COMMUNITY COLLEGE S-STEM NETWORK

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S-STEM STRATEGY BRIEF

CCSN Mission:

The Community College S-STEM Network (CCSN) connects and supports researchers and practitioners in conducting and translating research on how students navigate STEM pathways into evidence-based practices, programs, and policies.

Overview of the Grantee Survey: NSF S-STEM Principal Investigators on the Effectiveness of Advising, Academic Support, and Other Program Elements Toward Promoting STEM Pathways for Two-Year College Students and Transfers

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Introduction

Community colleges serve as a critical point of entry to postsecondary STEM education and STEM careers for first-generation, low-income, and historically underrepresented students. These two-year institutions are central to the effort of broadening participation in STEM disciplines.

However, community college students face significant hurdles on their paths to a STEM degree and career. These include financial constraints that necessitate working long hours, family responsibilities, a lack of social capital and mentorship in the STEM field, and the daunting logistical challenge of transferring to a four-year university without losing academic progress.

The NSF S-STEM program is designed to address these hurdles for community college students through a dual-pronged approach: providing scholarships to students and accompanying that financial aid with wrap-around supports like mentoring, tutoring, internship opportunities, and transfer advising. The programmatic supports are locally designed and not uniformly mandated by NSF, allowing practitioners discretion to tailor services to their unique environments and students.

In order for S-STEM practitioners to design and implement strong programmatic supports for their community college students, it is important that they have access to clear, actionable data about the effectiveness of various interventions. *S-STEM Principal Investigators on the Effectiveness of Advising, Academic Support, and Other Program Elements Toward Promoting STEM Pathways for Two-Year College Students and Transfers* offers just that: it presents findings from a national survey of S-STEM practitioners, offering a system-level view of practices to promote STEM pathways among two-year college students and transfers into four-year universities. These findings have been translated into a blueprint to help S-STEM projects across the country hone their program strategies to better serve students on their STEM journeys.

Study Design

The study utilized a national survey targeted at Principal Investigators (PIs), Co-PIs, and program staff managing S-STEM awards that included community college students between 2018 and 2023. The final dataset included 102 respondents from 79 distinct projects across the country, representing a diverse institutional mix: community college-led grants (49%), collaborative grants (29%), and four-year university-led grants with either named (41%) or unnamed (38%) community college partners.

The survey asked S-STEM practitioners to share their observations and perceptions about 24 different program elements (e.g., advising, faculty mentoring, tutoring) along three dimensions:

- **Prevalence:** Is this program element used in the practitioner's S-STEM project?
- **Frequency of Use:** How often do students engage with it?
- **Perceived Effectiveness:** How impactful is the element on these four student outcomes: GPA, persistence toward degree, transfer to a four-year university, and job placement?

The researcher used these data to compare 24 program elements and rank them relative to one another. The value of a program element is based on the interplay of all three dimensions: prevalence, frequency, and effectiveness. This gives S-STEM leaders a structured way to compare the value of different types of student support, and design local programs accordingly.

An Evidence-Based Blueprint for Success

While every community college and S-STEM program is different, the data from the 79 S-STEM projects suggest recurring patterns in program design. The study findings point to a practical blueprint for S-STEM programming at two-year institutions:

1. Lead with mentoring and cohorts
2. Secure course-embedded academic supports for GPA
3. Make transfer advising explicit and early
4. Build toward internships and research as partnerships allow.

S-STEM leaders at community colleges can align resources to these four program elements, translating S-STEM investments into improvements in student academic performance, persistence, transfer, and employment.

Lead with Mentoring and Cohorts

The data indicate that relationship-centered supports are the cornerstone of successful S-STEM programming.

Faculty mentoring was the most widely implemented and highly rated element. The almost universal implementation of faculty mentoring and its impacts on students, make it a strongly recommended practice for other S-STEM programs. Faculty mentoring that includes not just academic advising but also navigation through the hidden curriculum of higher education, clarifying institutional expectations, serving as a consistent point of contact within STEM departments, and encouraging students' development of their STEM identity supports students' GPA and persistence toward a degree.

