



# The Change Makers: How Three Universities Are Helping Underrepresented Engineering Students Succeed at Higher Rates

A PILOT PROJECT BY  
APLU & ASEE

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# INTRODUCTION

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*“Engineering programs must find better ways to attract and retain minority students if the United States is to remain a technological leader”  
(Alting, 2007)*

As the challenge to broaden participation across STEM fields continues, a fundamental question is: Why are certain universities more successful in granting degrees to students in Underrepresented Groups (URG) than other institutions? What are they doing differently? Are there practices or approaches used by certain institutions that might work for other institutions?

“Despite large numerical increases for Hispanic and Black students, these two groups along with American Indian/Alaska Native (AIAN) and Native Hawaiian/Pacific Islander (NHPI) students remain significantly underrepresented in engineering at the undergraduate and graduate level.” (APLU, 2018)

This pilot study explored the potential to identify relationships between notable changes in institutional practice with increased success by engineering students in underrepresented groups. The key question examined was:

***Can we identify specific equity-focused policies and practices to explain variation among institutions in undergraduate engineering degrees awarded to URG students?***

The work detailed in this report was an outgrowth of the 2018 Status Report on Engineering Education by APLU (NSF award EEC-1734899) and particularly its first report entitled [The 2018 Status Report on Engineering Education: A Snapshot of Diversity in Degrees Conferred in Engineering](#) (APLU, 2018). That project identified significant variations across large research institutions, Minority Serving Institutions (MSI) and all other institutions in their success in the number of engineering degrees they awarded to URM students.

This study was a small pilot focused on 3 institutions, each of which has been recognized at the bronze level of the [ASEE Diversity Recognition Program](#) (ADRP) for their diversity efforts. The engineering dean of each institution first signed the ASEE [Deans Diversity Pledge](#) and took the next step in applying for this recognition program. The pledge noted that a measure of success will be a notable increase in diversity in enrollments, retention and graduation rates of engineering and engineering technology students, and increased diversity in faculty and in the engineering workforce, over the next decade.

Information on graduation rates and programs aimed at serving URG students at The City College of New York, Georgia Institute of Technology, and California State University, Los Angeles were assessed to provide examples of successful strategies at diversely categorized institutions. Respectively, they are categorized as: a Doctoral University: high research activity; a Doctoral University: very high research activity; and a Master’s College & University: Larger Program (Carnegie, 2023).

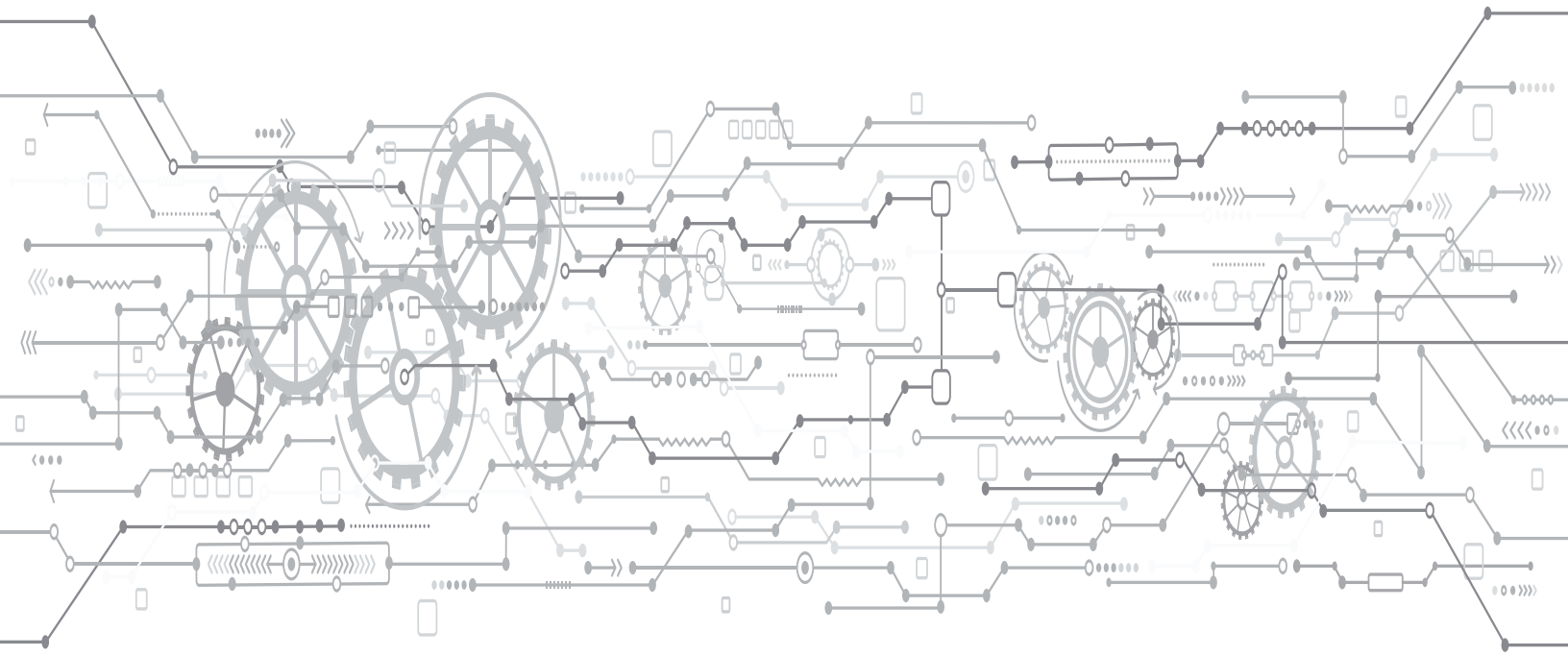
## PURPOSE OF THIS STUDY

As a result of the earlier analysis conducted in the 2018 APLU report, we recognize variations in programming across the campuses, seek to identify similarities and differences among unique policies, practices, and procedures on engineering degrees awarded to URG students and ask whether it is possible to broadly understand the variation in institutional success by the combination of programs underway at different campuses. The report highlights programs and practices at three institutions that are diverse geographically and categorically with the expectation that it may serve as a starting point for other institutions seeking to increase their URG undergraduate graduation rate.

