Lessons Learned in an S-STEM program: How to Improve Recruitment and Cohort Building

Abstract: In fall of 2018 the School of Engineering at Campbell University received an NSF S-STEM grant. This program funded by HI-B visas is meant to support U.S. citizens and permanent residents in their pursuit of a STEM degree[1]. The solicitation requires that additional supports be put in place to help students persist in STEM[2-5]. This paper will describe the program's recruitment strategies, the practices that have been most effective, and the demographics of the successful applicants. In addition, the paper explores the evolution of cohort community building efforts, starting with mostly faculty-led and planned events to events led by a consultant. Improvement in sense of community has been reflected in the evaluation reports, and selected supporting evidence will be shared from the reports.

Recruitment

This S-STEM grant was awarded in fall of 2018 with the goal of supporting at-risk students through multiple academic pathways, with our definition of at-risk as students who start at Campbell in a math class before pre-calculus. The Campbell School of Engineering allows any student admitted to the university to enroll in engineering; students are divided into tiers based on their math preparation. Tiers I and II have math ACT scores of 24 or below or math RSAT scores of 580 or below and start in Fundamentals of Mathematics (Tier I) or College Algebra (Tier II). Those with higher ACT or RSAT math scores are designated as Tier III and start in pre-calculus (or above if they have AP or transfer credits). To recruit for the S-STEM, students were asked to fill out an application that included the four essay questions listed in Table 1, aiming to get a large number of students applying from Tiers I and II. We also had a kickoff meeting open to the entire engineering school explaining the program features, the eligibility requirements, and how to apply. Starting in the second year of the program, we also accepted renewal applications that were shorter in length.

Table 1: Application questions for new applicants.

1.	What have been your most significant challenges to achieving academic success? Comment on how you overcame those challenges.
2.	Give an example of how you made the most of an academic opportunity.
3.	What are the biggest challenges to completing your engineering degree at this university?
4.	How would the S-STEM scholarship and program help you to overcome those challenges?

Table 2 shows the new and renewal applications for the first three years of the program. The first application cohort applied in fall 2018 and entered the S-STEM program in spring 2019. The cohort consisted of 40 student applications, which was 24% of the total engineering enrollment. Of these applicants, 40% attended community college, and 55% were employed. The total number of eligible students based on financial need and a minimum GPA of 2.5 (that we established) was 31, or 19.9% of our overall student population. Thus, students who were not eligible for the program applied. The accepted student cohort had 21% of students in Tiers I/II and 79% of students in Tier III. Twenty-one percent of accepted applicants transferred multiple

math and science courses and thus started at Campbell in higher level math courses. For most of them, ACT/RSAT scores were not available, and we grouped them with Tier III.

Table 2: Number of eligible students, renewal applicants, and new applicants

Scholarship Year	Number of Eligible Students	Number of Renewal Applicants	New Applicants		
			Number	Attended Community College	Employed
2019	31	-	40	40%	55%
2020	42	14	16	63%	38%
2021	40	15	18	44%	39%

For the second year of the program, we wanted to increase the number of students applying from Tiers I and II. In the required seminar course that all first-year engineering students take, a homework assignment was integrated that had very similar questions to those on the S-STEM application. The students were informed that the S-STEM application questions were similar. To communicate the applications were open, we used a slightly different strategy. We incorporated announcements into the weekly engineering email and asked professors to announce it in their classes. We had 14 scholars eligible to renew, and they completed the essay questions in Table 3 as part of the renewal application. Fourteen new applications were received, which was 8.2% of our total engineering students. Based on need and GPA requirements, the total number of eligible students was 42; so fewer students than were eligible applied in year 2. The percentages of accepted applicants were 24% from Tiers I/II and 76% from Tier III. Twenty-four percent of the accepted applicants transferred multiple math and science courses and were grouped with Tier III. Our external evaluator noted (after reading all the applications) that the fall 2019 applications did not capture the at-risk students we aimed to get in the program; so, we revamped efforts for fall 2020.

Table 3: Application questions that continuing applicants complete

1.	We are interested in how the S-STEM program helped to further your academic and career goals. Please give an example of how the mentoring and other program activities have been helpful (approximately 150 - 200 words)
2.	We are interested in how the S-STEM program helped to further your academic and career goals. Please describe what the financial support of the S-STEM program allowed you to do that would not have been possible otherwise (approximately 150 - 200 words)
3.	Optional: Do you have any additional comments or suggestions related to the S-STEM program?

