Board 253: Emerge Scholars Program: Increasing Enrollment in Engineering Technology

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Overview

In 2022, an S-STEM project, titled Emerge: Preparing Students for an Innovative Future (Emerge Scholars Program) was proposed to NSF to try to answer one of the highest national priorities in STEM education, namely, to increase the population of academically talented students from low-income, diverse backgrounds who graduate with an associate of science (A.S.) in engineering technology (advanced manufacturing specialization), and contribute to the American innovation economy as scientists, technicians, and/or engineers. This program was accepted in order to help answer this as well as to address a national need to increase affordable pathways from high school to two-year, then four-year institutions of higher education (IHE) or into STEM careers, improve educational equity, expand access to higher education (particularly among underrepresented minority (URM) populations, increase the post-secondary credential-attainment levels of students and the community, and raise social mobility.

Program Summary

Program Need

South Florida State College (SFSC) is located in a rural geographic region, serving a three-county service district in the center of Florida. The average per-capita income of the tri-county area is over 36% below the state average. Only 16% of residents (28% of whom are Hispanic/Latino) have bachelor's degrees or higher [1]. The region ranks as one of the highest statewide for incidence of teenage pregnancy. These and other social factors combine to produce a substantial percentage of non-traditional students seeking higher education, the impact of which is seen disproportionately in the tri-county region's Hispanic families, who along with low-income students are experiencing significantly lower educational success than their peers both in the district and throughout the state.

In addition to inequalities in SFSC's student populations, SFSC has experienced enrollment challenges in the Engineering Technology AS program. Initiated in 2017, with the first classes being offered in 2018, the program has struggled with relatively low enrollment, including students in underserved minority populations. As of applying for the S-STEM grant in the 2022 school year, enrollment in the program was 20, which was reduced from previous years. Much of this is due to the region's understanding of engineering technology and the term "mechatronics," and the skills students acquire upon completing the program. This is a local manifestation of a national phenomenon – educational research shows that primary and secondary teachers and students generally have a poor understanding of what is involved in engineering [2]. This has led to a shortage of engineers, technologists, and technicians in the region that is even more severe than the national shortage. Local business leaders have repeatedly informed us that they often must turn down orders due to the lack of a qualified workforce. Accordingly, the local Workforce Development Agency has added advanced manufacturing as one of its targeted career clusters in order to develop a talent pipeline for regional prosperity.

Program Objectives

The objectives of this program are as follows:

- Recruit 40 students from three local counties into the Engineering Technology AS program and award annual scholarships from entry through graduation and entry into the regional workforce or transfer to four-year institutions;
- Retain 80% (32 of 40) of Emerge Scholars from the first to second year of their major;
- Graduate 75% (30 of 40) of SFSC Pell-eligible, degree-seeking Emerge Scholars in the Engineering Technology AS program within 150% time, with scholars who are not retained being replaced to have 40 complete;
- 100% of Emerge Scholar graduates transfer to mechatronic-related majors in four-year institutions or enter into mechatronics-related careers;
- By the end of the project period, generate knowledge on the impact of a guided pathways approach to improving student success for academically talented students from low-income, URM backgrounds in community college mechatronics programs.

Student Support

The Guided Pathways model is the preeminent framework undergirding SFSC's comprehensive supports. It has been found [3] that the typical suite of support services that colleges have provided in the past is not effective in helping students choose a program of study, select appropriate courses, avoid excess credits, and stay on track. Student-support services are crucial to providing wraparound guidance in terms of ongoing, intrusive advising, systems to track student progress, and a structure to redirect students who are not progressing in a program to a more viable path.

Accordingly, the College is using the grant to enhance its current marketing efforts in the community to improve the understanding of what the program has to offer, as well as offering faculty mentoring services to all of the S-STEM scholars. Each group of scholars will be organized into cohorts, as the importance of belonging in a community and in STEM has been well demonstrated in academic literature [4], [5], [6]. Our close working relationship with local industry will allow our scholars to participate in course-based industry projects, which we will formally institute and evaluate during the program.

First Year Results

The Good

Per the report of our external evaluator, Megan Mullins, the program is being implemented as planned for its first year [7]. Specifically, we were able to recruit a full cohort of ten Emerge Scholars beginning in Fall 2023, all of whom were enrolled in the Engineering Technology AS, and were successfully retained through the fall semester. Of the ten scholars, two transferred over the winter break to Florida Polytechnic University in Lakeland, Florida in order to earn a four-year degree in an engineering field, while the remaining eight remained as part of the program. Also, we were able to collect important baseline data on our first cohort regarding self-

identification as an engineer, engagement in the practices that will encourage mastery of skill sets necessary to transition to engineering-related graduate schools or careers, and expectations of faculty and of the program more broadly while they attend SFSC.

The Bad

Due to the grant being awarded in December 2022, it was not practical to start the program in the spring of 2023 as was originally hoped.

After two Emerge Scholars transferred to Florida Polytechnic over winter break, we attempted to recruit replacements to take their place in the program. We were unable to find any replacement scholars, as we did not have any eligible students in the program, the other students being ineligible due to not being a US citizen, not being Pell-eligible, or not being a full-time student. In one student's case, the PI offered to create an independent study class for the student so that he could be full-time and be eligible for the grant, but the offer was declined.

Of the ten Emerge Scholars of our first cohort, only two scholars completed the program evaluator's pre-program survey in time to be included in the Year 1 evaluation, meaning that available results were extremely limited for the evaluation.

The Ugly

Of the three investigators on the grant application, only one, the PI, is still involved in the project. Dr. Sydney Valentine, Vice President for Academic Affairs and Student Services and co-PI, left the college in August 2022 before the awarding of the grant later that year, and Dr. Michele Heston, the Dean of Health Sciences was appointed as an interim replacement, making it difficult to ask the NSF to add her as a replacement. The college has since confirmed Dr. Heston in her position permanently, and the NSF was petitioned to add her as a co-PI, which was approved in March 2024. More recently, Dr. Brent Ferns, Dean of Applied Sciences and Technologies and co-PI, left the college in December 2023, and was replaced by Michelle Leidel. The NSF was petitioned to add her as a co-PI, which was approved in February 2024.

The change in grant personnel, as well as other personnel turnover at SFSC, has presented significant obstacles to the implementation of the grant. An example of this difficulty is that in the grant application, the director of the college's quality enhancement plan (QEP) was tasked with overseeing the faculty mentorship program, including developing mentoring practices, maintaining program guidelines, and facilitate training to the program faculty on the mentorship program. This training was supposed to occur before the first cohort of students was selected to be Emerge Scholars. However, the director of the QEP left the college before this training was scheduled to occur. Due to the time necessary to get her replacement up to speed, no training on faculty mentorship was conducted before the onboarding of the first cohort of Emerge Scholars in Fall 2023.

Conclusions and Future Plans

As the Emerge Scholars Program is only in its second year and has only just recruited its first cohort of students, the conclusions that can be drawn from the program are as yet limited. While the transfer of two students to a four-year program and the continued enrollment of the rest of the cohort is a good sign, only time will tell if it continues to be successful. We hope that the program will broaden participation in mechatronics by improving scholars' retention, graduation, and transfer rates in mechatronics majors.

We hope to evaluate the effect of evidence-based activities to produce new, inherently scalable information that will immediately apply to community colleges nationally. Upon dissemination, the results are expected to support reform and a much-needed paradigm shift in higher education for two-year IHEs seeking to better serve the needs of low-income, URM, and rural students in STEM fields.

References

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