## LIMITATIONS AND UNDERSTANDINGS

Data and narratives in this study are a composite of excerpts from each institution's ADRP application, publicly available information, ASEE's Engineering Data Management System (EDMS), and updated reports provided by the institution.

This report is not meant to suggest that the programs and policies highlighted will provide the same success at every institution. Differing factors exist at various institutions that affect success rate. Such factors can include admission selectivity, student socioeconomic levels, institutional funding, faculty and staff willingness and availability, location, and facility availability. Current widely accepted "best practices" for supporting URM engineering students can be difficult to implement, since most of them were developed at predominantly white research institutions with significant resources.



# FINDINGS FROM STUDY SITES

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This section includes overviews of the engineering schools, descriptions of programs focused on diversity, equity, and inclusion, and data for a subset of those programs for the three schools in this study: The City College of New York, Georgia Institute of Technology, and California State University, Los Angeles.

## THE CITY COLLEGE OF THE CITY UNIVERSITY OF NEW YORK, THE GROVE SCHOOL OF ENGINEERING

### **Institutional Overview and Background Information**

The City College School of Technology, which became the School of Engineering in 1962, was established in 1919. The College was the first free public institution of higher education in the United States and classified as a Regional Public University. Approximately 3,300 students pursue degrees at the Baccalaureate, Masters, and Ph.D. levels in a broad range of disciplines including Biomedical Engineering, Civil Engineering, Chemical Engineering, Computer Engineering, Computer Science, Cybersecurity, Data Science and Engineering, Electrical Engineering, Mechanical Engineering and Translational Medicine. It is the only public school of engineering within New York City.

### **URG Undergraduate Programs, Policies, Initiatives**

The Grove School of Engineering (GSOE) offers several programs to enhance the success of URG students. Female student participants are an area of focus. These programs are detailed below.

#### *Summer Bridge Program*

The Grove School of Engineering summer bridge program serves as an access point to its undergraduate engineering and computer science programs. It is part of a concerted effort by the Grove School to improve the math skills of entering freshman students that will, in turn, increase the likelihood of them graduating with either an engineering or computer science degree.

For a first-year student to gain admission to the undergraduate programs in the Grove School of Engineering, they must meet all its freshman admission criteria including placement into Calculus I. Applicants who meet all the freshman admissions criteria but have placed into pre-Calculus rather than Calculus I are invited to participate in the summer bridge program. Not all the invited students take advantage of this opportunity to begin their college studies during the summer prior to their first fall semester.

Barriers to participation for those who may want to but who choose not to participate include pre-existing summer plans such as prior travel engagements, a need to provide care for loved ones such as younger siblings or elderly relatives, or the necessity to earn funds during the summer to help financially support their family. The summer bridge program at the Grove School of Engineering began in the summer of 2018, the year when the school implemented a new freshman admissions criterion that included placement into Calculus I. The program is free-of-charge to participants.

The Grove School of Engineering summer bridge program is institutionalized and is open to all qualified students who would benefit from participation and who comprise the diverse population that is New York City and beyond. Some special opportunities through external partnerships for target populations were available for summer 2022 bridge program participants and demographic information for the summer 2022 program cohort is provided below.

Overall Program Data

<b>Total Number of Participants:</b>	<b>73*</b>
Successful Completion Data for All Program Participants	
<b>Number of Participants that Completed AND Passed</b>	<b>68**</b>

Under-Represented Minority (URM) Program Data

<b>Total Number of URM Participants:</b>	<b>18 (25%)</b>
Successful Completion Data for URM Program Participants	
<b>Number of URM Participants that Completed AND Passed</b>	<b>18 (100%)</b>

Female Program Data

<b>Total Number of Female Participants:</b>	<b>21 (29%)</b>
Successful Completion Data for Female Participants	
<b>Number of Female Participants that Completed AND Passed</b>	<b>19 (90.5%)</b>

\*Additional students participated in the summer bridge program as a refresher and to engage in the Grove School student community before their college studies began in the fall. These students were assessed through a rubric based on their grades, high school course work, or AP scores to be Calculus-ready and were accepted as entering freshman students, and as such, they are not included in this data.

\*\*The 68 participants that successfully completed and passed this program represent approximately 30 percent of the entering freshman class in Fall 2022 of the Grove School of Engineering.

### *Other Affiliated Programs*

Two City College of New York initiatives are the City College Academy for Professional Preparation (CCAPP) Summer Program and the City College Initiative to Promote Success in STEM (CiPASS) Summer Program. A select group of incoming freshman students who are accepted into the Grove School of Engineering as entering freshman students at the juncture of freshman admissions (in the summer prior to their entry into the college) participate in the CCAPP summer program. Another select group of incoming freshman students who may eventually become qualified for entry into the Grove School of Engineering as entering freshman students or as internal transfer students in the future participate in the CiPASS summer program. These programs do not reside in the Grove School of Engineering; they are special programs that are available to entering freshman students who are accepted into The City College of New York (and transcends across multiple disciplines at the College). Data associated with these special programs are independent of the Grove School of Engineering.

The population that is served by the two Joint/Dual Degree partner institutions of the Grove School of Engineering are representative of the communities where these two community colleges reside: Hostos Community College is located in one of the most economically-disadvantaged districts in America (where there is a large Hispanic population and a sizeable Black population) and LaGuardia Community College is located in the most diverse county in America (and possibly, in the world) i.e. Queens (with a significant number of Hispanic/Latinx population and recent immigrants). With limited staffing resources at the Grove School of Engineering, its main priorities are concentrated on serving the students in the joint/dual degree programs especially as related to their academic preparation, their transition to the Grove School of Engineering and their assimilation

into the Grove School of Engineering community (with an emphasis on academic excellence). A comprehensive demographic statistical analysis of the program is pending.

