



## A Student Success Program for Engineering Undergraduate Students to Improve Retention and Graduation

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# A STUDENT SUCCESS PROGRAM FOR ENGINEERING UNDERGRADUATE STUDENTS TO IMPROVE RETENTION AND GRADUATION

## Abstract:

University of Texas at San Antonio (UTSA) is a minority serving institution and considered a low-income serving institution. Therefore, many of our College of Engineering (COE) students have to work off-campus to meet financial needs and have limited opportunities to participate in on-campus activities focusing on their major. An interdisciplinary faculty team from mechanical engineering, civil and environmental engineering, biomedical engineering and chemical engineering, and electrical and computer engineering created a Scholarship Program for Undergraduate Retention and Success (SPURS) in Spring 2016 through the NSF S-STEM Program.

The program is specifically designed to develop outstanding graduates through training in required workshops in critical thinking, communication, professional development and research in addition to providing students with optional opportunities in research, internships or K-12 STEM outreach programs. On average, each scholarship is \$8,000 a year and covers about 90% of the yearly tuition cost. This paper discusses the mentoring provided, the workshop series developed, student performance, lessons learned and insights gained, which it is transferable to other universities. Since the SPURS program started, it has awarded 102 scholarships to UTSA engineering students. Ninety-two of the scholarship recipients have been retained in a STEM major with only ten students leaving the program (financial eligibility or full time status), a retention rate of 90.2%. The number of female and minority students in the program was higher (38% women and 74% minorities) than the target goals which was 33% for female students.

## Overview:

UTSA is a Hispanic Serving Institution and has seen rapid growth in the last 10 years; however, student income levels have not improved and UTSA is considered a low-income serving institution. Therefore, many of our College of Engineering (COE) students have to work extra hours off-campus to meet financial needs and have limited opportunities to participate in on-campus activities focusing on their major. About half of the engineering undergraduate students are Pell Eligible. An interdisciplinary faculty team from mechanical engineering, civil and environmental engineering, biomedical engineering and chemical engineering, and electrical and computer engineering created a Scholarship Program for Undergraduate Retention and Success (SPURS) with the support of NSF's S-STEM initiative. The proposed program consists of an integrated approach to increase the number and graduation rate of undergraduate students who enroll in the College of Engineering. As financial constraints are a major disincentive for students to enroll and persist in higher education, this project combines scholarships with other forms of academic and professional support to ensure student persistence and completion of a B.S. Engineering degree. Providing resources and educational opportunities for undergraduate

engineering students will increase the number of students graduating with Bachelor degrees in engineering and could encourage students to pursue Master's and Doctoral degrees in sciences and engineering along with increasing and diversifying the technical workforce in South-Central Texas. The overall objective of the proposed program will be accomplished by successfully completing the following three tasks: 1) Create an Undergraduate Engineering Scholarship Program; (2) Create a Workshop Series on Critical Thinking, Professional Development, and Research; and (3) Provide students with optional opportunities in research, internships or K-12 STEM outreach programs.

#### The SPURS Program:

A scholarship program, entitled "Scholarship Program for Undergraduate Retention and Success" (SPURS), was established in Spring 2016 to promote participation of undergraduate students and thus increase retention and success of students graduating from COE. The program is specifically designed to develop outstanding graduates through training in required workshops in critical thinking, communication, professional development and research.

On average, each scholarship is \$8,000 a year and covers about 90% of the yearly tuition cost. This arrangement will allow each COE department to have at least 3 scholarship awardees each year with at least 12 students a year for the college.

#### Students must

- be a United States citizen, naturalized citizen, refugee, or permanent resident at the time of application
- be enrolled full-time in an engineering discipline taking courses toward the engineering degree requirements (i.e., take more than 12 credit hours a semester)
- have completed 30 credit hours (at least 12 hrs at UTSA)
- demonstrate academic potential and ability by having at least a cumulative 3.0 grade point average
- demonstrate financial need, as defined for undergraduate students by the US Department of Education rules for federal financial aid
- fill out an application that includes, but is not limited to, the following: name, contact information, classification, major, unofficial transcript (with GPA information), one faculty recommendation letter, and three essays written by the applicant addressing: how the SPURS scholarship will benefit his/her academic career, why the applicant should be considered for this program, and what is his/her 5 year plan including academic studies and professional career.

