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BOARD # 454: S-STEM: Strengthening Education and Academic Development for Transfer Undergraduate Rural/Nontraditional Students in the Engineering Field

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S-STEM: Strengthening Education and Academic Development for Transfer Undergraduate Rural/Nontraditional Students in the Engineering Field

Abstract

The TURNPIKE (Transfer Undergraduate Rural/Nontraditional Student Pathways through Identity, Knowledge & Engagement) S-STEM project is a collaboration between a community college, Polk State College (PSC), and the University of South Florida (USF) College of Engineering (CoE). This community college is in a largely rural county with significantly higher poverty rates and lower education attainment rates compared to state and national averages. Many students from Polk State College are low-income, first-generation-in-college, and part-time. Most recently, during the 2022-2023 academic year, 58 percent of its first time, in-college, full-time students were awarded Pell grants, while 84 percent overall received some type (e.g., scholarships, loans, work-study, and grants) of financial aid [1]. Due to the financial challenges, non-traditional students often find it difficult to transfer to a four-year university to complete their studies. The students participating in the S-STEM program may receive up to $10,000 per year of scholarship depending on their unmet financial need. The duration of the scholarship support is two years at PSC and two years in USF. Overall, the objective of this program is to create a successful bridging pathway from associate to baccalaureate degree completion through curricular, co-curricular, social, and financial interventions for academically talented, low-income transfer students from community college to the University of South Florida. Addressing this targeted population, we focus on increasing the retention and graduation rates for financially challenging students [traditional and non-traditional students] pursuing engineering and computing degrees. Aligned with this goal, we seek to provide students access to co-curricular activities and university-wide resources that will enrich their education and career development.

The co-curricular supporting activities include learning teams/tutoring sessions, biweekly professional development meetings, and intrusive academic support through one-to-one personalized advising and mentorship. This paper outlines how implementing and developing these program's intervention activities, specifically learning teams/tutoring sessions and professional development meetings increases the retention of traditional and non-traditional students in engineering majors and their impact on the students' education and academic development. In this paper, the students participating in our program are referred as scholars.

Learning Teams

Learning teams were established in the College of Engineering in 2012 for first-year students [2]. In the College of Engineering, the size of the learning teams ranged from 10 to 20 students and were linked to a specific math course and section. It was a set up as a zero-credit hour course. Attendance was required for this course for one hour a week. The course was facilitated by a successful engineering student referred to them as peer mentor. In 2014, more sections learning teams were added for chemistry [2].

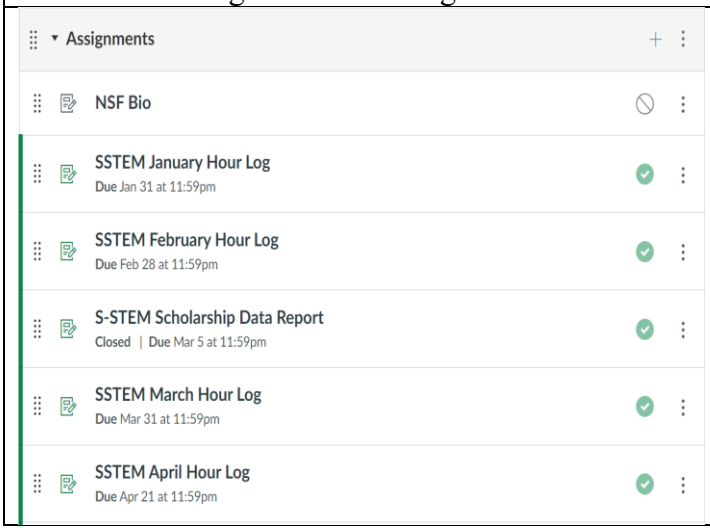
In collaboration with Engineering Student Services, we built, modified, and implemented this collaborative learning model for transfer students at the community college and the university

level. The purpose of the learning teams is to provide the scholars with academic and social support as soon as they transfer and start at the university. We know how critical the support is in the first semester for transfer scholars to acclimate and thrive in a new environment and alleviate the cultural shock. Through learning teams, we intend to encourage scholars to integrate into curricular activities and avoid isolation as well as develop academic and social habits. The university provided recruiting and training materials to the community college to hire and train peer mentors. A peer mentor was hired in 2021 who worked with scholars on a weekly/bi-monthly basis via zoom due to COVID.

The learning teams/tutoring sessions at the university level are led by a successful engineering student who serves as a tutor and peer mentor. The learning teams are structured based on study group session style. The groups are formed based on scholars taking the same class and, in some cases, the same majors. A minimum of one hour per week the scholars meet with the peer mentors. The scholars have an hour log to track the hours monthly and submit them on a Canvas course created for the cohort. The idea is to create a collaborative environment among the scholars.