In addition to specific programs, the school indicated in its diversity plan of 2019: Targeted services for URMs and female students at the Grove School of Engineering will be developed and strengthened in the areas of academic advising, supplemental instruction, tutoring, mentoring by professionals and alumni, transition assistance (orientation), peer mentoring, access to research and experiential learning opportunities and hands-on.

### **Data**

Figures one and two show the graduation of African American and Hispanic students by cohort. The information depicted beneath the gender breakdown indicates which cohorts are the source of the data. Numbers in parentheses show the average number of students in each cohort. A cohort is defined as the group of students that began their degree programs in the same year. All data in the figures below were provided by the GSOE at City College.



Figure 1. City College 6 Year Graduation of Black Full-time Freshmen Cohorts

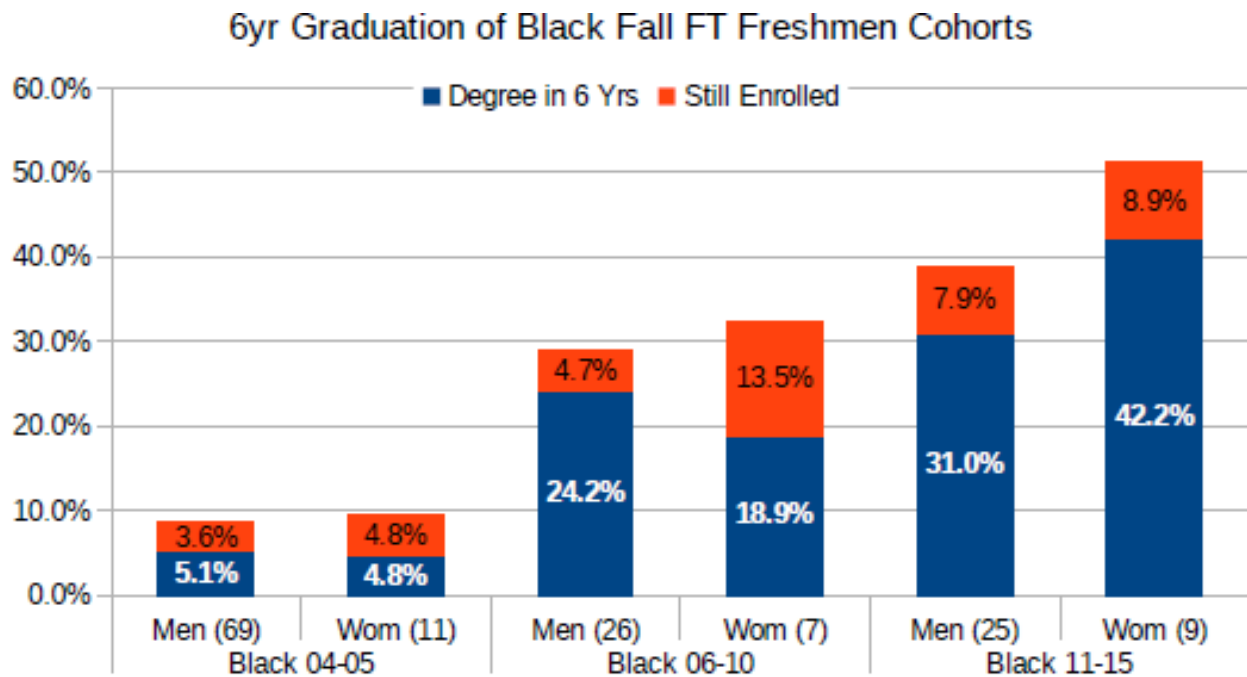
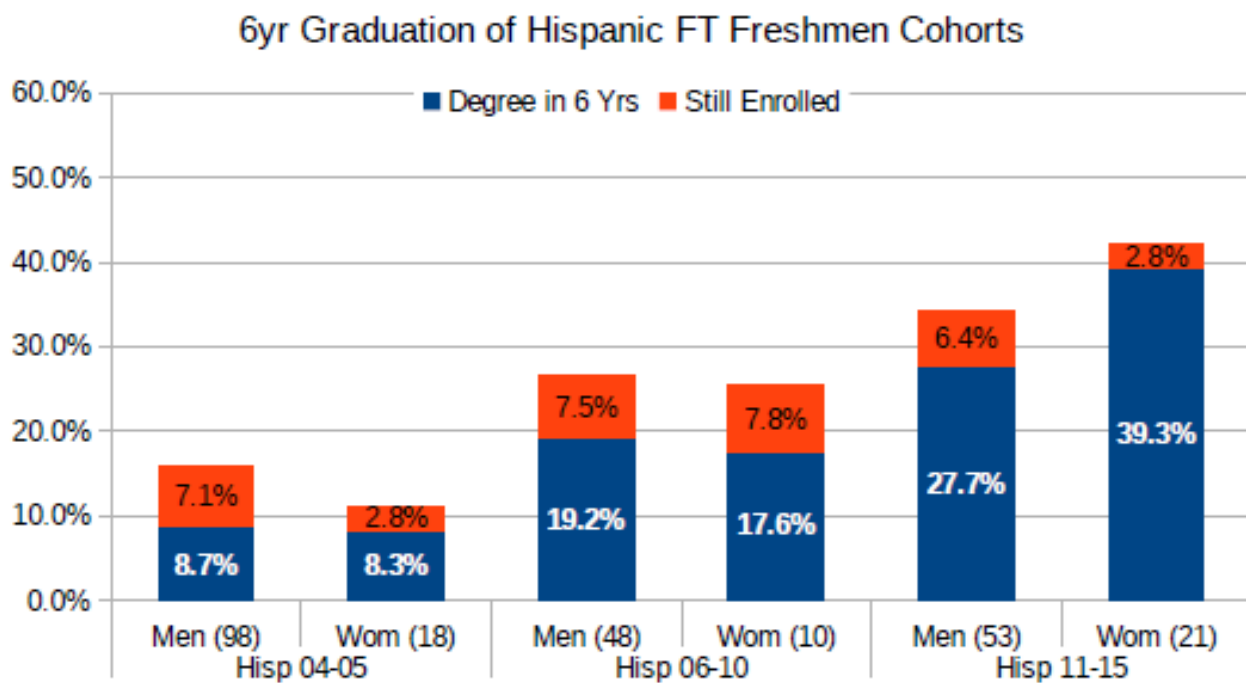


Figure 2. City College 6 Year Graduation of Hispanic Full-time Freshmen Cohorts



# GEORGIA INSTITUTE OF TECHNOLOGY, COLLEGE OF ENGINEERING

## Institutional Overview and Background Information

Georgia Institute of Technology was founded on Oct. 13, 1885, as the Georgia School of Technology. The college is ranked number one in engineering degrees awarded overall to women and minorities and in engineering doctoral degrees awarded to Black students. There are 11 undergraduate majors leading to 12 degrees across the College’s eight schools. Georgia Tech is categorized as a public research university.

