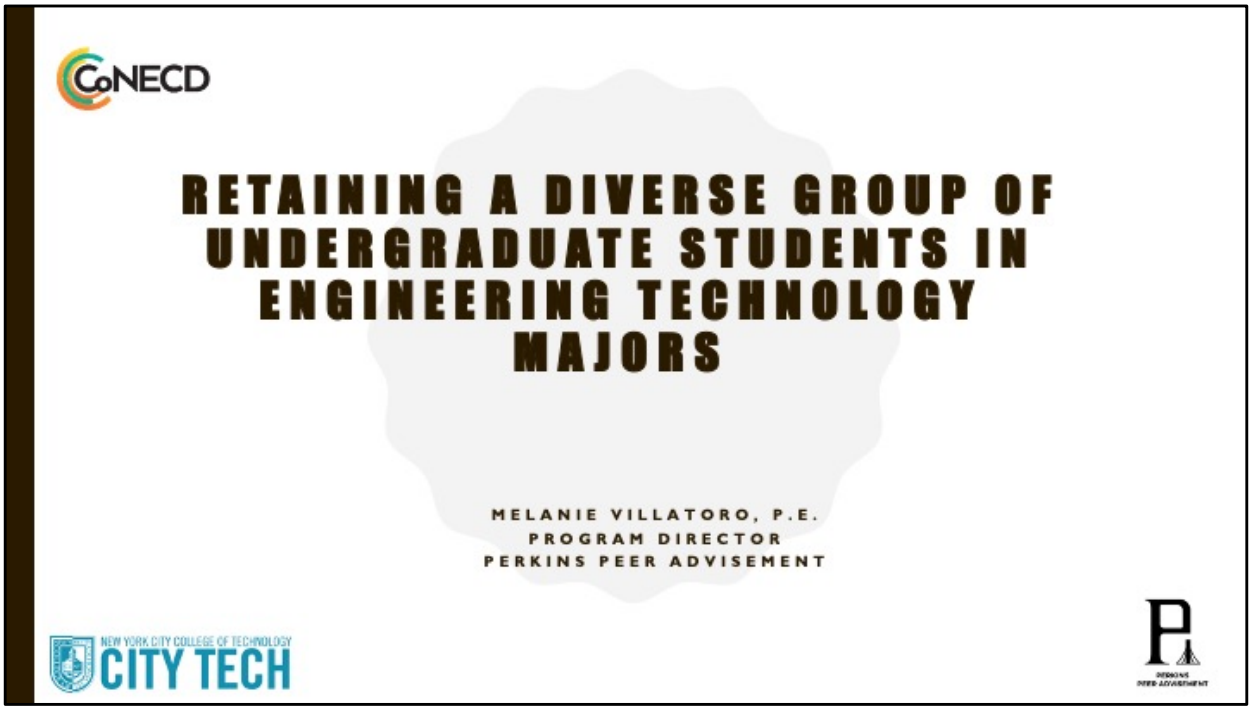
CoNECD
RETAINING A DIVERSE GROUP OF UNDERGRADUATE STUDENTS IN ENGINEERING TECHNOLOGY MAJORS
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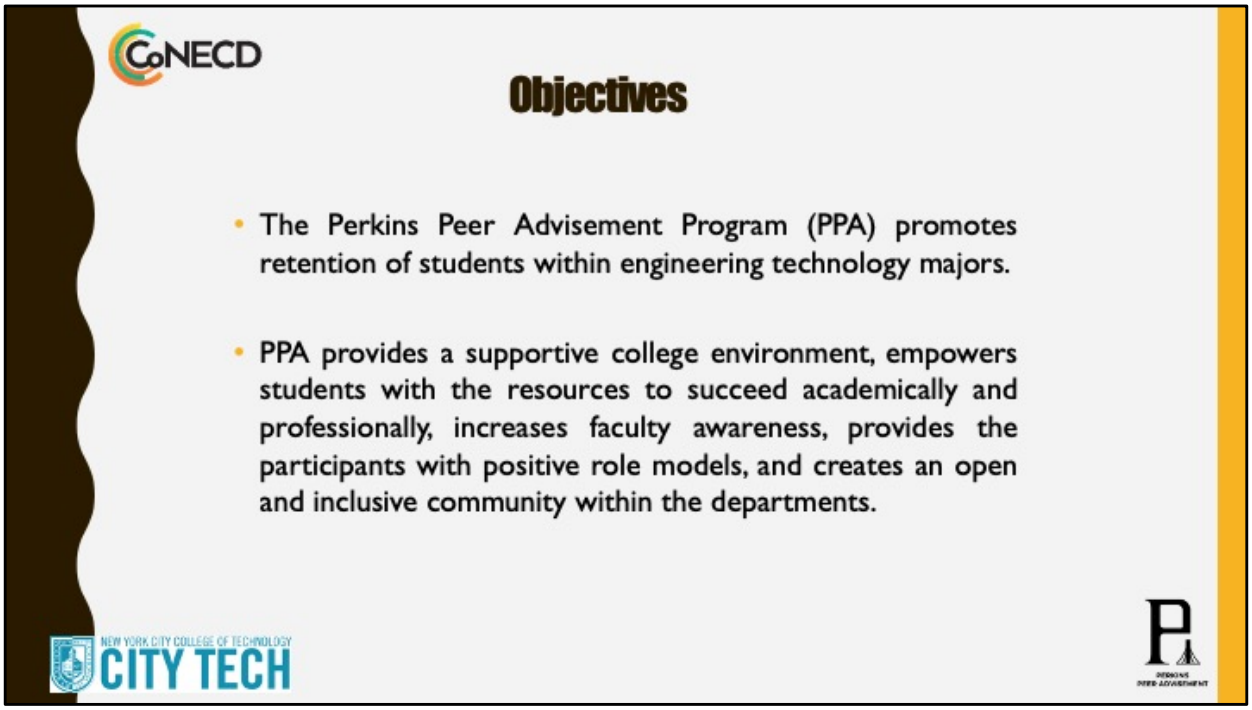
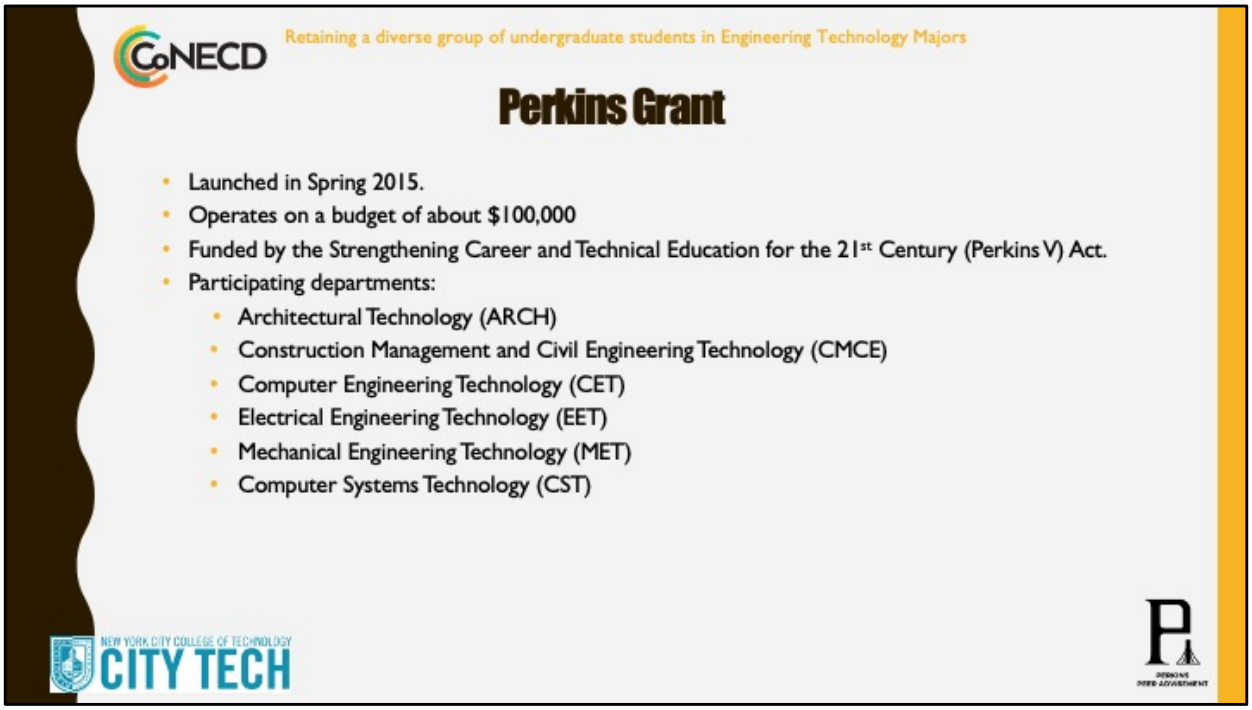
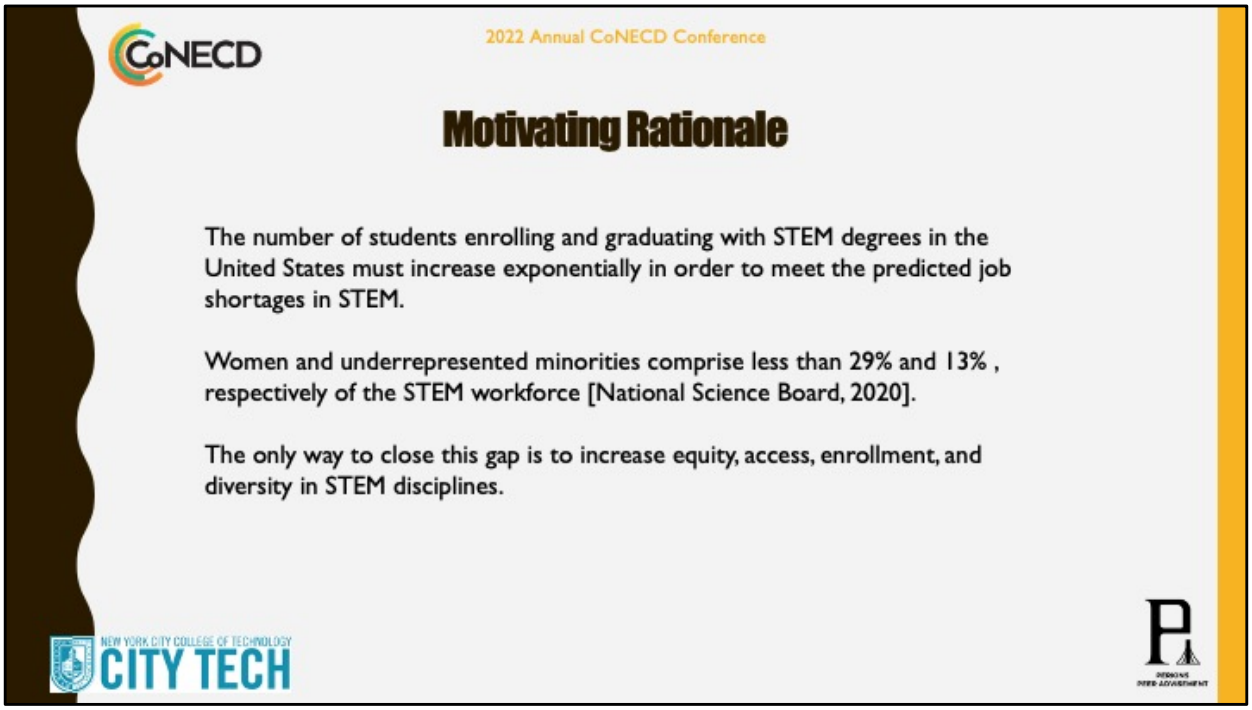
CITY TECH