For the application process in fall 2020, we implemented many strategies for recruitment. An interest meeting open to all engineering students reviewed the program and eligibility, and we put communications into the weekly email. We also asked all engineering professors to personally identify and email students who could benefit from the program. A sample email was sent to all professors, which can be viewed in the Appendix. The number of new applications received was 18, four more than 2019 and 11% of total engineering students. We also received

15 renewal applications. A total of 40 students were eligible in the School of Engineering. Of the 18 new applicants, 44% had attended community college and 39% reported employment during time of application. For this 2020 cohort, 25% were from Tiers I and II, with 75% from Tier III. Thirteen percent of the new applicants transferred multiple math and science courses and were grouped with Tier III. The percentage Tier I/II students has slowly increased from the first to third years of the program. The consensus of the PI and co-PIs who rated the applicants was this group more strongly represented the at-risk students we have been trying to recruit (the evaluation report was not available at the time of publication).

Overall, it is difficult to determine the most effective strategies for recruitment. Certainly, the kickoff meeting and personal recruitment of students from professors has likely increased applications. The essay assignment may or may not have helped. Because the student population is small, a strategy to encourage even a few students to apply is valuable for us.

Cohort Composition

The gender composition in the cohort has slowly changed over time as shown in Figure 1. While we only accept new applications in the fall, the figure shows data for each semester cohort of students. The first cohort was 79% male while our spring 2021 cohort is 68% male. The percent of male students has slowly trended down, with one uptick from 73% to 74% from spring 2020 to fall 2020. Gender is not a factor considered in the selection process. Estimated family contribution and essay question answers are weighted most heavily, with all genders treated equally. Thus, while more females in the program is an encouraging statistic, there was not an intentional effort to increase the number of females in the program.

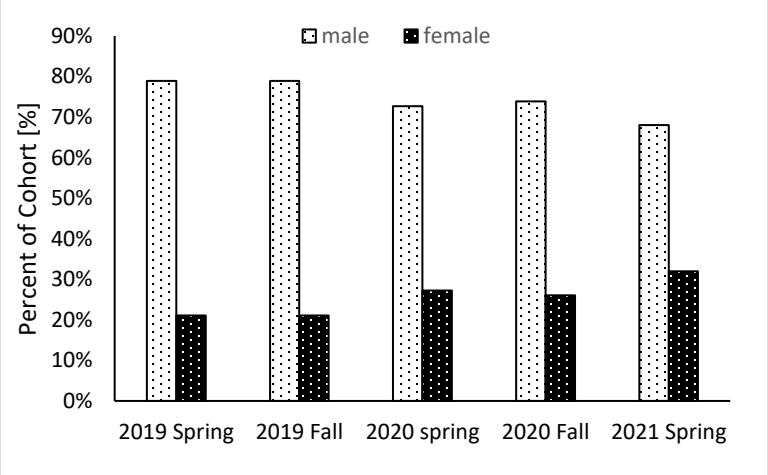

Figure 1: Gender data of each semester cohort from the inception of the S-STEM grant.

Race and ethnicity data for each semester of scholars is reported for all semesters in Figure 2. In the first semester, there were 74% White, 11% Hispanic, 5% Black, and 11% Native American students. The demographics stayed the same for the second semester, as all students renewed their scholarships. However, they changed each of the following three semesters: in 2020 spring there were 73% White, 5% Hispanic, 9% Native American, and 4% did not report. The percent of white students in fall 2020 increased and Hispanic decreased, and since we do not accept new

applications for the fall this indicates 4% of the Hispanic students in the S-STEM program did not return in fall 2020. In spring 2021, the cohort has 68% white, 8% Black, 8% Native American, with 16% of students not reporting their race or ethnicity. In the application process we are cognizant of race as a risk factor.

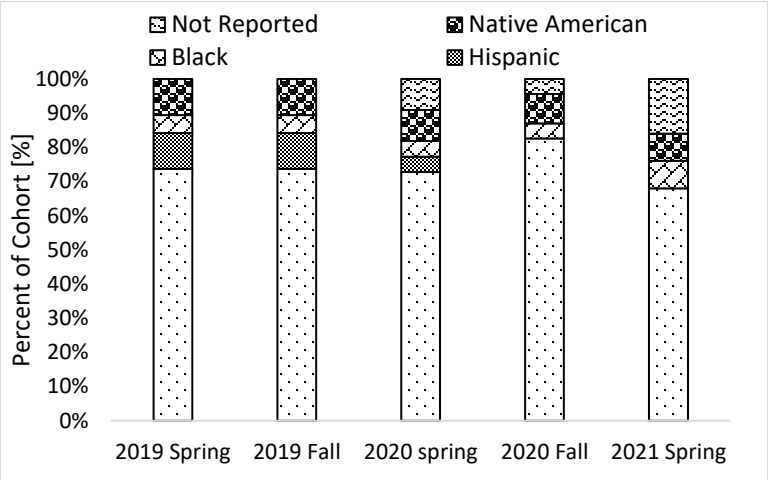

Figure 2: Race and ethnicity data of each semester cohort since the inception of the S-STEM grant.