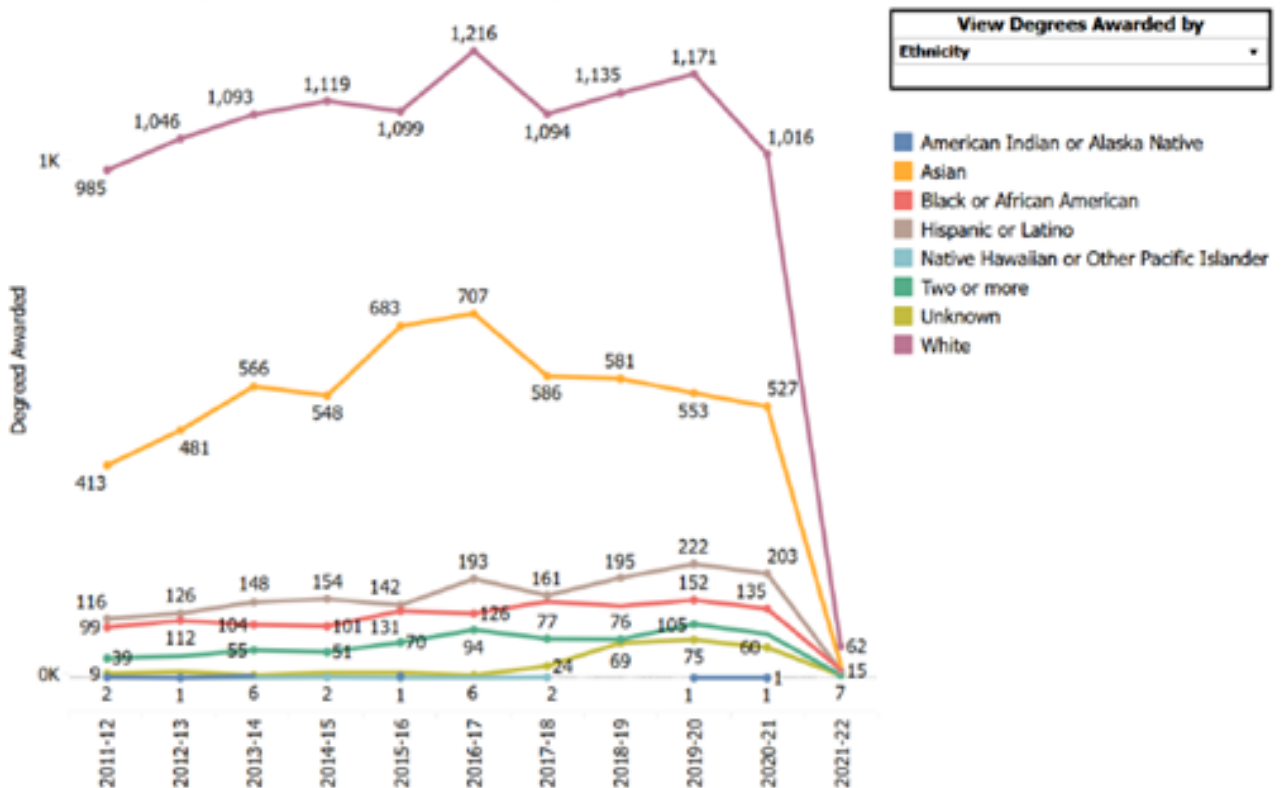
## Data

For all of Georgia Tech, the 5-year graduation rate is 90.2%. For the College of Engineering, the 5-year graduation rate is 90.3%. These are for the most recent Fall 2017 cohort.

It has been and continues to be a priority for Georgia Tech to better serve URM students. A breakdown by ethnicity of students that were awarded bachelor’s degrees by the College of Engineering over the past ten years following in **Figure 3**.

Figure 3. Georgia Tech Ten Year Bachelor’s Degrees Awarded by Ethnicity

College of Engineering Ten Year Bachelor’s Degrees Awarded by Ethnicity



Note: 2020-2022 were impacted by COVID-19 and thus the data are incomplete.

## URG Undergraduate Programs, Policies, Initiatives

The College's undergraduate initiatives are centered around partnership, mentoring for retention/graduation, and research. Under the Center for Engineering Education and Diversity (CEED) in the College of Engineering, to retain and graduate non-traditional and underrepresented students, the College has invested in the following initiatives.

### *Mentoring*

As depicted in **Figure 4**, Georgia Tech employs a tiered mentoring program that provides academic, financial, and social support to ensure that minority students are retained in STEM degree programs.

