2021 ASEE ANNUAL CONFERENCE
Virtual Meeting | July 26–29, 2021 | Pacific Daylight Time
Paper ID #33829

Lifting an LI, FG, and/or UR Support Program Off the Ground during COVID-19: Successes and Lessons Learned

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Lifting an LI, FG, and/or URM, support program off the ground during COVID-19: Successes and lessons learned

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Abstract

Researchers describe a need for increased access to and transitional support into STEM graduate education for low-income, academically talented, first-generation and/or underrepresented and minority (LIATFirstGenURM) students [1]. In October 2019, we were awarded an NSF scholarship grant to build infrastructure and provide support to low-income, academically talented, firs-generation, underrepresented, and minority (LIATFirstGenURM) graduate engineering students. As part of the internal evaluation of the program, we interviewed seven enrolled and funded graduate student beneficiaries to determine if they encountered any barriers during their recruitment and first semester of graduate study. Additionally, we asked them what support they valued most. We found that these students valued the organizational program support system, and as a result, we also found several opportunities to improve the system. In this paper, we share our findings and discuss implications for program updates.

Motivation and background

Researchers describe a need for increased access to and transitional support into STEM graduate education for low-income, academically talented, first-generation and/or underrepresented and minority (LIATFirstGenURM) students[1, 2]. Targeting these students is meant to increase and diversify the graduate student population [3, 4, 5, 6, 7]. The reasons for students stopping at the undergraduate level could be due to individual discrimination [8, 9], or other more systemic factors such as structurally racist [10], or classist policies and practices [11],

or financial constraints. For example, according to [12], "*debt deters STEM bachelor's degree holders from investing in graduate education...*" (p. 298). In response, we are looking to increase access to engineering master's degree programs for LIATFirstGenURM students through robust recruitment and retention strategies. Once in these graduate engineering programs, graduate students can take advantage of evidence-based practices and activities that have been successful at the undergraduate level such as near-peer and faculty mentorship, community service volunteer outreach programs, research support, professional development or networking events, social support programs, tutoring, and targeted academic interventions [13, 3].

According to [14], in its seminal 2005 report, it was stated that there is a growing need to train students at the graduate level [15]. Meeting the industry's needs will take ingenuity; new ways of thinking, doing, and being. Currently, there is an uneven and inadequate distribution of LIATFirstGenURM student populations pursuing engineering programs at the graduate level. In 2018, the year before this grant program was funded, the civil engineering and mechanical and biomedical engineering graduate programs included 0% first generation and 9% URM graduate students. According to a survey conducted among Boise State students where we evaluated the level of interest in Boise State's graduate engineering, a large number of survey respondents (70-80%) stated that financial limitations are the largest barrier to pursuing graduate education, and although a majority (75%) of students acknowledge that a master's degree would help them find a job, a large portion (45-60%) still see financial needs as a barrier. In short, it is vital to have these students trained at the graduate level as quickly as possible to meet the industry's shortfall of trained professionals from diverse backgrounds [16].

Therefore, a main goal of the emerging program evaluation is to explore to what extent our program, referred to as the SEnS-GPS (Stellar Engineering Students Gradaute Program Scholarship) support system positively influences the recruitment, retention, and persistence of LIATFirstGenURM students in their pursuit of graduate-level degrees. We started this undertaking by gathering interview data in the fall of 2020. We interviewed the LIATFirstGenURM student participants who had just been recruited the year before for graduate study and were in their first semester of study.

The Year 1 SEnS-GPS support system program offerings

The Boise State University College of Engineering (COEN) is situated in the city of Boise, Idaho a metropolitan research institution located in the pacific northwest. Boise State University College of Engineering was ranked at number 140 in best engineering schools in the United States [17]. Various programs at the College of Engineering have adopted a set of effective evidence-based practices, educational approaches, and flexible policies, providing students a quality engineering education. However, this level of support has not been available for the COEN graduate programs.