Finally, we will discuss estimated family contribution and Pell grant eligibility among the semesters. The S-STEM solicitation specifies that scholars need to be low-income and academically talented. Table 4 sumarizes the estimated family contribution (EFC) and Pell eligibility of each of our cohorts. The EFC has increased each year for three years, and the percent of students that are Pell eligible has decreased each year. These statistics show that we are accepting students into the program that have less unmet need each year.

Table 4: Estimated family contribution and Pell eligibility of the three S-STEM cohorts.

Cohort	EFC	% Pell Eligible
2019	$6,264	68%
2020	$12,859	59%
2021	$15,100	28%

Community Building

The other main component of the program that we would like to report on is community building. In year 1, we offered a few social events planned by faculty that included dinner. The evaluation report from year 1 reported that students most appreciated faculty mentoring but did not feel they were part of a community with their S-STEM peers.

For year 2, we followed a recommendation from the evaluation report and solicited event ideas from students. Another change was to hire a consultant to offer professional development sessions. We chose this consultant because of his efforts to get audiences involved during the sessions. Interaction is an important component to community building, and students were very

engaged during his sessions. When instruction went online due to the pandemic in spring 2020, we continued the professional development sessions online, and during the final session all students received a care package in the mail that we opened together virtually. More than one student sent an email noting how they felt very appreciated because of the care package and gave extra thanks because they were at home during the pandemic. The most encouraging part of year 2 was the difference in the evaluation report from year 1. One student noted:

> *"The program really focuses on community – it's just nice to have that group of students around learning new skills to help better themselves while being an engineering student."*

Our efforts to build community were working. The consultant sessions were met with high acclaim, and we have continued these sessions to this day. Another student noted:

> *"I feel like they did a really good job this year in making the events much more appealing to the students, keep trying new things that would seem interesting to us and provide us with as much community bonding times as possible."*

The evaluator mentioned in our annual meeting that our selection of the consultant was especially important. She said that most of the time when sessions like this are taught, students reflect that the sessions make them feel young, like high school or middle school students. She heard none of that from our students, and noted how strange it was that not even one student mentioned a poor experience. Instead, they cited strategies and information that they learned in the sessions and continue to use in their everyday life.

In addition to better programing, the mentoring aspect of the program was making a difference in student lives. A student reflection about the overall program said:

> *"The CORE-ES program has been a tremendous help for me throughout my last year at Campbell. Not only was the money a tremendous help for me and my family financially, but the different programs that were available through CORE-ES were also very important to me. For example, I thoroughly enjoyed the mentoring aspect of the program. . . my mentor for the last year . . . helped me in more ways than I could imagine."*

In year 3 we continued with virtual professional development sessions, peer and faculty mentoring, and one social event each semester. It is challenging to navigate community building during a pandemic, but we have found ways to get together. In fall 2020 we had an outside bonfire and served dinner. In spring 2021, we had a star gazing party with bonfire and dinner. Mentoring sessions have continued either virtually or online (at the discretion of the mentoring pair) and we look forward to reporting from Spring 2021. Finally, we ordered shirts for everyone with a design inspired by a student.

Conclusions

Since fall 2018, we have improved at recruitment and community building for the S-STEM program. Recruitment strategies that work for us include an interest meeting,

communications via the engineering weekly email, and announcements by professors in engineering classes. The demographics of our cohort have changed over time, with more females in the program now as compared to its start, but students now have a higher EFC and lower Pell eligibility as compared to the program's inception. Community and cohort building started slow, but we have found a few elements that work well. One important aspect to all our events is to ask students what they want. They help guide the consultant-run professional development sessions we host and inform which social events we will have during the semester. Feedback has indicated that we are building community with these strategies.

Acknowledgments

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Appendix – Copy of email sent to faculty for student recruitment

Hi (insert student name here),

I want to make you aware of a scholarship that only Campbell University engineering students can apply for. I think you would be a great candidate. Awards are between $1000 - $4000 per semester (or $2000 - $8000 per year). The program has the following requirements:

- US Citizen
- 2.5 entering GPA; 2.8 GPA to maintain

A few years ago the Campbell School of Engineering got a grant from NSF (National Science Foundation) for scholarships. The program wants students to graduate in STEM, but recognizes that scholarship money only goes so far. So, we have some other elements like mentoring for the

program as well. It is called the Campbell Opportunity to Retain and Engage Engineering Scholars (CORE-ES).

To apply, you have to write 4 essay questions. If you take them seriously you will have a competitive application. We have an interest meeting tonight at 7pm if you want to come: [information about interest meeting]

The scholarship application is here: [link to Qualtrics for application]

Applications are due Nov. 2.

You are a hard worker and well-deserving student. I hope you consider applying!

Thanks,

Your name