

Recruiting and Retaining Low-Income Engineering Students Across Four Institutions During a Pandemic: Progress and Lessons Learned from a Track 3 S-STEM Grant

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Abstract

In January 2020 East Carolina University (ECU) in partnership with Lenoir Community College (LCC), Pitt Community College (PCC), and Wayne Community College (WCC) was awarded an S-STEM Track 3 Grant (Grant number: 1930497). The purpose of this grant was to support low-income students at each partner institution, to research best practices in recruiting and retaining low-income students at both universities and community colleges, and to research how such programs influence the transfer outcomes from two-year to four-year schools. This grant provides scholarship support for two cohorts of students, one starting their engineering studies in Fall 2020 and the other starting their engineering studies in Fall 2021. Each cohort was to be comprised of 40 students including 20 students at ECU and 20 students divided among the three partnering community colleges. In addition to supporting student scholarships, this grant supported the establishment of new student support mechanisms and enhancement of existing support systems on each campus. This project involved the creation of a faculty mentoring program, designing a summer bridge program, establishing a textbook lending library, and enhancing activities for students in a living-learning community, expansion of university tutoring initiatives to allow access for community college students, and promoting a new peer mentoring initiative. The program emphasizes career opportunities including promoting on-campus career fairs, promoting internship and co-op opportunities, and bringing in guest speakers from various industry partners. A goal of the program was to allow community college students to build relationships with university students and faculty so they can more easily assimilate into the student body at the university upon transfer. This paper presents the challenges presented to the project in the first year and the pivoting that occurred due the pandemic. Data is presented regarding recruitment of scholars in both cohorts and retention of scholars from year 1 to year 2.

Project Overview

This grant funded scholarships and programming for 2 cohorts of low-income engineering students, one of which began their undergraduate studies in Fall 2020 and the other which began in Fall 2021. Each cohort was planned to be comprised of 20 students pursuing a Bachelor of Science in Engineering degree from ECU and 20 total students pursuing either an Associate in Science or Associate in Engineering degree from the partnering community colleges. Based upon anticipated enrollment, PCC was allocated 10 scholarships per cohort and LCC and WCC were allocated 5 scholarships each per cohort. Scholarship amounts were limited to a maximum of \$10,000 per year for university students and \$3,000 per year for community college students with scholarship awards capped based upon eligibility for federal aid as determined by the FAFSA. This project began January 1, 2020 and the first few months were intended to be focused on advertising the program and recruiting students. A specific region of 10 counties was identified as the target region for recruitment due to proximity to the partnering institutions and high rates of poverty in most of the selected counties. Visits were planned to high schools within

the region to present the scholarship opportunities for students. A summer bridge program was planned to invite the selected scholars to campus to become acclimated before the fall semester would begin. Additionally, students would learn about academic advising, meet the faculty, experience using campus resources such as dining, housing, and recreation, and learn about the various support services on campus such as Disability Support Services, financial aid, tutoring, health services, counseling, and the supports offered through the Dean of Students office. A textbook lending library was to be established to allow students to check out books for a semester in order to save on costs and to maintain a permanent resource for students. Each scholar was to be assigned a peer mentor and was to select a faculty mentor. Scholars would be required to live in the Engineering Living Learning Community on campus unless they were also selected for the Honors Living-Learning Community or elected to live at home with their families. Weekly meetings were planned for the scholars and special events were planned to be held at least once per semester to present career opportunities and to develop relationships between scholars and faculty. The goal of the program was for university students to be retained and complete their degrees and for community college students to complete their associate's degrees and transfer to ECU in order to complete their degrees.

Project Objectives

This project has several objectives.

1. To showcase engineering as a career opportunity to students who may not otherwise consider it.
2. To work towards mitigating issues that have been known to cause student attrition, particularly among low-income and first generation students.
3. To expand the available engineering talent pool in Eastern North Carolina where there is often a shortage of qualified engineering graduates to fill all available positions and where there is often significant employee churn.

By presenting the opportunity to study engineering throughout the target region in various high schools and other contexts where future engineering students may be found, engineering is presented as a career opportunity for people who may not otherwise consider pursuing engineering.

The student support model in this project is based upon the Model of Co-curricular Support [1]. By implementing various supports for students (scholarships, mentoring, professional development, cohort building, living-learning community, tutoring), this program is aimed at implementing and evaluating strategies to reduce attrition in engineering. The reasons for students leaving engineering have been widely studied in the literature [2-7] and this project aims to evaluate some strategies intended to increase retention, degree completion, and transfer from 2-year to 4-year schools. This project is very conscious of the different experiences that students face that may lead to attrition for a variety of reasons including the challenges in attracting and retaining women and underrepresented minority students in engineering[7-11], the unique challenges college students from low socioeconomic backgrounds face[12], and also the difficulty transfer students often have in integrating into a 4-year institution[13].

Throughout the project there is a focus on career readiness, from encouraging students to prepare and revise their resume, to mock interviews, to showcasing career fairs on campus at the university and neighboring colleges, and inviting guest speakers from local industries to showcase career opportunities.