PPA is a grant funded program at New York City College of Technology (City Tech) committed to increasing enrollment and retention of female and nontraditional students in engineering technology programs. PPA provides a successful model for mentoring, recruiting and retaining a diverse undergraduate cohort in engineering technology majors. PPA provides a supportive college environment, empowers students with the resources to succeed academically and professionally, increases faculty awareness, provides the participants with positive role models, and creates an open and inclusive community within the departments. The program elements have the potential to enhance the diversity and inclusion of all underrepresented groups in engineering and computing professions.

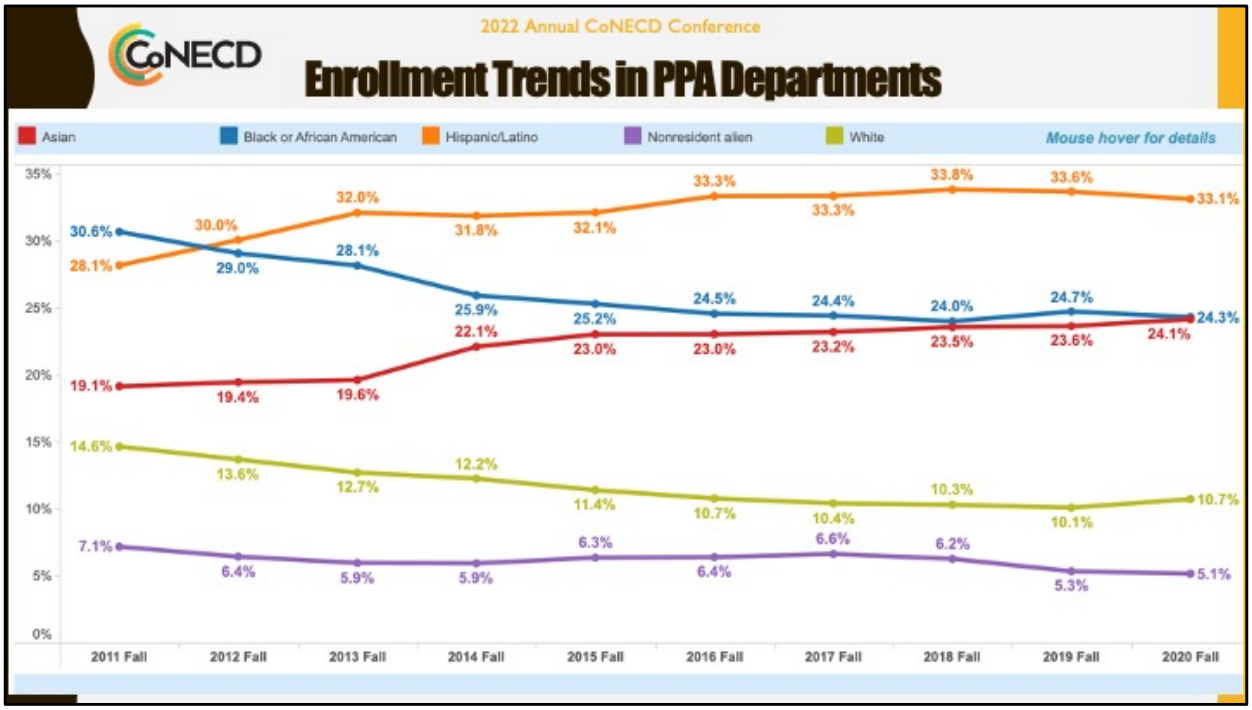


PPA is funded by the Strengthening Career and Technical Education for the 21st Century (Perkins V) Act. The program was launched in Spring 2015 and has operated on a budget of about $100,000. The program can adapt to the available budget and has run on varying budget amounts since 2015. Participating departments include Architectural Technology (ARCH), Construction Management and Civil Engineering Technology (CMCE), Computer Engineering Technology (CET), Computer Systems Technology (CST), Electrical Engineering Technology (EET), and Mechanical Engineering Technology (MET).