The SEnS-GPS program has been designed to support COEN graduate students primarily by providing the same infrastructure and support system components designed to reduce barriers

to education for LIATFirstGenURM undergraduate students. There are activities used to reduce barriers to entry through targeted recruitment, reduction of student employment hours, vertical and near-peer mentoring and shadowing, cohort development, and workforce preparation. The activities associated with the program are pre-admission mentoring, scholarship activities, time management, cohort support, mentoring & academic support, and workforce preparation.

Significance

The SEnS-GPS program is novel because we are implementing evidence-based practices often shown to improve undergraduate student outcomes [18, 19, 20, 21, 22, 3], by building similar infrastructure in our university organization for graduate students. However, the effectiveness of these activities at the graduate level in COEN has yet to be documented. Thus, we commenced an internal formative evaluation project, to determine the merit of our program and system [23, 24]. We began this process at the end of the recruitment phase and during their first semesters when students enrolled in the program. The first student cohort (n=11) occurred during the COVID-19 pandemic and shifts to virtual environments for universities across the globe. We implemented the change to help overcome this challenge and initiate a fully running support system for the first full year. Thus, our research questions are as follows:

1. What, if any, barriers do the SEnS-GPS participants encounter as they enter their course of study?
2. What, if any, support did the SEnS-GPS participants value during their recruitment and transition into their graduate engineering studies?

Method

Our formative evaluation project research follows Chyung's 10-step evaluation process. This process is divided into three phases: identification, planning, and implementation, with each phase producing a deliverable [24]. Phase 1, the identification phase contains steps 1 - 3 of the evaluation process. This phase centers on understanding the evaluation program and its overall purpose, leading to a statement of work (SOW). Next, phase 2, the planning phase contains steps 4 - 6 of the evaluation process. This phase explores the program in more detail, deciding on data collection, methods to use, and furnishes an evaluation proposal for the SEnS-GPS leadership team to review. Once the internal evaluation project proposal is approved, the evaluation team conducts phase 3, the implementation phase. This final implementation phase contains the remaining steps 7 - 10 of the evaluation process. These remaining steps consist of analyzing and drawing conclusions from the data to include in an evaluation report. This final deliverable is then submitted to the SEnS-GPS leadership team and NSF.

Participants

As mentioned, we recruited the 11 enrolled and funded graduate student beneficiaries, of which seven responded. Of these respondents, six identified as female and one as male. Six of the respondents are in their mid-20s and one is 30 years old. Most respondents were born in North America, with only one respondent having been born in Europe. Two of the participants consider themselves bilingual with the majority of survey respondents describing themselves as Caucasian. Additionally, the parents of many student beneficiaries possess secondary or tertiary levels of education.

Procedures

We conducted seven total semi-structured interviews. We conducted these interviews between weeks four and seven of the first semester the interviewees were enrolled in graduate engineering programs of study. The questions sought to identify the students' motivations, barriers that can inhibit their education, and valued facilitators of their education, that participants experienced as they entered into the first semester of study. We recorded the interviews, transcribed them, and anonymized the transcripts for coding and analysis.

Analysis

We conducted a thematic qualitative analysis that allowed us to identify both implicit and explicit themes appearing in the interview transcripts [25]. We also applied Chevalier's [26] updated behavioral engineering model in a deductive approach, as a theoretical framework to analyze causes of the themes that emerged with a codebook. A codebook is a tool used for qualitative analysis. It is composed of different codes that are used to codify and analyze qualitative data, such as transcripts. In our case, we were interested in exploring the barriers and facilitators to the entrance and progression in an engineering graduate program.

The SEnS-GPS support system; recruitment and first semester results

Ten of the eleven original participants have been retained from the first semester into the second semester. Also, the early program-participant interview results have shown promising results. For four program participants, obtaining a scholarship was a major factor in their decision to pursue graduate study. Throughout the recruitment process and transition into the graduate school, seven program participants communicated value for the faculty mentoring and graduate assistantship opportunities they received.

