Board 189: A Mentor's Reflection on Challenges of Practice in a Scholarship Program for Lower-Income Computing Students

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1. Introduction

This paper describes an NSF (National Science Foundation) S-STEM-funded scholarship program, representing a collaborative five-year grant project among three prominent universities in the Southeast region of the United States. Its primary objective is to support dedicated scholars in graduating and finding a professional pathway. Each institution recruited a cohort of 15-20 scholars annually for three years. The project offers scholarships and provides curricular and co-curricular support to academically talented but financially challenged students in the computing disciplines, including Computer Science, Computer Engineering, Cybersecurity, and Information Technology majors, starting from their junior years. The program aims to impact 150 scholars, most of whom are underrepresented in computing. Scholars receive support throughout their graduation and beyond should they pursue graduate studies in a STEM (Science, Technology, Engineering, and Math) discipline at any of the three participating institutions.

Besides funds, the program provides an expansive career pathway opportunity to each of its students, accompanied by various supporting services, a dedicated advising team, experiential learning offices, career services offices, and graduate schools. Supporting services include internship fairs, panel discussions with alumni, resume workshops, graduate school application workshops, and career fairs. The project brings together the unique collaboration of three institutions for each of its supported activities to significantly enhance the support and opportunities offered to its scholars and to conduct meaningful research studies that include significant-sized intersectional populations.

1.1. Implementation and evaluation

The program adopts a cohort-based model, wherein a new cohort comprising 15 students per institution is recruited at the beginning of each Fall semester. These students are provided financial assistance to alleviate their academic burdens, allowing them time to concentrate on their studies and actively participate in the program's various events and activities.

For the overall program assessments, the external evaluators and the internal researcher team have used different methods, such as surveys, interviews, and observations. On the other hand, advisors use holistic advising methods to ensure students are comfortable while being on track for their academic path. Each scholar has a team of dedicated professional advisors and a faculty mentor while in the program. Advising sessions are in-person or via Zoom, usually 20-30 minutes. At the beginning of the semester, the discussion usually revolves around which classes they should take for their career goals. During the semester, students may come for advice for any problem they have and are willing to share, whether academic or personal. Advisors usually put notes in the system so students can access them later, especially if the session concerns academic planning (for instance, course schedules, applications for graduation, or other forms). These notes may serve as data points for research purposes.

Another method used in the program is "crowdsourcing." Students would help each other and collaborate to build a sustainable community, contributing with their strengths and capabilities. For instance, the older cohort took on leadership roles in organizing events like the "Student-led Mentoring Event." For this event, four scholars from the first cohort (started in Fall 2021)

conducted a workshop for the second cohort (started in Fall 2022), sharing their experiences on maximizing the scholarship experiences and taking advantage of its resources. Another illustrative example was the Symposium event, where students spearheaded presentations about their interests- encompassing school projects, internships, research endeavors, or personal undertakings. These presentations allowed students to share their works with the program's academic community, comprising faculty, industry mentors, staff, and fellow students.

2. Purpose: *Reflecting on challenges of practice*

While the previous section highlights the basic program structure and how the program is intended to work, there are more subtleties and challenges to achieving these programmatic objectives. We think that more institutional programs should include reflections by those who carry out the program to help reveal the nuances, challenges, and strategies associated with the practice. In other work, we have documented student impacts through surveys, interviews, and observations [1]. In this paper, we highlight the reflections of a critical personnel practitioner to reveal the challenges that emerge once the plans are being carried out.

Tiana Solis (lead mentor and first author of this paper) is responsible for onboarding the scholars, mentoring some of the participants, managing the mentorship relationship between other mentors and mentees, and seeing that students are holistically supported until they graduate. This process starts with recruiting and selecting students, requiring cooperation with various departments throughout the institution to get correct and accurate data that satisfies the selection criteria. This collaboration extends to departments like the financial aid office, which manages student financials and addresses unmet needs. Different professional advisors are also involved because of limitations. Computer Engineering students receive advisement from outside their department. Computer Science and Computer Engineering are separate departments and have different requirements. Additionally, Solis oversees student activities, which demands collaboration across campus and with external partners, such as industry mentors and two other collaborating institutions, for joint initiatives. An example of these activities is the yearly Spring Symposium, which entails several months of preparation. This preparation involves coordinating with industry mentors, coaching scholars for their presentations, and planning the event, including securing rooms, arranging catering, ensuring technical support, and ensuring that most stakeholders, especially the scholars, can attend.

Stephen Secules (the lead education researcher and second author) has helped support the process of reflection by providing example prompts and helping to reshape the narrative. The findings presented here will hopefully help other programs have more insights into how to carry out successful student support, considering institutional constraints.

