University of California, Santa Cruz
NextGen Scholars in Applied Mathematics Program
National Science Foundation S-STEM program

Year 5 Annual Evaluation Report
December 2024

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The NextGen SAM project was designed to build on the existing infrastructure, programs, and research at UC Santa Cruz (UCSC) to provide high-quality support and mentoring for students, as well as scholarships to academically excellent low-income students who wish to pursue a Master of Science degree in Scientific Computing and Applied Mathematics. The following annual evaluation reports the Year 5 program outcomes, impact, promising strategies, and makes recommendations for improving the effectiveness of the NextGen SAM project. This annual report is based on qualitative data collected through one-on-one interviews with nine program alumni.

EXECUTIVE SUMMARY

Overall, alumni found the 4+1 program components - scholarship, career development, academic and personal advising - critical in lessening the loan burden, developing clear academic plans, understanding their career options, resumes building and PhD applications, and connecting with people and resources within the university or beyond. As first-generation students, the alumni found the most value in workshops that demystified the career and academic pathways. While most alumni achieved their desired outcome of entering a PhD program or securing a career in industry, alumni also expressed a need for support in completing the research thesis rather than the comprehensive exam. The following report provides a comprehensive overview of the program's strengths, recommendations for improvement, and specific impact on participants' academic and professional development as first-generation low-income students.

PROGRAM IMPACT

1. CAREER DEVELOPMENT: Meeting Students Where They Are

Participants entered the 4+1 Next Gen Program through diverse pathways. Some alumni were direct-entry students who spent four years as an undergraduate at UCSC, while others transferred to UCSC and joined the program during their second at university. For instance, one alumnus transferred to UCSC, double-majored, and took three years to complete their undergraduate studies before entering the master's program. Another alumnus spent four years as an undergraduate at UCSC, took some core master's courses as an undergraduate, and developed faculty connections that helped them explore their research before entering the master's program.

Their varied pathways led to differences in alumni's (a) clarity regarding their career and academic goals, (b) research interest, and (c) connections with UCSC faculty prior to starting the Next Gen Program.

A significant strength of the Next Gen Program is its **diverse career workshops, which meet students where they are in their career exploration journey.** The workshops were equally beneficial for students just beginning to explore their career goals and for those with a clear sense of their next steps. For example, students who were still exploring career options found the "PhD vs Industry" workshop helpful in hearing from alumni who had faced similar decisions and could provide insight into specific career paths. Similarly, this workshop benefited students who were certain they wanted to pursue a PhD by offering insider knowledge from alumni who successfully navigated that path.

Students who were unsure about their career and academic goals utilized program resources to explore options and receive support in defining their aspirations. Conversely, students with well-defined goals and research interests used the Next Gen Program as a launchpad, preparing them for their next steps.

First-generation students often face challenges in navigating the graduate school pathway and exploring career options. The career workshops empowered alumni to make informed decisions about their next steps, which is particularly important for first-generation students who often seek mentorship and guidance from faculty, peers, and counselors. **Learning from alumni** was especially impactful, as alumni brough credibility and relatability to current students.

These workshops helped alumni develop **agency**– enabling them to make informed decisions, understand the pathways, identify their interest, and intentionally choose a direction aligned with their interest. The alumni panel also provided insights into internship and job opportunities at the alumni companies. Additionally, alumni shared valuable resources such as networking strategies, conference opportunities, and joining LinkedIn groups, all of which were highlighted as beneficial for career guidance and professional connections.

Recommendations:

Support for transfer students: Transfer students expressed a need to "catch up" and navigate the time crunch, particularly those interested in completing a research thesis. They noted that exploring research interest, finding a research lab, and building faculty connections – a process that they believed required years — was especially challenging. Early engagement that familiarizes transfer students with UCSC faculty and research labs could alleviate these challenges. Structured program components to help all students, especially transfer students, build faculty connections and explore research interests could support the development of research agendas and thesis projects in subsequent years.

Career Preparation Workshops: In addition to the "PhD vs. Industry" workshop, alumni identified the job search and resume workshop as particularly helpful. These workshops reviewed different resume formats, introduced job search websites, and demonstrated how to structure LinkedIn profiles to attract employers. Alumni recommended enhancing career preparation through more interactive and skill-specific workshops such as:

- Making workshops more hands-on by asking students to bring a job posting they are exploring or a draft resume for live feedback.
- Guiding students on how to refine their resume for specific industries. For example, demonstrating how to translate skills from a course (e.g., Math Modeling II) into the coding and programming competencies required for a particular industry.

2. Academic and Personal Advising

The faculty academic advisor (FAA) and EAOP advisor played critical roles in supporting students academically and personally, offering tailored guidance, connections to resources, and letters of recommendations. Alumni highlighted the FAA's proactive approach, which including:

Developing Personalized and Clear Academic Pathways. Alumni emphasized the importance of the personalized and proactive support offered by the FAA in providing clarity about the steps need to graduate and pursue a career or PhD program. Together, students and the FAA created academic plans hat outlined the specific courses required based on students' post-graduation plans.

Alumni noted that the one-on-one discussions with the FAA about their plans were unique. One alumnus contrasted this personalized approach with other programs, stating, "We are directed to the website or given the catalog and told to figure it out on our own". Alumni appreciated that this tailored academic planning provided transparency about graduation requirements and a clear path forward.

Ensuring Students' Academic Success. The personalized advising by the FAA was described as reassuring. Alumni reported feeling as though "someone higher up actually cares" and is "watching over" them to ensure they had the resources needed to succeed. For example, one alumnus recounted seeking help from the FAA during a challenging graduate course. The FAA provided material from a prerequisite course, which helped the alumnus catch up in the course. Another alumnus, who was struggling to complete their research thesis but hesitant to ask for help, noted that the FAA proactively identified the issue and advocated for them to switch to the comprehensive exam option. help. This advocacy enabled the alumni to successfully complete the program.