Table 1: Learning Team Meetings

Table 2: Learning Team Hour Log



HOUR LOG

Student Name: _____

DATE	ACTIVITY	Start Time	End Time	# OF HOURS
03/01/23	Thermodynamics Homework	3:30pm	4:30pm	1
03/07/23	Thermodynamics Test and Homework prep	2:00 pm	4:00pm	2
03/21/23	Numerical Methods Homework	3:30 pm	5:00pm	1.5
03/23/23	Numerical Methods Homework	4:00pm	5:30pm	1.5
03/27/23	Thermodynamics Homework	2:00 pm	4:00 pm	2
03/29/23	Thermodynamics Homework	1:30 pm	4:00 pm	2.5

Total # of Hours: 10.5

Scholars have expressed how the learning teams have been beneficial for the challenging courses and the impact of receiving support from other S-STEM scholars undergoing similar experiences. At Polk State Community College, a score of 4.27 out of 5 was given by our scholars expressing

that they found peer mentoring adequate at their institution. In USF, an average of 8 learning teams are established every semester (fall and spring) with a participation of 2 to 5 scholars per group. The score results from the survey conducted was 4.08 out of 5. In one of the surveys conducted on learning team, one scholar mentioned how the services "*helped pushed me towards pushing forward and overcoming any confusing barriers I may have come across as I take my classes.*" Another scholar highlighted the benefits of collaborative learning and environment through learning team by stating, "*Even in some cases when they are classmates, it is helpful to know that there is somewhere to go where we can work constructively together*."

One approach that the College of Engineering uses for early interventions is to run reports to monitor on students' academic performance and progress in the semester. For the S-STEM project, the report used was from fall 2024. We compared the average GPA of our scholars against the average GPA of the rest of the transfer students pursuing engineering in our college. The average GPA of our scholars is 3.5 versus 3.14 GPA of the transfer students who have completed an associates (AA) degree that are pursuing engineering. This data only contains students who are actively enrolled in engineering and have not graduated as of December 2024.

Providing academic and social support to scholars through the learning teams has also helped with retention since more than 90 percent of our scholars have stayed in engineering and the program. Only 1 of the 4 scholars left the program for a change of degree, which is out of 73 scholars who have participated in the program at USF.

Professional Development Meetings and Career Competency

Critically, we provide professional development and resilience meetings. These meetings are bi-weekly in fall semester and monthly in the spring semester. In these meetings, we schedule a networking luncheon for the scholars prior to the meetings. We found this is the ideal time for our scholars to interact with each other.

The second hour is dedicated for the professional development workshops and seminars. The topics are specifically designed to support student resilience and retention, but also benefit the scholars in the long term. In doing so, we partnered with both internal and external partners (e.g., Office of National Scholars, Office of Financial Aid, Counseling Center, USF World, and others) to provide sessions on applying to prestigious scholarship programs, obtaining research for undergraduates (REUs), and preparing for the global STEM workforce as well as other. Notably, we have featured USF engineering alumni, including S-STEM recipients from past NSF funded projects, to share their lessons learned and career journey. A survey was conducted to receive feedback from the scholars about the efficacy of the professional meetings and the learning teams. 55.2 percent of the scholars rated the meetings as very high and 37.9 percent as high. Some have expressed their favorite part of the program are the professional development and resilience meetings due to the valuable information presented and the strong community built among the scholars.

As a result of these workshops offered by the Office of National Scholars (ONS), two of our scholars became the first twin Barry M. Goldwater scholarship recipients from the same research group in 2024. These two non-traditional transfer scholars achieved a first for the College of Engineering in our institution as the Goldwater scholarship is the nation's most prestigious award

for excellence in undergraduate research. Moreover, several of our scholars have shown interest in undergraduate research and graduate school. Currently, 5 scholars are participating in undergraduate research. Similarly, 20 scholars have completed one or two internships. In the survey conducted, one scholar stated, "*Working with the mentors I have met through the S-STEM program is single-handedly the reason I have been able to make the most out of the opportunities available to me and get accepted in research labs, REUs, and even the Goldwater Scholarship for 2024."*

Table 3: Professional Development Meetings

Conclusion

Our S-STEM program intervention activities have been, and continue to be essential to the scholars' retention in engineering. The success of our scholars showcases the program's impact in providing academic and social support for low-income, community college transfer students. We believe the co-curricular activities encouraged them to integrate into a community of like-minded peers, seek academic and career guidance assistance from mentors and role models, and reduce barriers to become engaged and connected.

Moving forward, we aim to provide additional learning teams for upper-level coursework and hands-on workshops in emerging technologies such as the "Maysemester", offered last summer on Semiconductor Processing and Metrology Techniques. Another objective is to enhance their career readiness through elevator pitch interview sessions and resume preparation. We plan to increase the number of scholars involved and expand access to university-wide the resources. For future research, we will explore the broader impact of learning teams as cooperative learning, role of near-peer graduate mentors in improving self-efficacy, as well as well as the impact of career competency.

Acknowledgments

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