3. Findings: The Challenges of Practice

While a formal research question does not organize the paper, Solis's reflections were organized to answer a question of practice. The following reflections answer the overarching question: *How can mentorship be executed effectively under various constraints?*

We organize this review by identifying four key challenges in running the S-STEM program. For each obstacle, we create a descriptive name and definition, highlight key aspects, and discuss lessons learned or strategies for solutions.

3.1 The Challenge of Time

In the programmatic and institutional contexts where the project is embedded, time feels constantly constrained. Prior student feedback on the program has suggested a need for more events. However, due to the substantial workload of the key personnel and stakeholders, the organization of events and activities is curtailed, primarily owing to insufficient human resources. This time constraint is a notable program limitation. While the NSF (National Science Foundation) provides scholarships and essential personnel funding, there needs to be more time to carry out programmatic aspects.

Further, event planning and organization require considerable time. The process requires multiple tasks that often depend on other departments. For example, finding a room for a large event (which must be done months ahead), getting permission to buy food for the events, and ensuring that most stakeholders will attend make each event a complex and time-consuming planning task.

Finding a typical day and time to hold events requires contacting stakeholders via multiple means. Students have different class schedules, work, and other commitments, so finding a time when most students, faculty mentors, and administrators are available is challenging. Some of the problems of time and the difficulty in implementing the grant goals might be attributed to the institution's core functions and culture. The unspoken culture of the school is for everyone to do more, which may be intended to push productivity but can have a negative effect on the employees (being overwhelmed) and the quality of services. For instance, it is time-consuming to reach students via email, group chat, and phone calls to ensure that they will attend events and activities since they are the core of the program and must be present.

In this area, we learned the lesson of planning the major events early and finding one or two students from the group to handle the group chat. We also have a student assistant/worker handle calls from the key personnel office, as students may only answer if the phone number is known. We also suggest having more than one coordinator and splitting the work into roles: a) manage students (academics, financial aids, NSF data reporting well-being) and activities; b) manage faculty and industry mentors and any external related issues.

3.2 The challenge of quality individual mentorship at scale

Student involvement often needs encouragement from the program coordinator or mentors. However, at this university, employees are frequently engrossed in their duties, grappling with large workloads and time constraints. This grant brings the challenge of providing comprehensive mentorship to 40 scholars with only three faculty mentors who are often tied up with other administrative tasks, rendering it impractical to explore students' potential thoroughly.

Given the scarcity of faculty mentors compared to the sizable number of mentees, only a select few students may have the opportunity to benefit from mentorship. This dynamic could result in reduced interaction for those unable to initiate contact with professors independently. The mentorship process may adopt a "first-come, first-served" approach, as mentors may only be able to take on a limited number of mentees, typically two or three. It is essential to acknowledge the challenges faculty face in balancing their responsibilities with the additional demands of

mentoring numerous students while maintaining quality. This issue may also stem from broader cultural challenges within the institution.

In an ideal world, mentors and mentees should be more involved and reach out to each other outside the main events (orientation, symposium, and graduate showcase) to continue and maintain an active relationship throughout the academic year. This applies to the industry mentor as well. The idea is to assign students a mentor at the orientation and the symposium, and then they will set up a schedule to stay involved during the semesters. However, as time passes and everyone becomes busy, no follow-up usually occurs until the next leading event. The complexity of this issue goes back to time constraints and the institutional culture of assuming multitasks. Figure 1 shows a faculty mentor discussing research on AI (Artificial Intelligence) and Robotics at the orientation event- topics many students were highly interested in. However, a professor may only accommodate enough time for a proper mentorship with two or three students.