Learning communities are also highly effective interventions. By grouping S-STEM scholarship recipients into learning communities that meet regularly, institutions can transform the educational experience from a solitary struggle into a shared journey. These meetings promote persistence and social integration and provide a space for students to normalize their struggles, share resources, and build peer bonds among students who may otherwise feel isolated while balancing external commitments like work and family.

Secure Course-Embedded Academic Supports for GPA

Direct academic scaffolds are essential for maintaining the high GPAs often required by S-STEM scholarships. Most S-STEM scholarships require students to maintain a 3.0 GPA, a high bar for students who may have entered college with academic gaps or who have limited time to study. The study found that the most effective way to protect these GPAs is to embed support directly into the student's daily academic life. Examples of effective embedded academic supports include tutoring, cohorted classes and first-year STEM seminars. Interventions that were found to be less impactful included "soft-skills" workshops such as those focusing on time management or growth mindset. As S-STEM programs consider supports for students, these findings suggest more broadly that when students are in academic peril, they need direct content help above all else.

Make Transfer Advising Explicit and Easy

While academic difficulty is a challenge, for many S-STEM community college students the transfer process represents a primary hurdle to bachelor's degree attainment. This transfer process is fraught with the risk of credit loss, where a student's hard-earned community college credits are rejected by the university, forcing them to spend more money and time on the same material. Other challenges include complex transfer applications, missed deadlines, and a lack of guidance on how to navigate a much larger, more intimidating institutional landscape.

S-STEM programs should prioritize pre-transfer advising since it was found to be the most valuable intervention for ensuring students actually make the jump to a bachelor's degree program. In addition, pathway alignment and institutional collaborations are valuable areas of intervention. Practically, this means developing clear degree maps and articulation agreements with 4-year institutions and establishing structured partnerships between 2-year colleges and 4-year colleges.

Build Toward Internships and Research as Partnerships Allow

The final pillar of the blueprint focuses on moving a student from the classroom into a successful STEM career.

It is important to distinguish between "exposure" and "experience." For community college programs that are just starting or have limited resources, "exposure" activities are highly effective at building student interest and helping them visualize a future career. S-STEM programs can consider a STEM speaker series, which was found to engage students and

supported their persistence and job placement. Another option in the “exposure” category is field trips to industry, which were found to positively impact students’ persistence and transfer.

For the highest impact on career preparation, "experience” through internships and research positions is unmatched. S-STEM programs should consider research opportunities and internships, which are the primary career preparation tools, with internships most strongly associated with job placement outcomes. However, internships are also among the most difficult to implement: they require deep institutional partnerships with local industry, are limited and competitive, and require students to give up a lot of time that they may not be able to afford.

The blueprint encourages S-STEM projects to build toward offering more high-impact experiences over time. By starting with field trips and guest speakers, colleges can build the industry relationships that eventually lead to formal internship pipelines. This phased approach allows even small community colleges to eventually offer higher-impact experiential career supports.

Conclusion

This blueprint equips S-STEM practitioners with the key insights they need to design and implement successful programs for their community college students. S-STEM projects at community colleges should strive to strategically align high-value program elements to the specific outcomes they want to achieve. If an institution's goal is to improve transfer rates, for example, they may find success by investing heavily in pre-transfer advising; if they want to ensure students persist, they may benefit from a focus on faculty mentoring and cohort-building. Institutions must also take into account their capacity to build and sustain program elements: they may consider starting with high-leverage, low-cost practices like faculty mentoring and tutoring before phasing in more complex elements like internships as programming matures.

By providing an evidence-based blueprint, this research empowers community college S-STEM leaders to build robust, sustainable pathways that support students through STEM pathways and into related careers.

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