The good

Six of seven participants reported excellent academic support from their faculty mentor. All seven participants reported the support they received from their course instructors with navigating the courses and engaging with the content was excellent. Most participants reported appreciation for their course instructors' ability to slow down or speed up courses as students needed to be successful. A few participants mentioned that faculty communicated empathy for

the special situations LIATFirstGenURM students face when offering mentoring and support [27]. Most participants also said their faculty members have created a supportive community atmosphere [28]; fostered near-peer student-student [29] and student-faculty mentoring relationships [30], encouraged students to ask professional and academic-related questions [29], and offered a healthy amount of challenge without feeling overburdened [28]. They also facilitated contact with outside professional organizations, which has been shown to positively affect outcomes as well [31]. Five of the seven participants shared that faculty adeptly created spaces where both social and informal learning can take place, which is imperative for building relationships, both mentor-mentee and student-student [32]. Finally, as research indicates [27], half of the participants attributed the financial support from the scholarship as a key to their ability to enter and persist through one semester to the next.

The opportunities

Five of the seven participants found it difficult to understand some expectations regarding their graduate programs of study. For example, specific required or elective courses needed to graduate in 2022 and multiple examples of thesis projects published after 2014 are not easily accessible in two to three clicks from the departments' websites. Half of the students reported feeling overwhelmed because of the increased (i.e., from undergraduate courses to graduate courses) workload, research responsibilities, and ineffective time management skills, in light of the weekend family responsibilities commonly associated with LIATFirstGenURM students [32]. Further, several participants reported the transition from textbook testing and labs at the undergraduate level, to adding research and thesis projects at the graduate level, with no perceived intentional or formal bridge, to be a significant challenge that could be better supported. Perhaps unsurprisingly, most program participants expressed their desire for more opportunities to build relationships with scholarship peers. They also reported missing additional networking and peer support opportunities like picnics, social gatherings, and networking events, which was a result of the COVID-19 impact on the program. Half of the participants felt they were not informed about the SEnS-GPS program expectations, opportunities, or what belonging even meant.

Our next steps

There are a number of factors that should ideally be monitored closely moving forward. First, communication with the students, faculty, SEnS-GPS leadership team, and department chairs should be completed to elaborate upon the following findings. Feedback regarding the faculty's superb efforts to mentor and respond to students' progress and questions should be given so that they know to keep doing what they are doing [33]. In addition, the continuation of fostering a community atmosphere within the programs is imperative because it is beneficial for students [28]. Recognition of the importance of the scholarship program should be noted because

it has afforded the opportunity for at least half of the scholarship participants to continue through their designated programs, where they would not otherwise.

We found it interesting that only half of the program participants expressed gratitude for the scholarship opportunity provided. This could be due to the participants not knowing they were enrolled in the program, the support system has been designed and implemented by the program, reduced activities (especially face-to-face) due to COVID-19, or some other factor, which requires more investigation. Moving forward, considering changes to the program selection and recruitment process is likely in order.

To address the above-mentioned concerns, we will implement additional interventions shown to yield benefits to graduate students such as more formal support when transitioning into and progressing through graduate-level study [34, 35, 36]. Easier online access to the graduate programs of study information and scholarship support system program, which elaborates on expectations, current program requirements, opportunities to connect outside of class online, and thesis examples, should be available. Some informal learning such as near-peer mentoring or formal instructional intervention such as a workshop regarding reading research and taking on research responsibilities should be considered for online implementation. Articulating the transition into the graduate-level study, providing a greater level of access to data, program information, resources, required courses for students, and projected timelines for graduation, has been shown to allow students to manage their schedules and persist more effectively through their program of choice [37, 38]. When providing examples for potential thesis projects, students can begin their thesis project scope sooner rather than later and feel more prepared to broach professors about topics and their own ideas for potential research projects.

Conclusion

Monitoring program participants and gathering feedback as they work through their graduate assistantships is vital to better understand challenges that have been voiced surrounding them. While COVID prevented or hindered the implementation of most planned interventions, our findings thus far demonstrate that the recruitment and first-semester interventions are supporting many of the students' needs. However, we realize additional steps may better meet program participants needs as they transition into their graduate studies. By doing so, we anticipate an increase in the positive outcomes of the SEnS-GPS students' GPAs, program retention, and graduation rates.

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