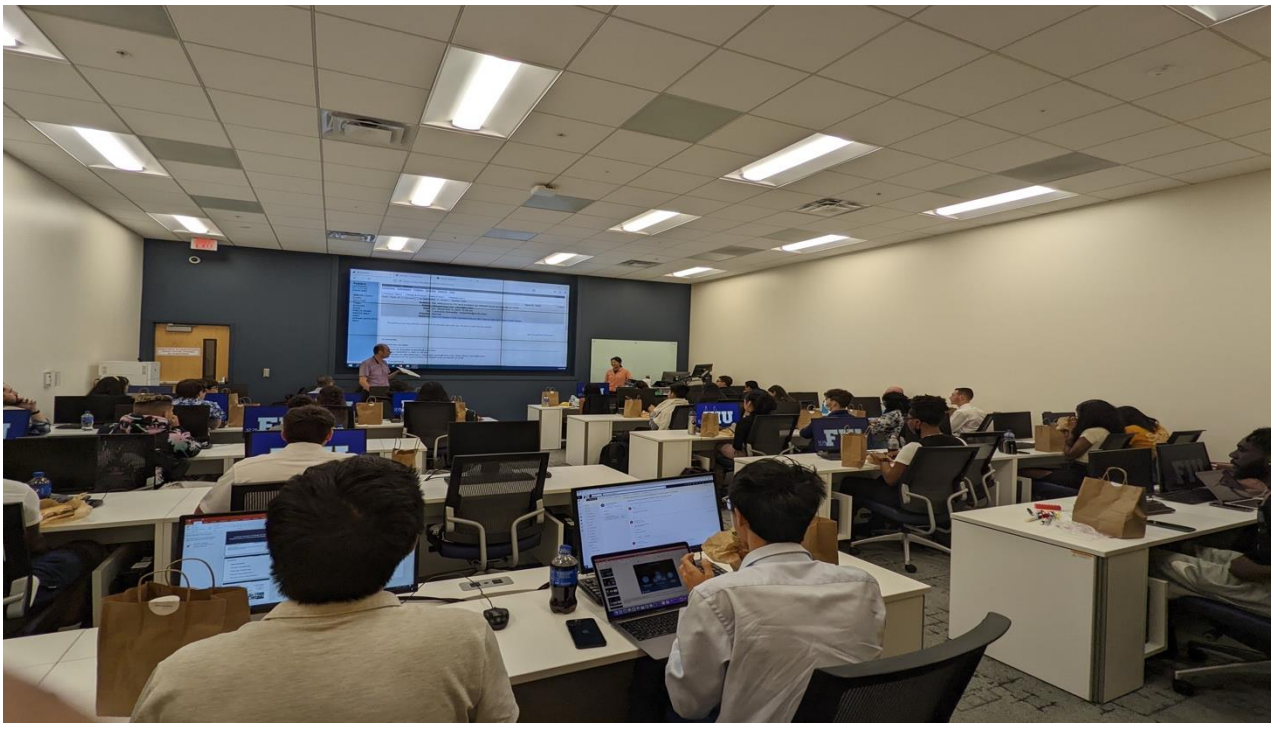

Figure 1 – A faculty mentor presentation on research projects

Students who opted to pursue graduate studies highlighted the significant influence of their faculty mentors on their decision to pursue the research pathway.
One key takeaway for implementing a similar program is ensuring enough self-motivated faculty mentors are available to support students effectively, maintaining a reasonable ratio of mentors to students.

Figure 2 shows a small mentoring interaction between peers and an industry mentor. In order to become an industry mentor, this person needs to allocate time from their workday, travel to the university, attend the presentation, provide feedback to the presenter, and engage with students. While it is feasible on occasion, maintaining this regularly also poses challenges.

Figure 2 – A mentee discussing his project with his peers and an industry mentor

During the spring symposium, students highlight their projects, such as their capstone, internship, or class projects. This event also serves as a platform for students to make a positive impression on industry professionals, potentially leading to securing internships for the upcoming summer. The interactions during the symposium are often fantastic, but the follow-up engagement outside the event could be improved.

Figure 3 – A mentor industry giving presentation feedback over lunch

We have an ongoing challenge with no straightforward solution regarding the challenge of quality mentorship at the individual scale. The program needs to provide mentoring to all students. It is essential that the mentoring be high quality and individualized. However, this takes personnel and time, which is hard to produce and sustain. However, the first step to a solution is to prioritize transparency regarding mentors' roles and expectations of mentoring. This way, mentors can accurately assess their contributions and the program's success. Mentors need to understand the time commitment required to support their mentees effectively. It may also be beneficial and efficient for grants like this program to financially support additional faculty mentors by adding more compensated personnel roles.

4. Outcomes and Conclusion

This collaborative program involves three large universities; each institution benefits from the other regarding best practices, feedback, and program improvement needs. In its third year, this five-year grant program is still in progress. However, it has significantly impacted student graduation and the number of students pursuing graduate studies, which is considered a success at the University level and according to the State University System (SUS) Strategic Plan [3].

Since it started in Fall 2021, the program has provided funds and support to 63 students. The scholarship average is $4000, ranging from $1000 to $ 5000 per semester without exceeding $10000 per year [2]. The financial support allowed students to concentrate on their studies. Some students who no longer needed to work part-time were able to improve their quality of life. The scholarship funds have played a significant role in students' degree completion.

Eighteen students (29%) of the participants graduated already; seven out of 16 (43%) of those who graduated while in the program continued pursuing STEM graduate studies. Two of the graduate students are female [2]. Within the history of the school where the study takes place, the program is unique as it yielded an unprecedented number of local students going straight to graduate school after completing their bachelor's degrees in two years.

While this paper has highlighted worthy challenges and offered initial practical solutions, many are fundamentally built into providing students with financial support, programs, and mentoring to help them along their intended career path. Like many S-STEM programs, the program in question works daily to resolve these problems, reach more students, and broaden participation in computer science for low-income students.

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