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Supporting Engineering Transfer Students at Scale: Sustaining the EMPOWER S-STEM Model Through Growth and Adaptation

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Abstract

Sustaining a student support program is more than maintaining funding; it's about preserving purpose as participation grows. The EMPOWER S-STEM project was launched to help low-income engineering transfer students navigate the academic and social transition from community colleges to a four-year university. Now in its fourth year, the program has entered a phase focused on scale and sustainability: how to serve more students while holding on to the mentoring elements and community-driven approach that makes the experience meaningful.

Years 3 and 4 brought both challenge and opportunity. Because more scholars than expected received other federal, state, and institutional financial aid, including grants and scholarships, the leadership team expanded the cohort to ensure that NSF scholarship resources reached as many qualified students as possible. The larger group required new forms of coordination and flexibility. Faculty mentors, co-PIs, and staff worked together to reimagine event planning and mentoring assignments to accommodate a more complex community. What emerged was not just a larger program, but a more robust network among students, mentors, mentees, and institutions, one that highlighted the importance of intentional structure in maintaining connection at scale.

Outcomes, informed by student questionnaires, suggest that growth has not diluted the impact. By spring 2025, most Scholars from the first two cohorts had transferred successfully to four-year programs, and participants continue to report a strong sense of belonging and satisfaction with the program. These results reflect the value of adaptability, the ability to adjust without losing the human element that defines the project.

This paper shares how the EMPOWER Program has balanced expansion with sustainability, highlighting lessons on partnership, coordination, and the evolving meaning of "support" in a growing multi-institutional program.

Introduction

The National Science Foundation's Scholarships in Science, Technology, Engineering, and Mathematics (NSF S-STEM) program funds projects to support low-income domestic students so they may provide scholarships, mentorship, and targeted programming with the aim of them advancing with a STEM degree into a STEM-oriented career [1]. Currently, up to $5 million dollars across 6 years is invested into student support projects across the United States. Scaling and sustainability are significant issues faced by these and other large scholarship programs.

EMPOWER, initially described in [2,3], is an NSF S-STEM program focused on the transfer engineering students at two 2-year colleges and one 4-year university, over 5 years. The EMPOWER program assists these students as they transition from community college to a

4-year university. It provides scholarships, mentorship, and activities guided by Schlossberg's 4S framework, considering the students' situation, self, support, and strategies [4].

In this study, EMPOWER students at all three institutions are surveyed to better understand how recent scaling has impacted their accessibility to mentorship and other supportive programming. A snapshot of program specific results, regarding mentorship and financial support, is highlighted in this paper. The corresponding full paper has a more detailed description of the study, including a comparison of support and perceptions between the community colleges and the university. The full paper includes additional analysis and discussion of self-efficacy, motivation, transfer student capital, institutional engagement, and perceived social support, and a sense of belonging. The transition experience and EMPOWER impact are highlighted in both papers.

Financial background for a common Pell-eligible student

Scholarships are initially one of the most, if not the most, attractive aspects of applying and being accepted to the EMPOWER program. The scholarship opportunity, in terms of attractiveness, is closely followed by direct access to faculty mentorship and being included in a transfer engineering student cohort. Upon implementation of the program at UC San Diego, it was found that many Pell-eligible students already receive a significant amount of other financial support. For example, an annual Pell-eligible student financial aid package, covering approximately a $40000 cost of attendance and illustrated in Figure 1, might include ~$7000 from Pell grant, $14000 from Cal grant, $10000 from university grants, and $2000 from other grants. EMPOWER would cover the left over $7000, since it is a "last dollar" scholarship, displacing any loans or work study. Some students might be in the EMPOWER program but fully financially supported by another scholarship.

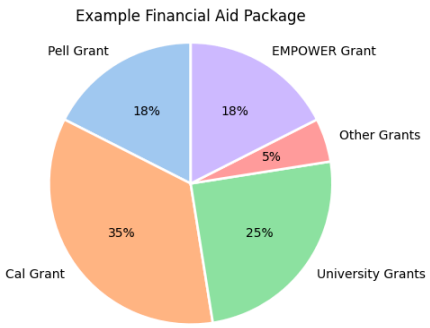

Fig. 1: Example financial aid package break down for a university EMPOWER student.

The EMPOWER program, when proposed, called for up to $10000 per EMPOWER student. Considering the lower actual applied per-student scholarship amount, an increased cohort size was required to ensure the grant funds were appropriately expended. Scaling was both a challenge and an opportunity, and it led to the EMPOWER program at UC San Diego doubling the next cohort size.