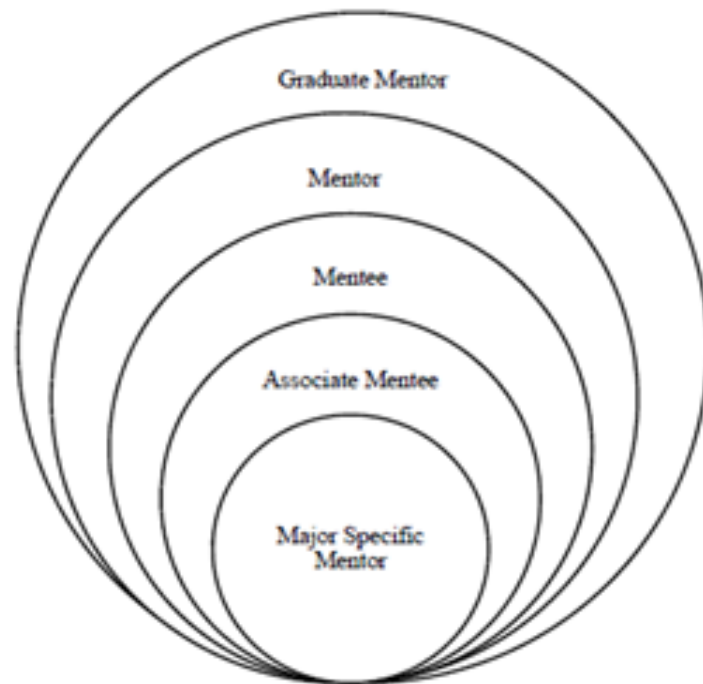
**Figure 4. Georgia Tech Tiered Mentoring Program**

#### Key features

Semester Stipend

Major Specific Mentoring

Monthly Professional Development



### Peer-2-Peer Mentoring (P-2-P)

Focused on students who are traditionally underrepresented in STEM fields—including African American, Hispanic/Latino, and Native American/Pacific Islander—P-2-P is a retention program that is open to all students. The target population is non-traditional/ethnic minority STEM undergraduates, although 96% of participating students are engineering majors. P-2-P is part of a broader mentoring program as shown in **Figure 4**.

The P-2-P program was created due to an overwhelming student interest for the GT-PSLSAMP; therefore, the program was created to meet the student demand. Supporting P-2-P, there is a staff member who acts as a program manager. She is the assistant director of undergraduate initiatives in the Center for Engineering Education and Diversity (CEED).

## Data from P-2-P

Since 2017, P-2-P has served both undergraduate and graduate students. More specific data that serve as indicators of success as well as demographics of participants are displayed below.

- 140 undergraduate participants (99% overall graduation rate)
- 82% engineering majors
- Race of Engineering Majors
  - » Black: 56%
  - » Latin/Hispanic: 23%
  - » Unknown/Other: 21%
- Gender of Engineering Majors
  - » Female: 44%
  - » Male: 56%
- 93% retention rate of participants enrolled in STEM majors at Georgia Tech

## The Peach State Louis Stokes Alliance for Minority Participation (LSAMP)

Since 2016, Georgia Tech has been a member of the Peach State Louis Stokes Alliance for Minority Participation (LSAMP). LSAMP has supported over 250 students with mentoring, research experience, professional development, and financial support.

The goal of the LSAMP program at Georgia Tech is two-fold:

- to focus on the retention of URM students through completion of the baccalaureate degree, and
- to expose URM students to research careers in STEM.

Toward the two-fold goal, LSAMP provides professional development, graduate school prep, peer and faculty mentoring, summer research funding, access to conferences, and financial support.

## Data from LSAMP

Indicators of success as well as demographics of LSAMP participants since its inception follow.

- Retention and graduation rate: 100%
- Average GPA: 3.3
- Major Field of Study
  - » Engineering: 82%
- Race of Engineering Majors
  - » Black: 72%
  - » Latin/Hispanic: 21%
  - » Unknown/Other: 7%
- Gender of Engineering Majors
  - » Female: 54%
  - » Male: 46%

### *Summer Undergraduate Research Experience (SURE)*

With the goal of attracting qualified, underrepresented minority students into graduate school in STEM fields, SURE is a 10-week summer undergraduate research program that allows students to conduct research on the GA Tech campus. Students are mentored by faculty and graduate student advisors, attend professional development workshops, industry visits, and social activities that promote community building and establish rapport between students. The target population is URM sophomores, juniors, and seniors.

### *Financial Support*

The Georgia Institute of Technology partners with National Action Council for Minorities in Engineering to provide scholarship support to undergraduate African American, Native American, and Hispanic/Latino students enrolled in STEM majors. In addition, the Retaining Inspirational Students in Engineering (RISE) Scholarship program was established as an avenue to recruit and retain both minorities and nontraditional engineering students.

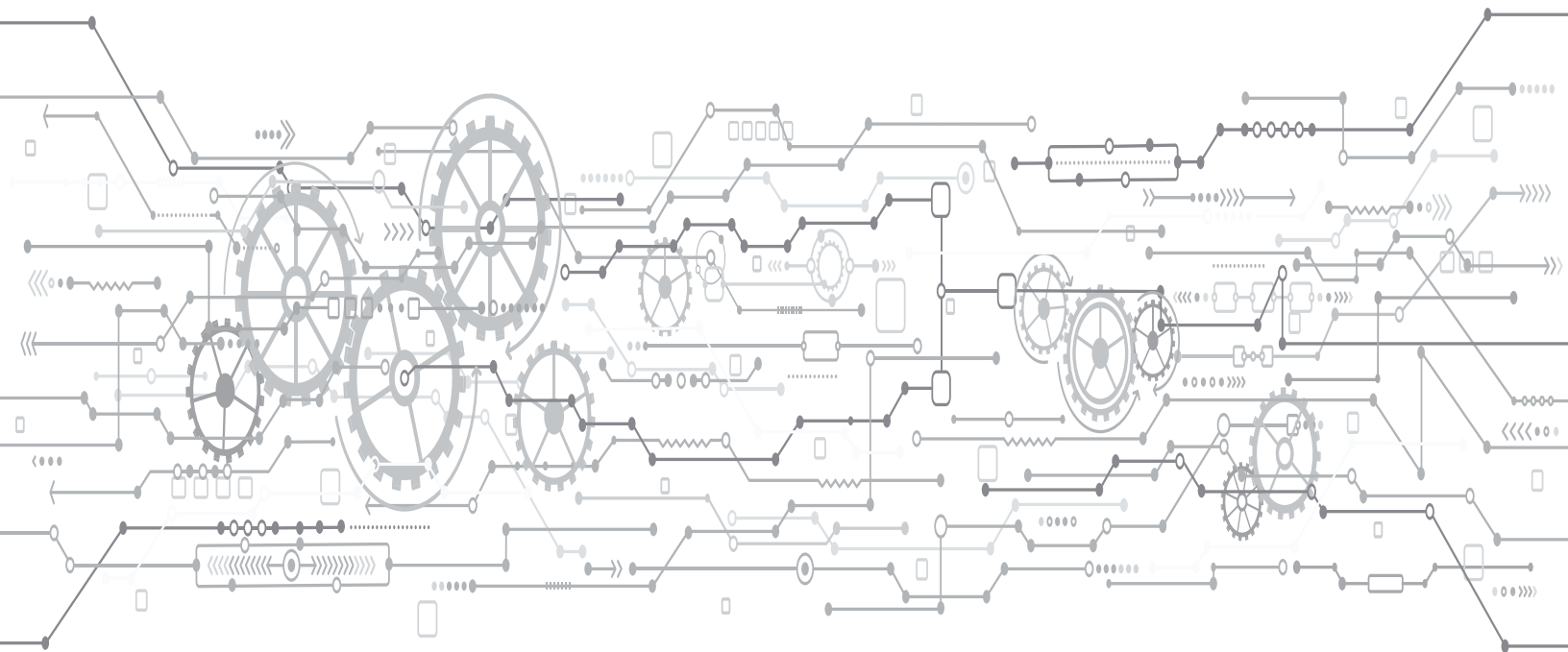
### *Summer Engineering Institute (SEI)*