Recruitment Results and Challenges

The scholarship was listed as an opportunity on the ECU scholarship portal and was advertised through the appropriate channels at the three community colleges. Scholarship applicants were required to submit high school GPA information and information on standardized test scores along with demographics information regarding their race, gender, county of residence, etc. Each applicant was required to write 2 essays, one on how they approach time management and the other about why a career in engineering interests them. Applicants were also required to request letters of reference from two people, one of whom must have been a teacher in a STEM discipline. Counselors and teachers at high schools in the selected region were contacted and several recruitment presentations were scheduled. The PI and some of the Co-PIs presented the scholarship opportunities at several high schools and community colleges throughout the region from January to early March of 2020. Unfortunately, the Covid-19 pandemic forced most schools to deliver instruction remotely for the remainder of the Spring 2020 semester and this limited the opportunities for in-person recruitment. Some online presentations were then scheduled and the opportunity was advertised via online video conference sessions. The ECU Department of Engineering undergraduate program director shared the scholarship opportunity with each applicant who applied to the BS in Engineering program.

A total of 62 completed applications were received by ECU for the first cohort of scholarships. These students were first screened by the financial aid office to determine eligibility for aid and all students who had at least \$7,000 in difference between their expected family contribution (EFC) and the university total cost of attendance (COA) were considered by the scholarship selection committee. Applicants who were not US citizens and/or engineering majors were also eliminated from the applicant pool.

A committee of faculty at ECU comprised the scholarship selection committee including the PI, one Co-PI, the department chair, and the undergraduate program director. Each eligible application was reviewed by two members of the committee who scored essays and reference letters on a 1-4 point rubric. Bonus points were given for applicants who were residents of North Carolina and who resided in one of the 10 counties in the targeted region, for students from underrepresented groups (women and underrepresented minorities), first generation college students, students with extenuating circumstances not fully captured in the FAFSA, students with significant involvement in extracurricular activities and/or employment, and exceptional interest in engineering. A total of 23 scholarship offers were made to try to fill the first cohort of 20. Only 11 of the students offered scholarships enrolled in the engineering program at ECU in Fall 2020. Unfortunately, the Fall 2020 admissions cycle was very strange in that with the uncertainties of higher education for the 2020-21 academic year with the ongoing pandemic, some schools were forced to admit more students than they otherwise would have. Several students who had committed to accept the scholarship and enroll at ECU declined the scholarship

offer later than it would have been possible to find a replacement. A further challenge was that the Spring 2020 open house at ECU was cancelled due to the Covid-19 pandemic, so there was not an opportunity to advertise the scholarship to more students.

The community colleges had a particular challenge in recruiting students for the first cohort. Of the three partnering community colleges, only one was able to recruit students before the start of the Fall 2020 semester. Each of the partnering community colleges have very late admissions and enrollment cycles allowing students to enroll the same week that classes began. This made it a particular challenge for the community colleges to find candidates for the scholarships until after the Fall 2020 semester began. The community college partners had further challenges in getting messaging out to students due to their restructuring of instruction due to the pandemic. One CC partner did not allow any face-to-face classes in Fall 2020 except for science labs (and engineering was not considered science). One CC partner significantly limited room capacities and would not allow more than 10 people to be in any classroom regardless of course enrollment or room size, meaning that many students were forced to attend classes online. The third community college partner did have in-person classes, but unfortunately had very low enrollment in those classes.

In order to add more students to the first cohort, first year ECU engineering students with at least a 3.0 GPA were invited to apply for the program after the Fall 2020 semester. From this application process, 4 more students were added to cohort 1. Community colleges began to add to the first cohort once classes began and the engineering instructor at PCC actually made it a class assignment for all students to apply for the S-STEM scholarship program in order to get more engineering students in the applicant pool.

A similar recruitment process was held for the recruitment of a second cohort. A total of 84 students submitted applications for the second cohort of scholars at ECU. Of these applicants, 38 were disqualified for either having too high of an expected family contribution or having not submitted FAFSA information. Another 7 were eliminated for having incomplete applications including either not submitting an essay or having no reference letters. The remaining applicants were evaluated by the committee and scholarships were offered to 25 students and 19 scholars enrolled in cohort 2. Among the community colleges, a total of 21 scholars have been enrolled in the program. Given that each of the cohorts have room to add students, the program officer has granted permission to add a third cohort to be able to award the remaining available scholarships and work is currently underway in summer 2022 to fill in the remaining cohort spots.