Student Impact

An increased cohort size does not necessarily lead to increased impact. A questionnaire was designed and deployed to investigate EMPOWER students' perspectives on their situation, self, supports, and strategies. A total of 54 students across all three institutions consented to participating in the research study. Response summaries regarding financial aid, mentorship, and overall program support are highlighted in this paper.

Financial Aid: Financial constraints are observed on most all students enrolled in higher education institutions. Figure 2 illustrates, on a 1-7 scale, "To what extent do EMPOWER students feel financially constrained during this academic quarter or semester?". 1 is described in the survey as "I never think about money, this is never an issue" and 7 is described as "I am unsure whether I am able to afford my next meal." The data reveal a heightened sense of financial strain for both community college and university EMPOWER students. There is a trend toward increased feelings of financial constraint after students transition to the university. Figures 3 and 4 show the number of hours worked per week by community college EMPOWER students and university EMPOWER students, respectively. This data reveals a slightly higher percentage of university EMPOWER students working, compared with their community college counterparts. However, in the community college setting, there is a larger percentage of students who work 11+ hours per week, 39% of community college EMPOWER students compared with only 19% of university EMPOWER students. Many factors could be contributing to these results, e.g., study time displacing work time, less time to acquire a job in a new environment, etc.

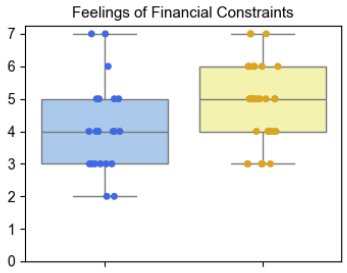

Fig. 2: Financial aid constraints averaged data for each student, comparing community college (left) and university (right).

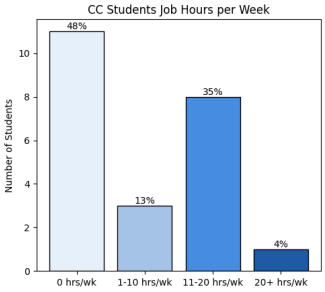

Fig. 3: Number of hours worked per week in a job for a community college EMPOWER student.

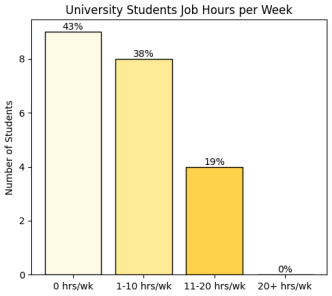

Fig. 4: Number of hours worked per week in a job for a university EMPOWER student.

Mentorship: Mentorship programs are commonplace in professional spaces. In the undergraduate setting, a student might find a mentor through their academic department, student organizations, alumni programs, and internships. Faculty mentors are of great value for students navigating through their degree programs and in preparation for their careers. In Figures 5 and 6, the frequency of interaction with a mentor is shown for the community college EMPOWER students and the university EMPOWER students, respectively.

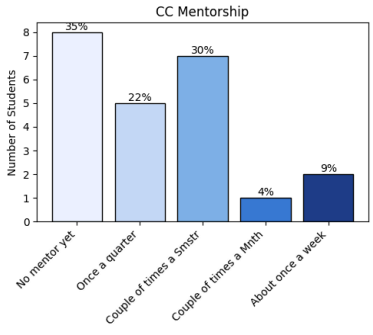

Fig. 5: Frequency of interaction with a mentor for community college EMPOWER students.

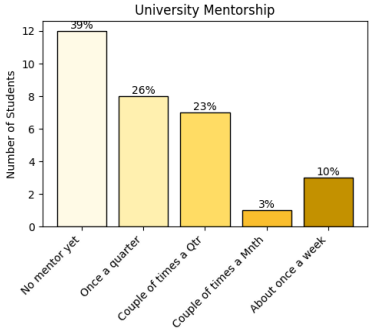

Fig. 6: Frequency of interaction with a mentor for university EMPOWER students.

The EMPOWER Program has implemented a variety of forms of faculty mentorship. The EMPOWER faculty leadership team at each institution is made available at a series of events during the academic quarter or semester. EMPOWER faculty leadership often makes time for one-on-one chats in person, virtually, or through email, however the student might be comfortable interacting. Group mentoring lunches with faculty from different engineering departments are available at least once per quarter. Students are encouraged to seed mentorship relationships with these faculty. To extend those mentorships or find new ones, an EMPOWER coffee with the mentor program was developed so students are supported to get a small drink while obtaining useful advice. Additionally, many students engage in research working in research labs under the guidance of faculty PIs. Even with many opportunities, it is noted in the data that many students do not identify yet as having a mentor. NSF S-STEM does not allow scholarship programs to require any activity. It is important to reach these students and ensure they know the value of mentorship along their pathway.