Applications are reviewed using a review matrix by a committee in the College of Engineering. Students who accept the SPURS scholarship must graduate from their respective degree program within 3 years from receiving the scholarship. Students will remain in the program as long as he/she is a full-time engineering student and maintains a cumulative GPA of 3.00 or higher. Students must participate in at least two SPURS Workshops each semester, meets with their faculty mentor at least two times a semester and COE academic advisor, and career counselor at least once a semester.

Below are demographics on our fellows for each semester

Semester	No. of Fellows	% Female	% Minority*
Spring 2016	12	42%	83%
Fall 2016	8	38%	88%
Spring 2017	5	40%	80%
Fall 2017	13	38%	62%
Spring 2018	14	36%	64%
Fall 2018	16	38%	75%
Spring 2019	14	43%	71%
Fall 2019	20	50%	55%

\*refers to students who are Hispanic, African American, Native American, or Native Hawaiian/Pacific Islander

Ninety-two of the scholarship recipients have been retained in a STEM major with only ten students leaving the program (financial eligibility or full time status), a retention rate of 90.2%.

#### The Workshop Series:

A key component for success in school and beyond is the training and development of critical thinking, professional and research skills. A series of workshops are created each semester by the faculty and/or other support services on campus. Fellows are required to attend two workshops a semester. Thus far we have provided or worked with other groups to have the following workshops: resume writing, negotiating salaries and accepting offers, Career Paths: Your Possible Lives, College of Engineering's Womengineering Luncheon, Expert Learner Series (student success themes), Networking/Interview Skills Workshop, Mock Interview Workshop, Negotiation and Next Steps, and Building Talents into Strengths.

#### Mentoring Program:

In addition to the workshop series, fellows meet with a series of mentors each semester. They have a technical mentor that is a faculty member in their major of study and one of the principle investigators on the project. They meet with this mentor at least 2 times a semester and discuss items from graduate school, internships, course planning, and any other topic the mentor or mentee feels is relevant to their growth during their studies. They also meet with their academic adviser and the career counselor at least once a semester. These meetings ensure the students are making appropriate progress in their degree plans and thinking and planning for their long term career goals.

#### Other Opportunities:

The SPURS program provides students with opportunities to conduct hands-on research, participate in internships, or participate in K-12 STEM outreach programs. These opportunities are not required but fellows are encouraged to participate in the opportunities at least one semester during their time in the program. Many of the students thus far have participated in internships but a few have also conducted research.

#### Key Results:

The percentage of women students in the program was higher (41% average) than the target goal of 33%. SPURS students' average GPA is 3.62, which is higher than the average College of Engineering GPA (2.98). Three students showed minor increases in the overall GPA since starting the SPURS program. Most students hovered around the same GPA or had some minor decreases in GPA over time. Only one student had below a 3.0 GPA (2.9), while the rest of the current SPURS cohort have GPAs of over 3.0. Only one student has been dismissed from the program due to academic performance and switched majors to education.

Twelve students have graduated from the program and should the remaining students' self-reported projects remain true, all SPURS participants will graduate within 3 years of entering the SPURS program. With the exception of those students who leave the programming due to a change in their status as well as the one who left for poor academic performance, the current statistics implies that SPURS students are graduating at an increasing rate. The good academic standing of those remaining also imply that the SPURS students are on track to graduating.

#### Lessons Learned:

There have been many key lessons that have been learned thus far during the project. The lessons are the following:

- Don't reinvent the wheel; use resources available on campus
- Recruiting is the key to success of cohorts
- Survey students to see what their interests are when developing programming/workshops
- Provide feedback to internal university partners based on student discussions
- Ensure students are utilizing the mentoring opportunities including peer mentoring among the cohort
- Use predictive analytics to help in monitoring of students progress

All of these lessons have helped us to continuously improve the program and provide the best experience and support for our students.

#### Conclusion:

The SPURS program builds on the faculty members' experience in mentoring students and dedication in increasing diversity in academia. It is an integrated approach to increase the number of undergraduate underrepresented minority and female students who graduate in the College of Engineering. SPURS consists of financial assistance, workshops to increase student critical thinking and professional skills, and mentoring. In addition, students are given the opportunity to participate in research, internships, or K-12 STEM activities. This approach attracts, but also retain students in engineering and give them the skills necessary to succeed as employees and/or as graduate students in engineering. SPURS will increase the diversity of the engineering workforce specifically in South-Central Texas. SPURS have increased their critical thinking, professional knowledge, and self-efficacy. Taken together, these aspects will ensure

timely completion of undergraduate degrees and will increase the marketability and job placement of these graduates.

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