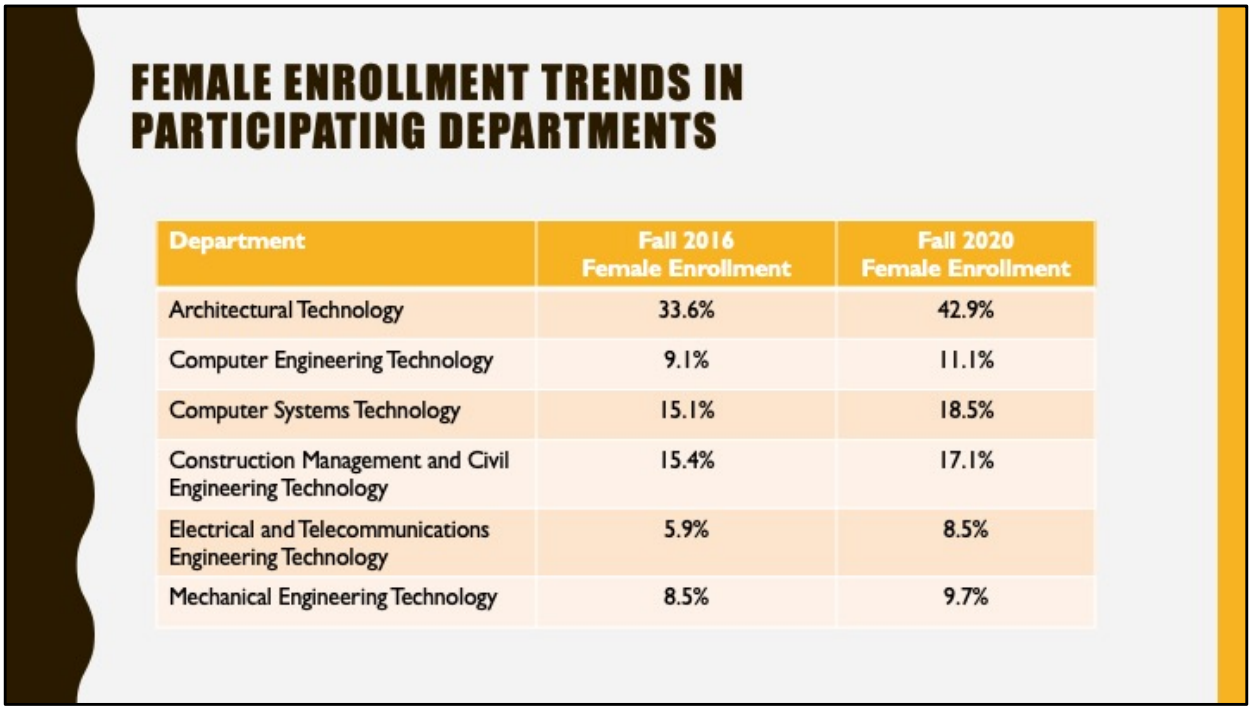


Reports in the recent literature suggest that the continued capacity of the current and future STEM workforce to meet the nation's scientific and technological needs is threatened by a sharp decline in the number of available STEM professionals.
Note to reviewer 2020 Census Data release date was delayed due to the pandemic. If census data is available prior to the presentation, demographic breakdown of US population will be added.

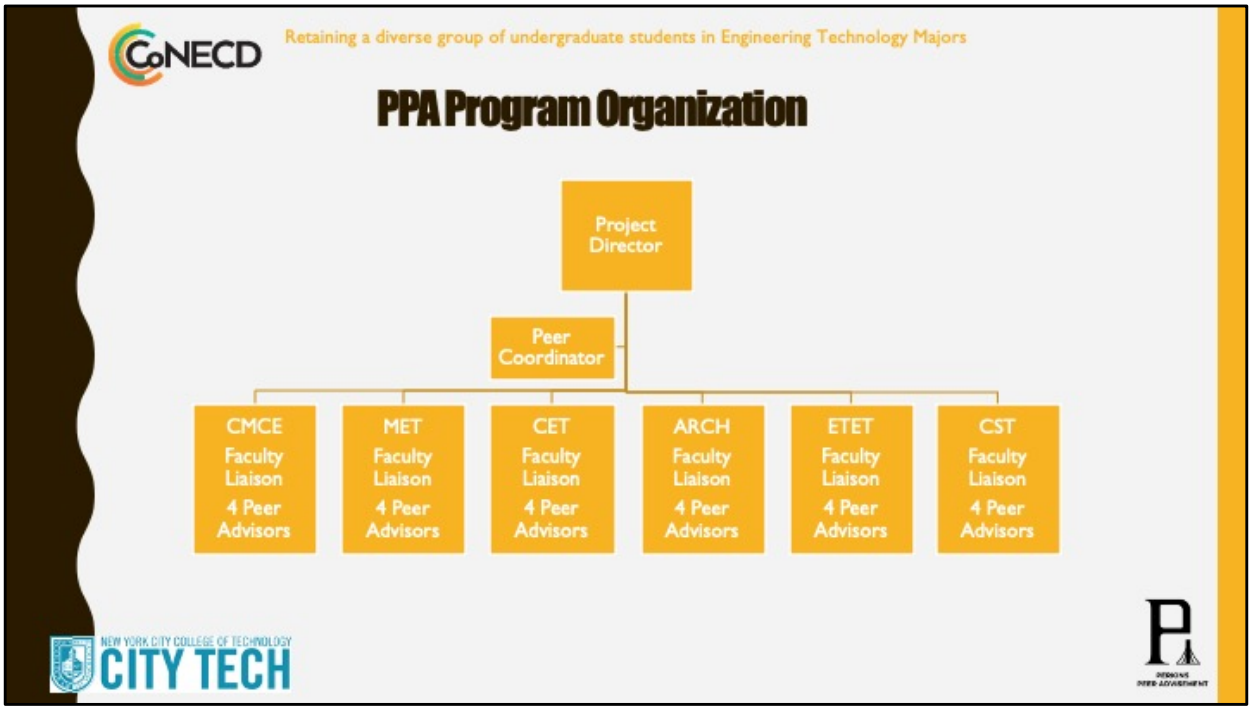
City Tech boasts a diverse student population reflective of the NYC demographic with a total enrollment of about 15,500. Our location makes us an affordable option for obtaining a valuable education. We are the technology college for CUNY and about 40% of our students are enrolled in the School of Technology and Design. We are proud to be a Hispanic Serving Institution, with 34% Hispanic student enrollment. The National Science Foundation ranks colleges awarding associate degrees in science and engineering by gender and race. City Tech ranks 8th for associate degrees to males, 7th for degrees to black students, and 9th to Asian students.



The demographic breakdown within the participating departments is reflective of the entire school. The breakdown by gender at the college is about 50%. In the Engineering Technology majors, however, the female percentage is typically less than 20%.