Founded in 2008, SEI is a three-week residential summer program for underrepresented minority rising junior and senior high school students that provides an intensive immersive experience in creating and completing an engineering-themed project led by graduate students. The goal of GT-SEI is to offer students a real-world engineering experience that prepares them for the challenges and opportunities to come.

### *Data from Summer Engineering Institute (SEI)*

Tracking and assessment measures for the SEI program are defined by the following data:

- 84 percent of SEI participants pursue BS degrees in a STEM Field
- 94 percent retention rate for SEI participants that enroll at Georgia Tech



# CALIFORNIA STATE UNIVERSITY, LOS ANGELES, COLLEGE OF ENGINEERING, COMPUTER SCIENCE, AND TECHNOLOGY

## Institutional Overview and Background Information

California State University, Los Angeles is located East of downtown Los Angeles and enrolls students primarily from high schools and community colleges in the eastern part of LA County. The undergraduate population of the university as well as the college is over 75% underrepresented minorities (URM), primarily Hispanic (72%), primarily first generation to college (57%, though only 20% of parents have a 4-year degree), low-income (65%), and with a large percentage of first-generation English speakers.

The College of Engineering, Computer Science, and Technology (ECST) enrolls about 3,000 undergraduates and 250 Master's students. The College offers BS degrees in Civil, Electrical, and Mechanical Engineering, Computer Science, Engineering Technology, Aviation Administration, and Fire Protection Administration and Technology. The college has 59 tenure-line faculty, 100 adjunct faculty, and 40 administrative, student support, and technical staff. The institution is classified as public, comprehensive, Hispanic Serving Institution (MSI/HSI).

## URG Undergraduate Programs, Policies, Initiatives

In addition to programs and initiatives that intentionally cater to the URM population at their institution, California State University, Los Angeles also reported a policy change.

### *Pre-major Designation*

Starting in Fall 2019, per a new policy, all students must complete certain required math and science classes within a certain number of attempted units, before they can be classified into their major. For example, pre-mechanical engineering students must complete Physics 1, Calc I and II, and Chemistry to transition to the mechanical engineering major. This has resulted in students having a deeper understanding of the academic performance that is expected of them, as well as several students making the decision to change major out of the college or to technology majors instead, thus improving their likelihood of graduating from the university with a four-year degree.

### *The Acceleration Initiative*

ECST's student success programs are housed under the Acceleration Initiative, which is based on the idea that, rather than asking whether our students are college-ready, the college asks whether it is student-ready. The initiative includes K-12 programs, pre-matriculation programs, and freshman, sophomore, and transfer programs.

The goal of the Acceleration Initiative is to improve the 4-, 5-, and 6-year graduation rates of the mostly underrepresented minority students who start as freshmen, to reduce time to degree for transfer students, and to increase gender diversity in the incoming student body. Programs are described below.

### *Math, Engineering, and Science Achievement (MESA)*

The MESA program is a middle-and high-school enrichment program serving 1000 kids, offered at 30 partner schools in our region of LA County. It is part of a statewide program, offering enrichment training to teachers, host campus activities and competitions, and help steer MESA participants into college STEM programs. MESA is funded by a statewide grant.

### *LAUNCHPAD*

LAUNCHPAD is a two-week summer engineering and computing camp for rising high school senior girls from our local schools. Faculty and college students provide hands-on activities introducing the participants to various fields of engineering and computing. Industry speakers bring the participants into their workplaces virtually and discuss their career paths and challenges. LAUNCHPAD begins its fifth cohort in 2023. Alumni of LAUNCHPAD who enroll at Cal State LA are some of our most passionate and committed student leaders. LAUNCHPAD has been funded by philanthropic gifts from individual donors, Boeing Global Engagement, and other local industries including Los Angeles Department of Water and Power and Aerojet/Rocketdyne.

### *Summer Transition to ECST Programs (STEP)*

STEP is a free summer bridge program for matriculating ECST freshmen that began in 2008 and includes calculus preparation and community building. Over 250 incoming freshmen typically enroll in STEP during July and August; the program includes a math bootcamp, introduction to college student organizations, and freshman orientation. STEP has been offered for free to students for more than 10 years. STEP enrolled about 80 percent of incoming freshman during pre-COVID years, and since the pandemic about 50 percent of incoming freshman enrolled in the virtual program. The STEP program will return to in-person programming, including a dorm stay, in summer 2023. Many students cite their STEP experience

as the most foundational help to their degree attainment. STEP is currently partially funded by the Ralph M. Parsons Foundation.