EMPOWER Support

The EMPOWER program offers a wide range of support. As mentioned in the previous section, NSF S-STEM does not allow making activity participation required. In Figures 7 and 8, the frequency of participation in EMPOWER events is shown for the community college EMPOWER students and the university EMPOWER students, respectively. The variance of participation modes is larger for community college, being more uniformly distributed, whereas in the university setting, most students have "participated in some" EMPOWER activities.

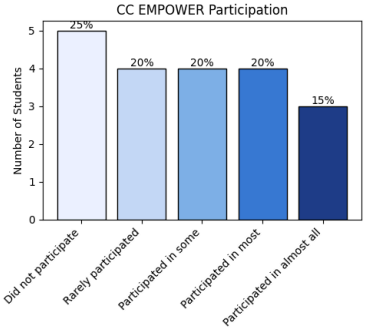

Fig. 7: Frequency of participation in EMPOWER events for community college EMPOWER students.

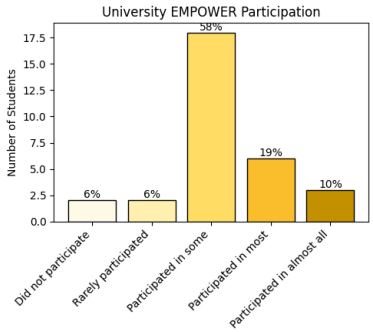

Fig. 8: Frequency of participation in EMPOWER events for university EMPOWER students.

EMPOWER students shared that they have gained from participating in EMPOWER. These are a few quotations in response to "What have you gained from your EMPOWER program experience?" These quotations highlight mentorship and community.

> "The EMPOWER Group Faculty Mentorship Lunch has been incredibly supportive during my transition. It was actually the first time in my academic career that I gained a real understanding of what academic research entails and what the faculty are actively working on."
>
> "That there are people with similar experiences than me, and it is possible to succeed as a transfer student."
>
> "Research experience and mentors that I will be sure to keep in contact with long after I've graduated."
>
> "Resilience and support from professors that get the struggle."
>
> "More Friends!"

Summary & Lessons Learned

Amidst an increase in EMPOWER program scholars, it is important to gauge, quantitatively and qualitatively, in what ways and to what extent scholars are being supported by the EMPOWER program. In this paper, the scaling and sustaining of financial aid, mentorship and other EMPOWER program activity participation were most closely examined through review of survey responses. Student feedback was positive, however, opportunities to improve presented themselves. For example, reaching more students through the currently available, multi-modal EMPOWER program mentorship offerings is needed. In the corresponding full paper, a more extensive investigation was conducted, including analysis and discussion of self-efficacy, motivation, transfer student capital, institutional engagement, perceived social support, and a sense of belonging.

Key lessons learned from this study, impacting scaling and sustainability, include:

1) Many low-income students are being financially supported by multiple scholarship programs. This may necessitate an S-STEM program to scale and accept more students, to meet NSF S-STEM requirements on financial aid expenditures.
2) Even with large financial aid packages, students feel financially constrained. Those feelings of financial constraint might change as students move from community college to a university, possibly due to different academic pressures or other environmental changes. It is important for a scholarship program to consider offering a variety of support to relieve financial pressures, for example, funding research opportunities.
3) Scaling may require expanding the range of programming approaches, such as moving beyond a single mentorship program to offer multiple opportunities for students to connect with and continue engaging with mentors.

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References

[1] “NSF Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM) | NSF - National Science Foundation.” Accessed: Jan. 19, 206. [Online]. Available:(https://www.nsf.gov/funding/opportunities/s-stem-nsf-scholarships-science-technology-engineering-mathematics)

[2] K. Morris, J. Duerr, S. Baghdadchi, B. Lin. "Toward understanding engineering transfer students' transitions from community colleges to 4-year institutions." ASEE Conf. 2024.

[3] S. Baghdadchi, K. Morris, B. Lin. "Fostering Success in Transfer Engineering Students: The Role of the EMPOWER Program Activities and Support Services." ASEE Conf. 2025.

[4] N. K. Schlossberg, “A Model for Analyzing Human Adaptation to Transition,” Couns. Psychol., vol. 9, no. 2, pp. 2–18, Jun. 1981.