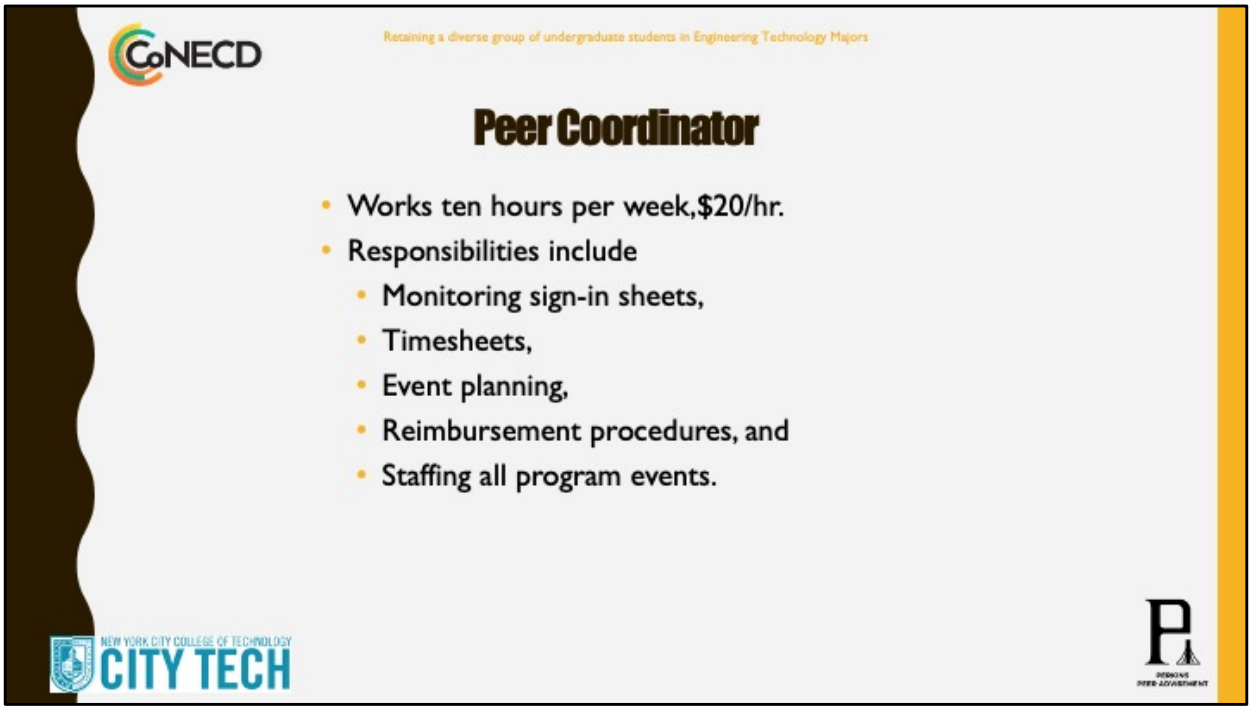


The enrollment of female students has increased in all of the participating departments since the program was launched in Spring 2015.

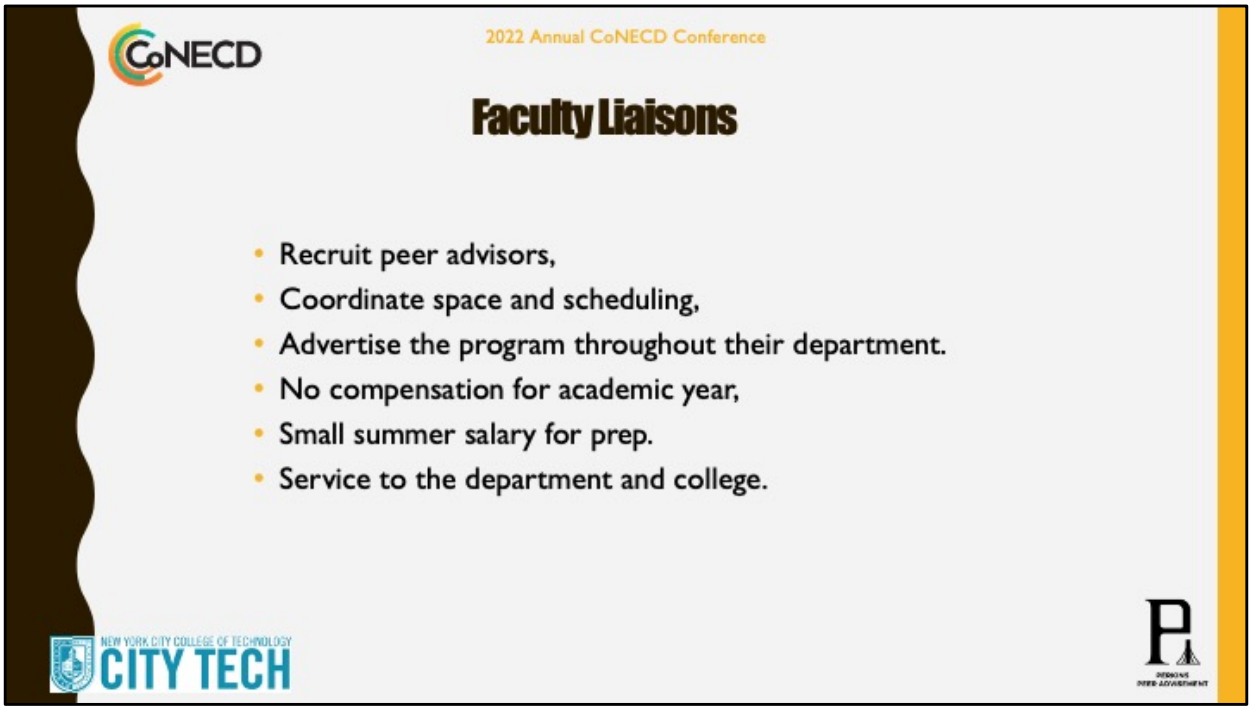


The PPA program organization is critical to ensure the program elements run smoothly. The program is managed by a faculty member serving as the Project Director and experienced students are hired as peer advisors. A senior student or recent grad is hired as the Peer Coordinator to assist the Project Director. Each department has a designated faculty liaison and four peer advisors.