### *First-Year Experience@ECST (FYrE)*

FYrE is a first-year cohort program for calculus starters who choose to commit to the program after their summer STEP experience. The program was started in 2015 and provides block scheduling in Calc I and II, Physics, I Chemistry, Intro to Engineering or Computer Science, a physics skill-building class, and Supplementary Instruction sections led by peers. The cohort has a dedicated advisor and peer mentors. The FYrE program has generally enrolled about half of the calculus-ready freshmen each year and is entirely self-selected. This program is in its eighth cohort in 2022-23 and has helped many students thrive during the pandemic. Prior to the FYrE program, most students did not enroll in an aggressive course load that could lead to finishing in 4 or 5 years. Since the success of the FYrE program, even non-FYrE students (calculus starters) are taking more appropriate and challenging course loads, leading to an increase in the 6-year graduation rate for all students. The success of the FYrE program has changed students, staff, and faculty expectations about what our students can achieve.

The FYrE program has been previously funded by the Helmsley Foundation and the National Science Foundation.

### *Successful Transfer and Retention (STAR)*

One of the newest programs, launched in 2022, STAR provides pre- and post-transfer support for community college students, including peer mentors, relationship-building and course articulation with Community College counselors and instructors. STAR is funded by the College Futures Foundation.

### *Commitment to Learning Instilled by Mastery-Based Learning program (CLIMB)*

Launched in 2022, CLIMB provides faculty development and course development using Mastery-Based Grading in three key sophomore engineering and math courses, to build motivation and mastery attitudes in students. It is a collaboration with researchers at Arizona State University and several local feeder community colleges. CLIMB is currently funded by the National Science Foundation.

### *S-STEM Program: Culturally Adaptive Pathway to Success Scholarship (CAPS)*

Culturally Adaptive Pathway to Success (CAPS) is a scholarship program for low-income, high potential students. Students apply and are selected during their freshman year, receive a scholarship, and participate in career-oriented programs throughout each year. CAPS is in its last year of funding by the National Science Foundation.

### *STEM Advantage*

STEM Advantage is a partnership with an outside non-profit organization which provides scholarships, summer internships, and career mentoring to around 40 of our students each year. This program is key to helping these students stay in school, develop career awareness, and complete their degrees on time.

A number of our students have benefited from participation in many of these programs. They may have been involved in MESA in middle and high school, attended our LAUNCHPAD program, entered the College through the STEP program, chose to enroll in the FYrE program, taken classes that are part of the CLIMB program, and been awarded scholarships through CAPS or STEM Advantage. Many of the students most involved in the programs have not only graduated on time and entered excellent careers but served as peer mentors and in other leadership roles in the college before graduating. Ideally, all students could have these experiences.

### *Faculty and Staff Development Programming*

ECST reported that as part of their effort to meet students where they are, they have learned that they also need to meet faculty and staff where they are and provide professional development to help them understand our students better, and to try new pedagogies and new approaches to student advising.

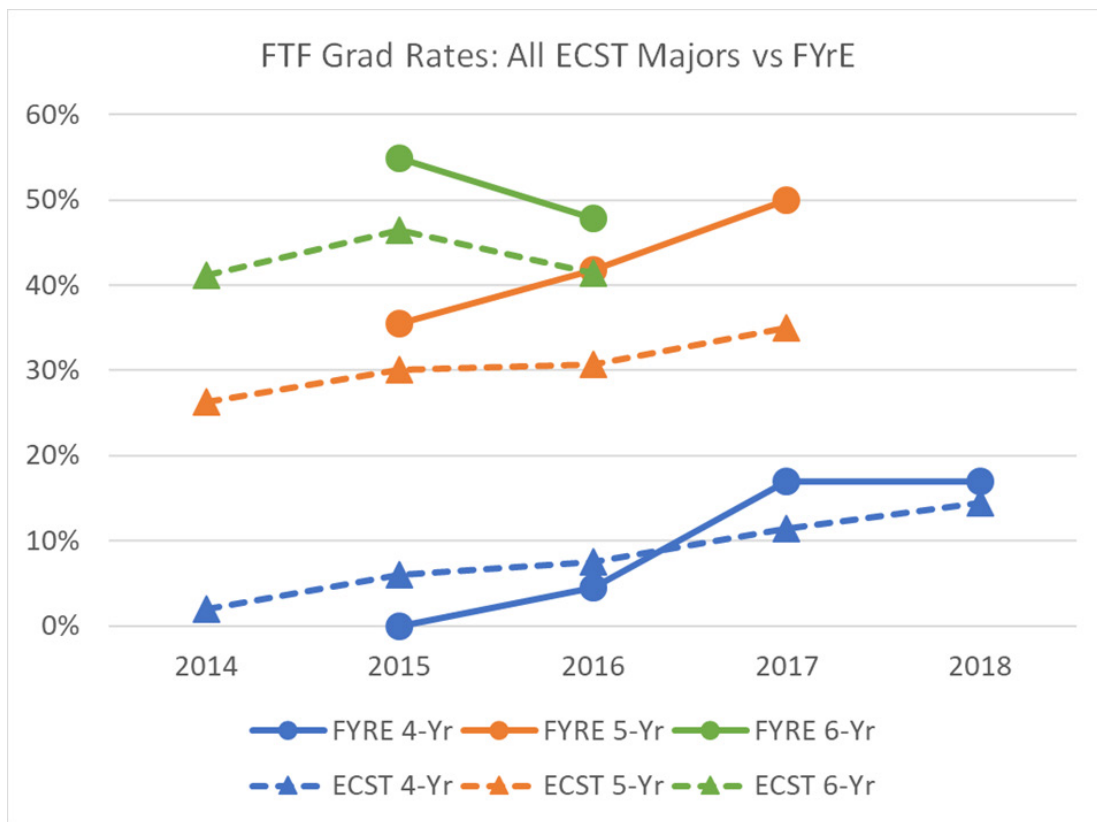
Both CAPS and CLIMB programs include significant faculty development components. In 2020, an NSF: IUSE grant for the ECO-STEM program was awarded. The overarching goal of the ECO-STEM program is to create a supportive and culturally responsive learning and working environments for all members of our community that utilizes their assets to enhance motivation, excellence, and success, thus making teaching and learning rewarding and fulfilling experiences. This program has enabled the creation of various professional development opportunities that focus on the community cultural wealth of our community members and relies heavily on self-reflection, mentoring, and critically reflective dialogue. This has helped our faculty become better mentors and teachers, as we aim to transform our college into an eco-system designed for students, faculty, and staff to thrive.