Co-Curricular Supports, Activities, and Challenges

In Fall 2020, all incoming scholars at ECU agreed to live in either the engineering living learning community, the Honors College community, or student-athlete housing. A summer bridge program was planned for incoming students, but it was very difficult to work with university officials to be able to get permission to move into the dorms before the usual move in period, because many university staff in student affairs were furloughed for weeks or months during the pandemic including the director of campus housing. The summer bridge program was thus turned into a virtual event on the Sunday afternoon before classes started. This event presented

study habits, a virtual campus tour, and introduced various campus resources. Several activities were planned for the 2020-21 academic year with the living learning community, however, after just 2 weeks of in-person instruction, all classes were pivoted online for the rest of Fall 2020. Most classes were also offered in an online format in the Spring 2021 semester. All of the students in the Engineering LLC moved back home with their families and the only scholar in the first cohort who remained on campus was the one student athlete who continued to have required athletics training events on campus. This made it a challenge to put on programming and to do much cohort development as all activities had to be done online rather than in person. Instead of meeting in person with the scholars, a weekly online meeting was scheduled with the scholars to identify opportunities and to check in with students to identify any challenges they were having. Social events also needed to be moved online and involved some de-stress nights playing online games with each other. It was not clear how to properly implement the textbook lending library in the first semester as it was not clear if books would need to be disinfected between users. This was later implemented in Fall 2021 with some books purchased from various textbook vendors and some vendor representatives graciously donating books for the lending library.

In the 2021-22 academic year, more events were able to be held on the four partnering campuses. Classes were back in person on each campus. This also made it possible to have special events in person rather than online. A summer bridge program was held for incoming students in August 2021 and included a kickoff dinner and lab tours for all incoming scholars at the university and partnering community colleges. A collaborative event was also held in November 2021 at LCC for all scholars and involved rocket building and launching and a career speaker from a local business that manufactures prosthetics. In February 2022 a second scholar event was held on the campus of PCC and involved programming small sumo robots and a robotics competition along with career presentations from two local engineering companies, one a biopharma company and other a company that builds pressure vessels. During this event, each of the scholars in attendance had the opportunity to meet with several engineering professionals and do a mock interview and have their resumes critiqued.

In both academic years of the program so far, all of the scholars at the university were invited to participate in the peer mentoring program. Additionally, in the first year of the program, faculty who wanted to serve as mentors were invited to a training led by a senior faculty member. Potential faculty mentors all gave short 2-minute presentations on their research and teaching interest and scholars were asked to schedule meetings with at least 2 potential faculty mentors before selecting one to serve as their mentor. Similar presentations are planned for Fall 2022.

Retention and Academic Performance

Once students have entered the scholars program at the university, they tend to persist in engineering. As is depicted in Table 1, of the Cohort 1 students at ECU who either started in the scholar program in their first semester as freshmen or were added in the second semester, 14 out of 15 (93%) are still in pursuit of a BS in Engineering degree. One student changed to a major outside of engineering. Another student in this cohort is still pursuing a BS in Engineering degree, but is currently not enrolled in classes due to a medical issue. The students in this cohort

have higher GPAs on average than their peers who entered the BS in Engineering program at the same time with a mean GPA for the scholars of 3.275 compared with a mean GPA for all students entering the BS in Engineering program as first time freshmen of 3.007. Of the 19 students who entered the university as part of the second cohort in Fall 2021, 18 (95%) are all still pursuing a BS in Engineering degree. This cohort has a mean GPA of 3.085 after the Fall 2021 semester when compared with a mean GPA of 2.948 for all first semester students.

Table 1 Cohort Retention Data at East Carolina University

Cohort	Enrolled	Retained to 2nd Year	Mean Cumulative GPA	Still enrolled in engineering
Cohort 1-Fall 2020 start at University	15	14	3.275	13*
Cohort 2-Fall 2021 start at University	19	N/A	3.085	18

*One scholar in cohort 1 is still in pursuit of a BS in Engineering degree, but has had to take a medical withdrawal

The cohorts at the community colleges are not as clearly delineated. Although it was planned that students at the community colleges would all start at the same time as the cohorts at the university, some of the community college scholars were selected later and some transferred to the university earlier than expected. In one case, a student was identified as a potential scholar, but was ineligible for the scholarship at the community college, but was able to be awarded the scholarship upon transfer to the university due to the higher cost of attendance at the university. The enrolled scholars at each of the partnering community colleges and their retention data is tabulated in Table 2.

Table 2 Community College persistence data as of Spring 2022

Community college	Enrolled	Still enrolled in AE or AS program	Transferred to university
WCC	5	2	2
LCC	3	3	
PCC	14	10	3*

*3 of the scholars at PCC enrolled in classes at both PCC and ECU in Spring 2022 with plans to fully transfer to ECU in Fall 2022.

Conclusions and Future Work

The first two years of this project have been successful in recruiting and retaining low-income engineering students at 4 partnering institutions including one university and three community colleges. The retention of scholars in engineering and the scholarship program indicate that the scholarships and the co-curricular support model is working to help students persist in their engineering studies. It is anticipated that a third cohort will be selected soon with applications

currently under review and that the project will be able to meet the goal of enrolling 80 total scholars across the four partnering institutions. Those students who have dropped out of the program are being replaced by new scholars at a similar academic position and some scholars who were not able to be funded at the maximum award of \$10,000 per academic year also free up budget funds to provide even more scholarship awards. The PI team hopes to build a successful model of co-curricular support and see the transfer of many of the community college scholars to the university in the next year or two.

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