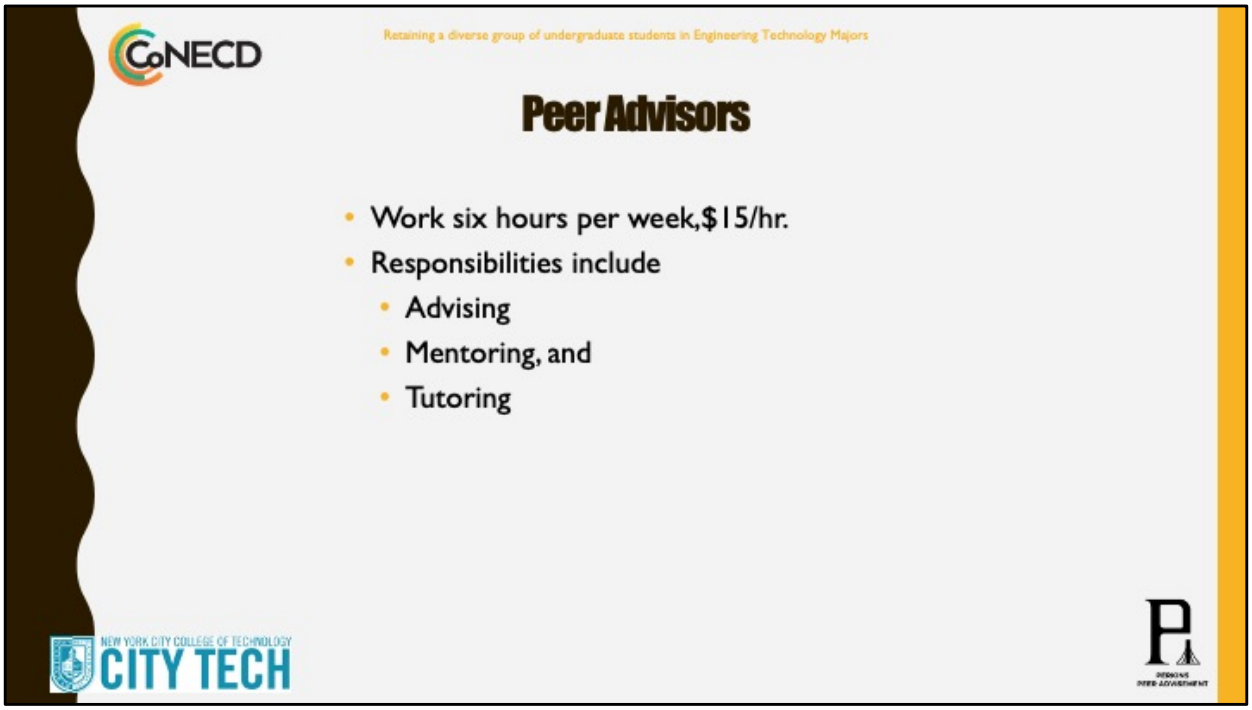
The Project Director administers the program and oversees the activities across all five departments. Initially there was no compensation for this role. However, based on the success of the program, as support from administration grew, the role earned recognition and compensation. During the pandemic, the Project Director has not received any compensation during the academic year.



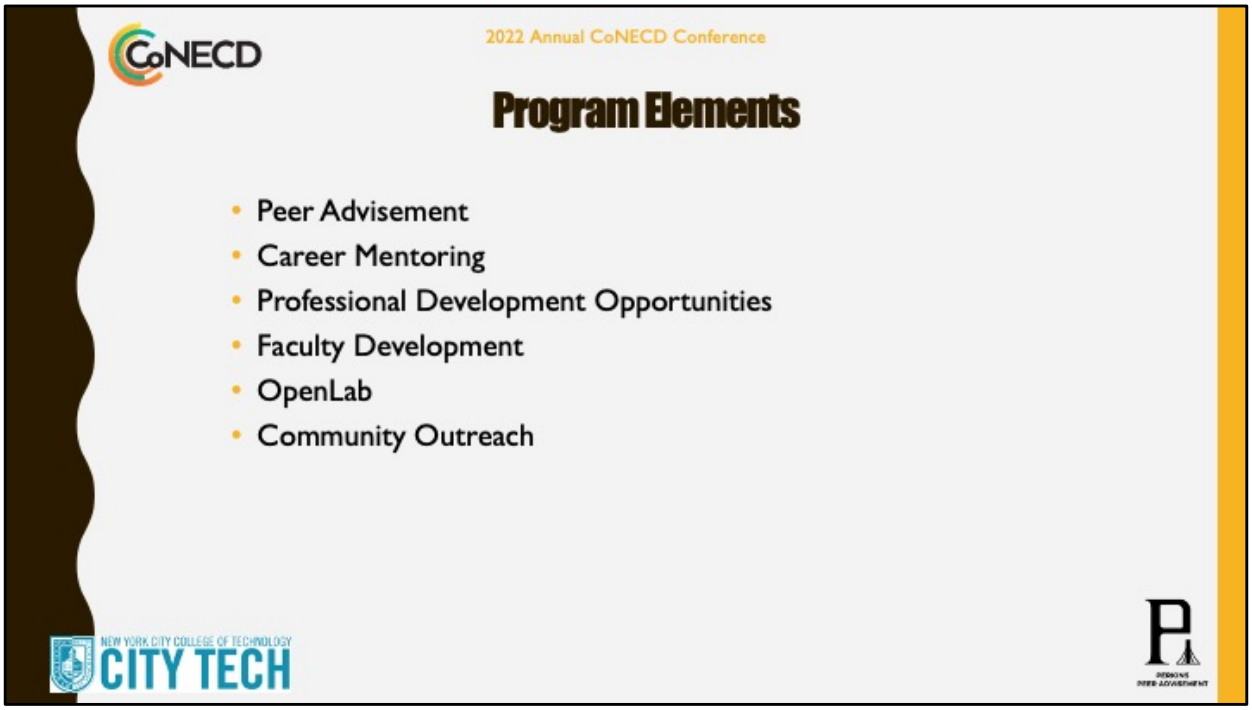
A student is hired as the Peer Coordinator to assist in the administrative tasks required for coordinating the program. An effective peer coordinator is critical to the success of the program. The coordinator keeps the Project Director on track and keeps the OpenLab updated.



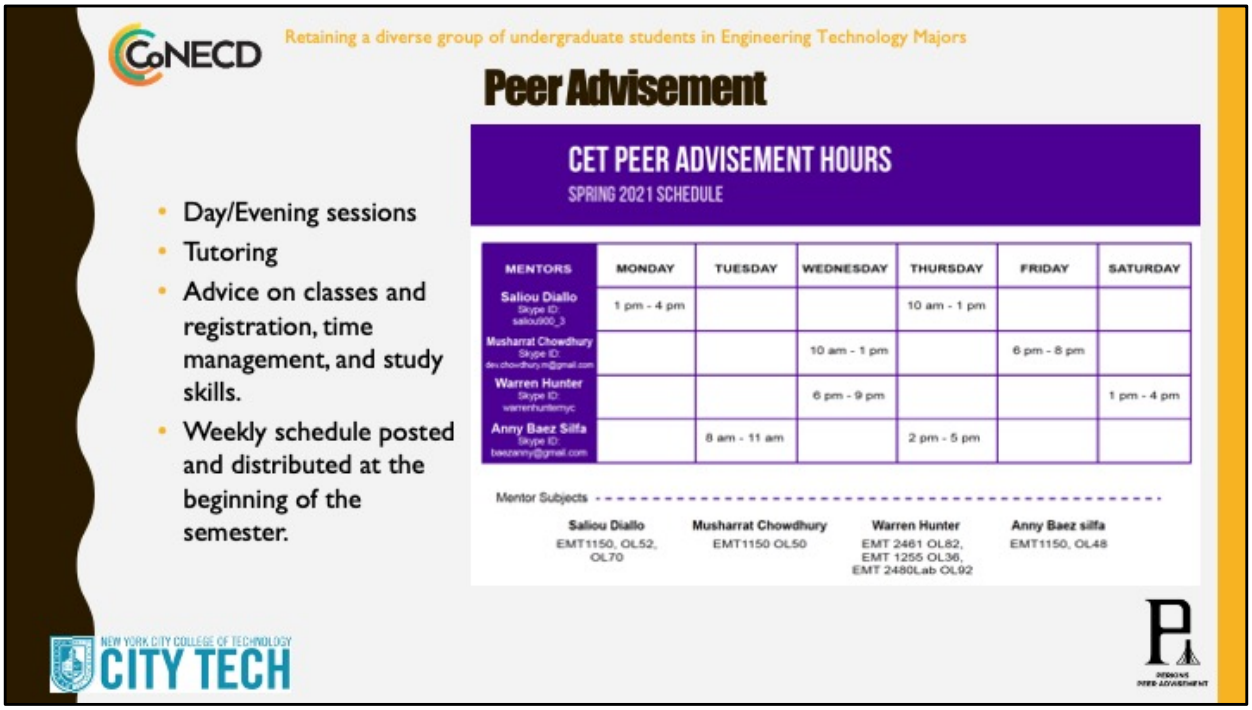
Each department has a faculty liasion. This position has no compensation and is considered a service to the college. The faculty liasion is the most important link to the departments for recruiting hires and promoting the program among faculty and students within their department.