### **Data**

Out of the previously mentioned programs, the one with the most measurable outcomes is the FYrE program. The table below compares the most recent graduation rates available for the university and the college, along with the rates for FYrE students. FYrE cohorts have varied in size from 30 the first year, to 90 a few years ago, to approximately 60 during the pandemic. One of the most successful additions to the program over the last several years has been adding peer mentors to the program, typically one mentor per 20 students. The mentors help students find the resources they need, and interface with the program faculty and staff to keep them aware of issues or concerns. Most of the mentors and supplemental instruction leaders were previous FYrE participants.



**Figure 5** compares the 4-year, 5-year, and 6-year graduation rates for the for the FYrE cohorts to the rates for the entire College of ECST freshman cohorts which includes Industrial Technology, Aviation Administration, and Fire Protection students. As an example, for first-time freshmen who started in Fall 2017, 17% of the FYrE students graduated in four years, while only 11% of the entire college (including the FYrE students) graduated in four years. It can also be seen that the graduation rate for both cohorts has been increasing as the university and the college have improved access to course sections, improved advising, and encouraged students to take a full load of units. The strongest effect of the FYrE program can be seen in the 5-year graduation rates. The most recent drop in the 6-year grad rates is probably because of the pandemic.



**Figure 5 California State University-Los Angeles ECST data** shows the 4, 5, and 6-year graduation rates for the College of ECST as a whole, and for the FYrE cohorts.

# RESULTS AND CONCLUSIONS

In this section, we discuss results and analyze themes, which inform final conclusions and implications for the future.

## RESULTS AND ANALYSIS OF THEMES

URM students' success has grown over the past decade in each of the three institutions, as they have continued to add programs to support them. Institutions offer several common programs to help the success of students, particularly URM students. Institutions implemented these programs based on their own understanding of effectiveness in providing support and increasing the graduation rate of URM engineering students, including initiatives that focus on the pre-matriculation experience, first-year support, faculty development, mentoring, and support for transfer students. Pre-matriculation programs allow students to experience what majoring in engineering will entail and therefore reduce the element of surprise once in their first year. First-year support helps students adjust to college life and expectations. While many of these are examples of student-focused programs, two institutions reported a prioritized heightened focus on also training faculty in how to best serve URM students. Another arm of the faculty/administration focus is the encouragement of mentoring relationships with students. A Summer Bridge Program is the only commonality across all three institutions.

Table 1. **Programs in Common among Institutions.**

	City College of NY	Georgia Tech	Cal State LA
Summer Bridge Program	X	X	X
First Year Experience Program			X
Mentor Program		X	X
SURE (Summer Undergrad Research)		X	
Pre-Major Program	X		X
Faculty Training and Development	X		X
Service Learning		X	X
Transfer Student Support	X		X
Targeted Financial Support		X	X

We found only three programs for which institutions provided graduation rates for program participants (LSAMP and P2P, Georgia Tech; FYrE, CSU LA). Otherwise, institutions provided data for student success in particular programs and separate data on student success overall in attaining an undergraduate engineering degree. In general, institutions do not have data on the effects of particular programs on overall graduation rates. Over the past decade, institutions have added programs and support for students, presumably based on published information and from colleagues. Data for each program has typically been kept by the separate offices responsible for them and indicate students are succeeding in them. Thus, it appears these programs help in retaining students, thus presumably enhance overall undergraduate education. However, we were not able to find data to support links between student successes in particular programs with their overall degree completion.

## CONCLUSION AND FUTURE IMPLICATIONS

The key question for this study of three participating institutions, was:

***Can we identify specific equity-focused policies and practices to explain variation among institutions in undergraduate engineering degrees awarded to URG students?***

In short, no, we cannot discern the effects of specific equity-focused policies and programs on URG students' success, and thus we cannot account for the variation among institutions based on their programs. We received data for only one program that compared degree success by program and non-program participants (FYrE). Given the sample size (3) for this pilot, it was not possible to draw a generalizable conclusion about correlations between success from particular type of programs and the types/categories of the institutions themselves (including the demographics of the populations that they serve).

Still, the description and success of the programs in this pilot work might be helpful to other institutions. While an entire program may not be implemented at another institution, a part of it may and could start the path to success.

Should there be interest in replicating portions of any of the three programs in the study, institutions might gather more data, such as:

- » More longitudinal data
- » Specific data on variables with control sub-samples (ie. Black students that participated in a program vs Black students that did not)
- » Data about the success of the individual students (such as their overall GPA or their graduation rates) beyond the individual programs to be able to address the research question
- » Larger sample space

It still might be difficult to discern the effect of individual programs on success rates given the complexity of other confounding variables such as the unique institutional characteristics, demographics of the student body, as well as the interactions among and between participation in particular programming. The difficulty in making such conclusions exacerbates the problem that institutions that are particularly under-resourced must make to be able to make research-based decisions about allocating funding strategically such that it “has the most bang for the buck”.

Direct causal relationships between specific programs and success can be difficult to pinpoint because multiple variables can contribute to success and most institutions do not implement policies or programs one at a time or in isolation.

## LIST OF TABLES AND FIGURES

Figure 1: City College 6 Year Graduation of Black Full-time Freshmen Cohorts

Figure 2: City College 6 Year Graduation of Hispanic Full-time Freshmen Cohorts

Figure 3: Georgia Tech Ten Year Bachelor's Degrees Awarded by Ethnicity

Figure 4: Georgia Tech Tiered Mentoring Program

Figure 5: California State University, LA ECST FTF Students Four Year Graduation Rate

Table 1: Common Themes

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