Connecting Student to Campus Resources and External Opportunities. The FAA and EAOP counselor were instrumental in connecting students to campus resources and external opportunities, including internships, job openings, and alumni networks. Alumni valued the emails the FAA and EAOP counselor sent, which connected them to campus contacts such as faculty, the director of graduate admissions, and counseling and psychological services.

One alumnus described how the EAOP counselor navigated the UCSC website to find the phone number and email for a campus resource. The alumni then had to make two calls and complete a form to get the resource he needed. The alumni remarked that if they had attempted this alone, it would have taken them a week just to identify whom to contact. Another alumnus noted that introductory or inquiry emails sent by the FAA helped them capture people's attention and receive quicker responses.

Recommendation: Alumni shared mixed feedback regarding the EAOP counseling services. Some alumni felt supported by the counselor, who listened to their concerns about school, grades, stress management, and time management. One alumnus described it as feeling nice to have someone "who was happy to listen".

However, others described the counseling sessions as "unstructured" and found the purpose of the meetings "unclear".

It is possible that the mixed feedback reflects a change in counselors during the program. To improve engagement and utility, alumni suggested:

- Structured check-ins with a counselor who has relevant disciplinary expertise. Meetings should be goal-oriented.
- Define the purpose and objectives of the counseling session and communicate expectations to students.

- Offer tailored support for transfer and non-traditional students. Provide more structured and customized advising for transfer students and those with non-traditional pathways, such as older students or those with prior career experience.

3. Financial Support

Alumni described the scholarship as the most essential component of the Next Gen Program. Several noted that they would not have committed to the master's program without the financial support provided by the scholarship.

One alumnus highlighted why scholarships are more especially critical for reducing the loan burden at the graduate level, stating "What students qualify for as graduate students is much more limited compared to what is available to undergraduates. In addition, loan options for graduate students have a higher interest rate, are not subsidized, and parents need to co-sign the loan."

While most alumni still had to work as teaching assistants (TAs) to cover their tuition and living expenses, the scholarship reduced their financial stress. It allowed them to avoid loans, pay off existing debt, or purchase technology necessary for their academic work.

For example, one alumnus used the scholarship to purchase a computer, noting: "Access to technology was important for the AM250 course, which was a high performance computing class. Because I had a good computer, I could run multiple programs at once." Although university computers were available, having a reliable computer at home significantly reduced stress and allowed the alumni to complete course assignments more efficiently.

Recommendations: While working as a teaching assistant helped supplement the Next Gen scholarship, the combination of TA responsibilities, intensive coursework, and financial challenges created significant pressure for many alumni, particularly those working to complete a research thesis.

Alumni reported the psychological burden of balancing TA duties with academic demands and the high cost of living in Santa Cruz. One alumnus suggested providing fee remission or increasing scholarship amounts to better address these financial challenges. Enhanced support could help reduce the physical and mental strain on graduate students and improve their overall academic experience.

4. Academic Structures: Comprehensive Exam vs Research Thesis

Most of the alumni interviewed had completed the comprehensive exam to fulfill the master's program requirements. When asked what changes they would recommend to better facilitate transitions to a PhD program or a career in industry, the majority indicated that completing a research thesis instead of a comprehensive exam would have been more beneficial.

Many alumni defaulted to the comprehensive exam option due to the time constraints, unexplored research interest, or a lack of early connections with faculty. However, they believed that completing a research thesis would have been advantageous for all students, regardless of whether their goal was to pursue a PhD or enter the workforce. They noted that a research thesis provides valuable experiences,

including working on a real-world project, collaborating as part of a team, and gaining hands-on research experience – all of which can offer a competitive edge in the PhD applications and job interviews.

Alumni who entered the workforce directly after completing the master's program recommended refining the coursework to better align with expectations and standards. To create alignment between their academic training and industry standards, one alumnus recommended revising course titles and descriptions to reflect industry-relevant skills and content (e.g., "Math Modeling" to "Data Science and Applications").

Recommendation:

Support for Research Thesis Completion: To encourage more students to complete the research thesis option, alumni suggested developing structured mechanisms for

(a) Early research exploration - Facilitate opportunities for student to explore research interest early, ideally starting their sophomore and junior year

(b) Undergraduate research integration - Encourage research involvement during undergraduate studies, such as completing a capstone project that could later serve as the foundation for the master's research thesis.

(c) Faculty engagement - Expand faculty involvement to address time constraints by fostering early student-faculty connections and creating more research opportunities. To expose students to potential research areas, faculty could deliver research presentations or open their research labs for summer rotations.

Transfer students, in particular, would benefit from support in exploring their research interest before beginning the Next Gen Program. As part of the program's application process, students could be encouraged and supported to build relationships with faculty and engage with research labs. To integrate research in undergraduate years, perhaps support undergraduate students to complete a capstone project that they can build on for the research thesis option in the masters program.

5. Cohort Approach: Community and Collaboration

When asked for additional comments about the program, alumni consistently highlighted its "family approach", which fostered camaraderie and strong faculty-student relationships. This supportive environment reassured students that there was "someone higher up" who genuinely cared about their progress and well-being. One way the program cultivated this sense of community was by creating physical spaces for students to connect, such as reserved study rooms exclusively for Next Gen participants. Alumni also appreciated seeing their peers regularly in the same courses and at the program workshops. The cohort model played a significant role in fostering a sense of belonging, which alumni found invaluable.