Each department hires four Peer Advisors/Mentors to work 6 hours/week. During the pandemic we have moved to an online tutoring platform. We are hoping to move towards a hybrid model for this academic year as we acknowledge that there are benefits to both in person and online tutoring. The program is beneficial to both peer mentors and mentees. Peer mentors gain leadership skills and professionalism. We hire male and female students as peer advisors. Studies show that mentors of the same gender are more effective for retention therefore we aim to maintain at least 50% of female employees.



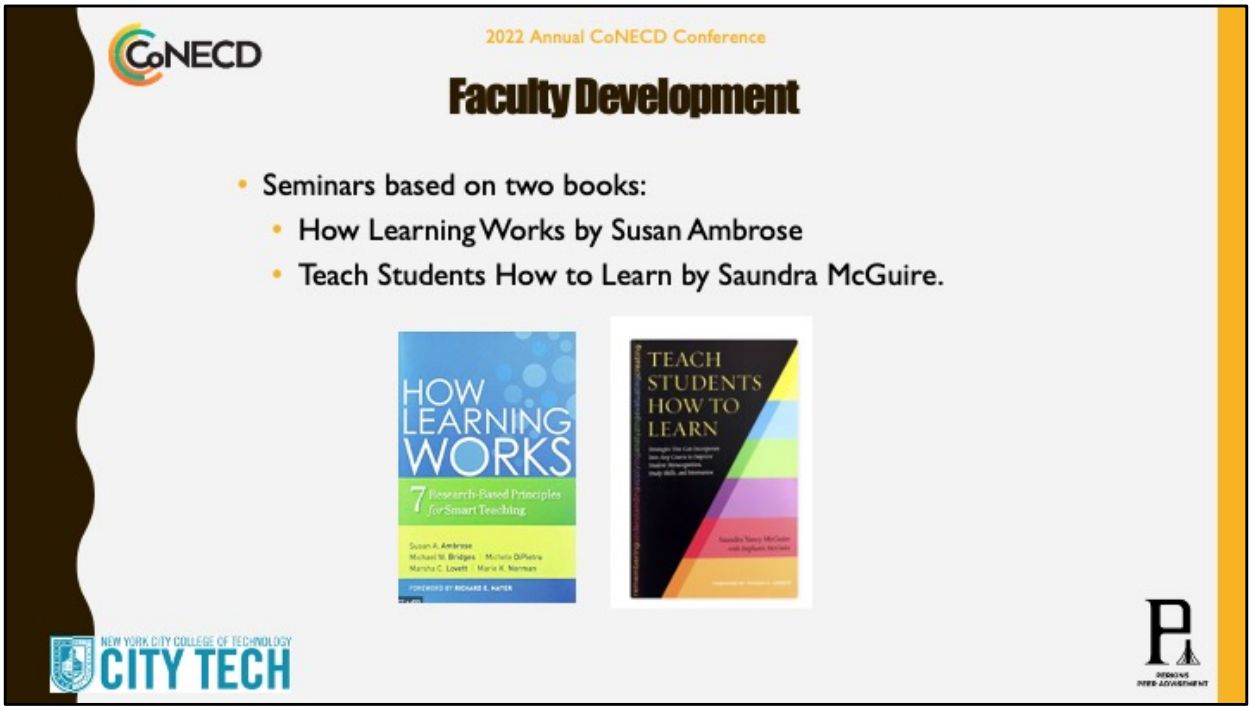
Program activities include professional development, mentoring, faculty development and community outreach. Studies show that these elements contribute to retention of females and underrepresented students in STEM majors. Program information and resources are housed on the OpenLab, a digital platform designed for the City Tech community.



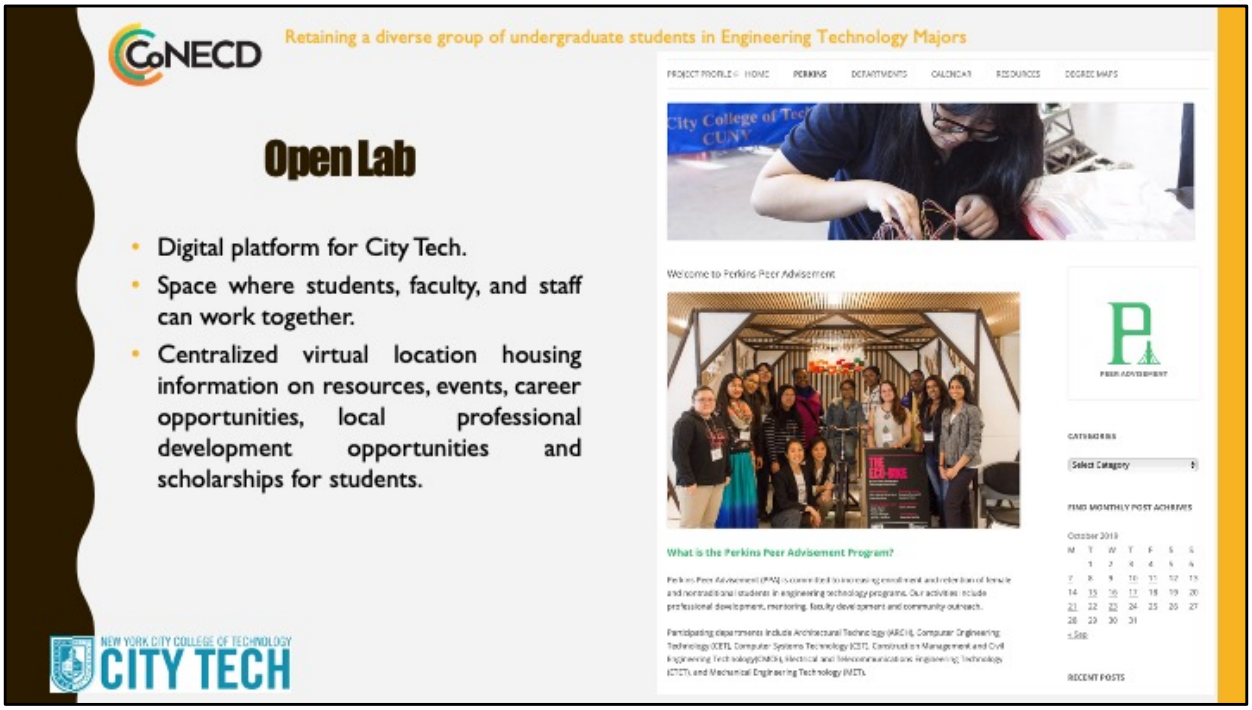
Peer Advisement takes place through scheduled hours where peer advisors are available for tutoring, advice or simply to chat. Peer advisors are available at different times throughout the day. The schedules are intended to minimize overlap and increase availability of peer advisors to students. The schedule is determined at the beginning of the semester. It is shared with faculty and students and posted on the OpenLab platform.

Professional Development activities are planned monthly including guest speakers, recruiters, alumni, construction site visits, etc. The topics vary among the engineering technology fields but we always looks for speakers that can relate to the students. Having speakers that look like the students and have similar backgrounds and experiences can provide the students with a role model in their field of interest. During the pandemic the workshops were held virtually.

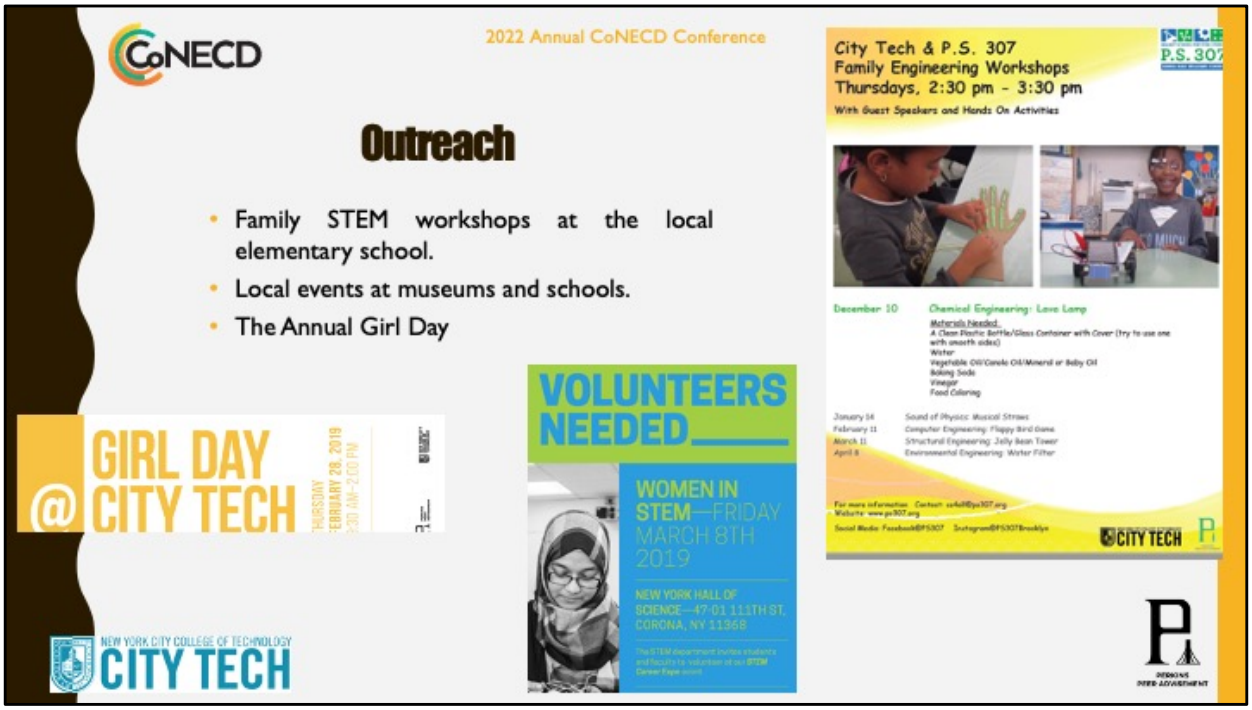
The primary focus of the program is on the associate level students; however each semester, there is a cohort of about 20 Peer Advisors working for the PPA program that develop as leaders in their respective departments and mentors for their peers. As peer advisors, they participate in orientation and professional development workshops. The peer advisors are recruited from their respective programs and typically have completed their associates degree and pursuing their bachelor's degree. The grant provides experiences for conference participation for advisees and encourages conference presentations for peer advisors. Their experience as peer advisors provides them with many valuable workplace skills.



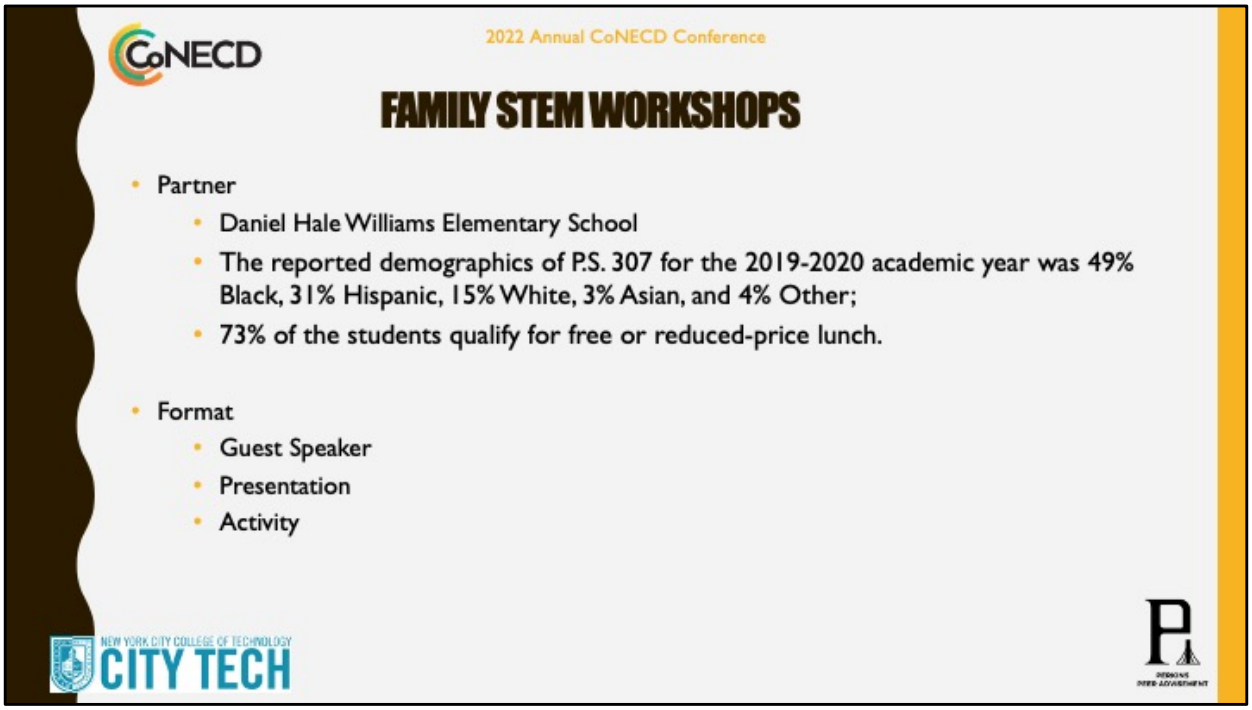
Faculty development seminars have been conducted in an effort to bridge the gap between teaching and learning, specifically when it comes to helping our students be the best learners they can be and Professors understanding how they can meet the students half way.



The OpenLab is a state-of the-art digital platform that everyone at City Tech can join. It promotes an open environment enabling communication and connections within the College and beyond while simultaneously providing a space where students, faculty, and staff can work together. The PPA Page serves as a centralized location housing information on resources, events, and opportunities for students.

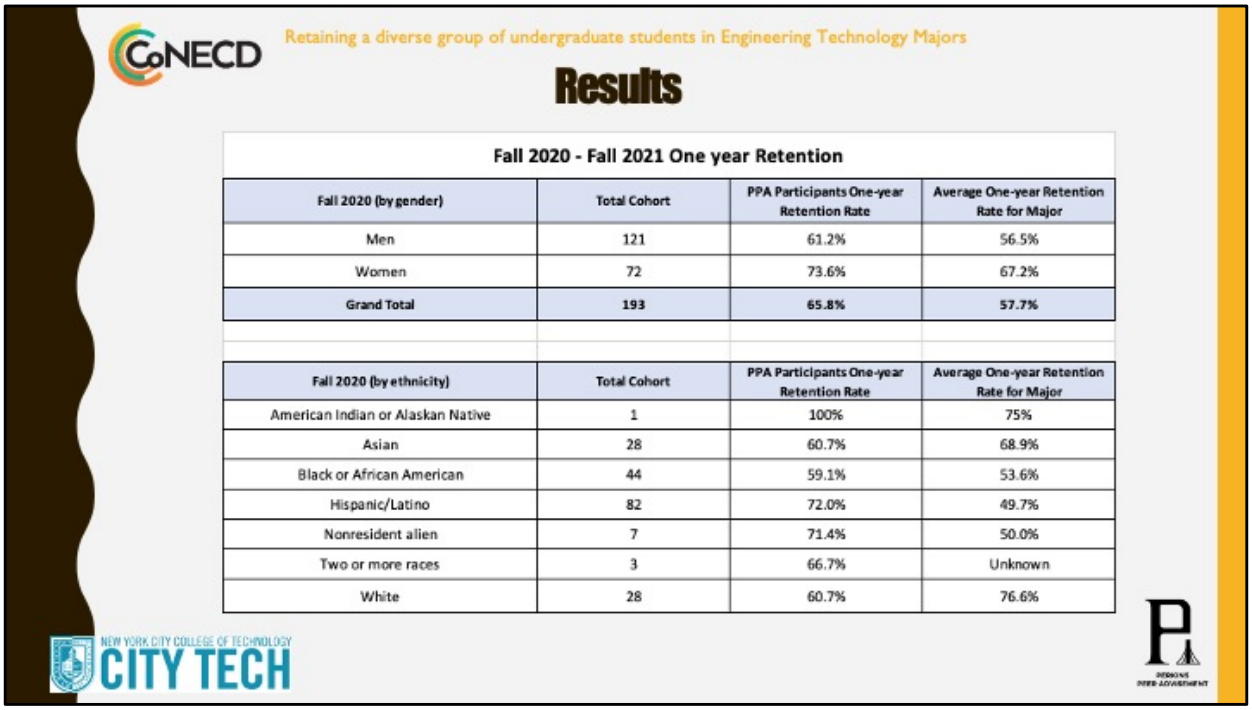


Community outreach is a critical component of the program as it benefits the undergraduate students hosting the events as well as the K-12 students participating in them. As part of the outreach component, PPA provides monthly family STEM workshops at the local elementary school and hosts an annual Girl Day event in recognition of National Engineers Week. These activities hope to promote exposure of STEM careers at the K-12 level.



The guest speakers are content experts on the workshop topic and can be college students, alumni or industry professionals. The presentation highlights related career opportunities and information on middle schools and high schools with a STEM focus. The activity is designed to engage the participants in a hands-on project aligned with the workshop topic. The presentation also includes information on college majors of study to inspire the participants to think about long term college plans. During the activity the students are divided into breakout rooms to allow for smaller groups and greater engagement. The activity is followed by a discussion about challenges and successes of the activity.

A key component of the grant is the communication, recruitment and awareness of females and nontraditional students in STEM through development of marketing materials and participation at local community events.
Materials were developed that highlight diverse students, particularly females.

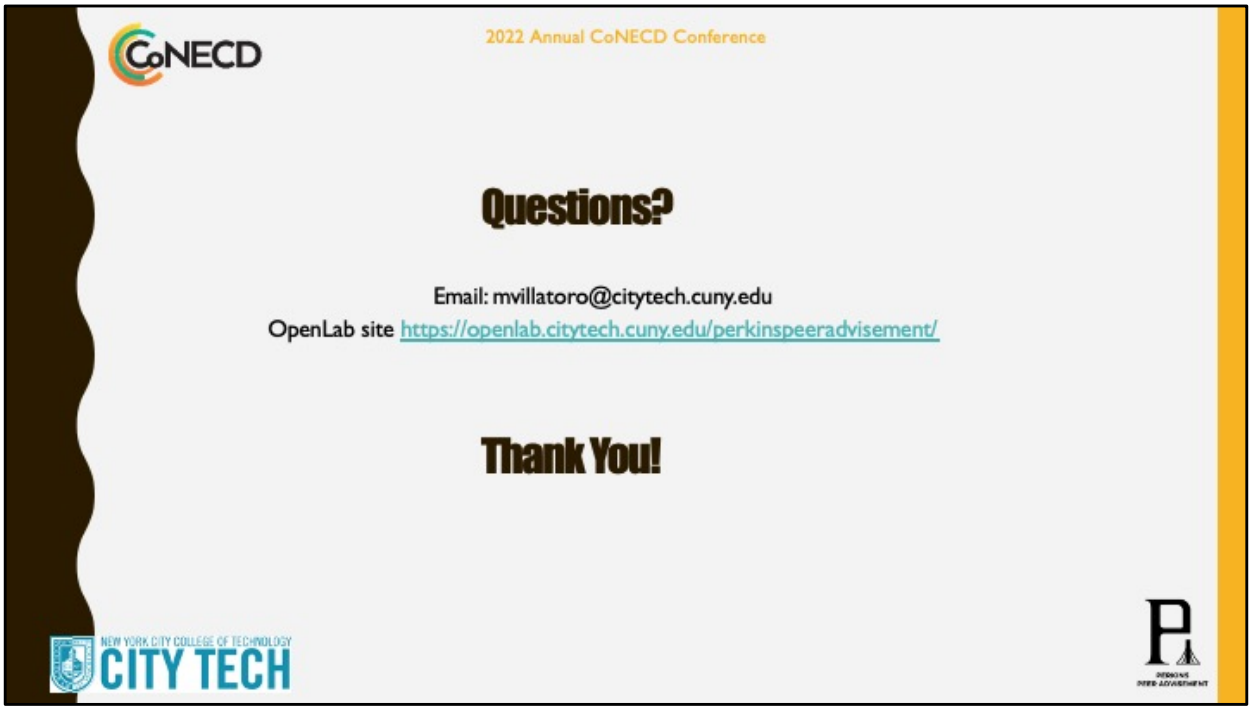


Fall 2020 (by gender)	Total Cohort	PPA Participants One-year Retention Rate	Average One-year Retention Rate for Major
Men	121	61.2%	56.5%
Women	72	73.6%	67.2%
Grand Total	**193**	**65.8%**	**57.7%**

Fall 2020 (by ethnicity)	Total Cohort	PPA Participants One-year Retention Rate	Average One-year Retention Rate for Major
American Indian or Alaskan Native	1	100%	75%
Asian	28	60.7%	68.9%
Black or African American	44	59.1%	53.6%
Hispanic/Latino	82	72.0%	49.7%
Nonresident alien	7	71.4%	50.0%
Two or more races	3	66.7%	Unknown
White	28	60.7%	76.6%

Retention rates in the participating majors was used as an indicator for the success of the program. PPA program activities are open to all students at City Tech, regardless of gender. Overall, one-year retention rates for all participating students are typically above 65%, compared to the overall average retention rate of 58% in these majors. The retention rates for participants compared to non-participants for non-traditional students in STEM were higher. Hispanic/Latino was 72% versus 49.7%; Black/African American was 59.1% versus 53.6%; Nonresident alien was 71.4% versus 50%, Female was 73.6% versus 67.2%.

These retention rates indicate that the components of PPA are beneficial to all students and can be of particular benefit to target underrepresented groups and promote student success and advancement of a diverse student population in STEM.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