



S-STEM REC



Bridging Potential and Opportunity: The Experiences of NSF S-STEM Scholars

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S-STEM REC

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The AAAS S-STEM Resource & Evaluation Center (REC) seeks to cultivate a network of NSF S-STEM stakeholders and further develop the infrastructure needed to promote the exchange of ideas, resources, opportunities, and knowledge related to the effective strategies and practices to increase the number of academically talented students with financial need obtaining degrees in STEM and entering the STEM workforce.

Additional resources including NSF proposal preparation resources, blogs from invited experts in the field, and information about our annual S-STEM Scholars Meeting are available on our website. Please visit our website and join the network of growing S-STEM stakeholders as we increase opportunities for all people and build a more robust and excellent STEM enterprise.

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Preface: S-STEM 2025 Outcomes & Impact Report



Travis T. York, PhD
Principal Investigator,
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For 25 years, the congressionally mandated National Science Foundation's (NSF) Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) program has played a pivotal role in expanding access to STEM education and careers for academically talented students from low-income backgrounds. Funded through H-1B visa fees aiming to expand domestic talent by providing critical scholarships and evidence-based academic and professional support, the S-STEM program ensures that promising students have the resources they need to persist and thrive in STEM fields. These scholars not only contribute to the U.S. workforce and innovation economy but also serve as role models in their communities, inspiring future generations of STEM leaders.

Developed as part of the NSF-funded S-STEM Resource and Evaluation Center (S-STEM REC), this report reflects a collaborative effort led by the American Association for the Advancement of Science (AAAS) in deep partnership with the American Institutes for Research (AIR), which conducted this research and developed the report, along with the Center for Evaluation & Research for STEM Equity (CERSE) at the University of Washington, Quality Education for Minorities (QEM) Network, and MN Associates (MNA).¹ It provides a comprehensive exploration of the experiences and outcomes of S-STEM scholars, faculty, and institutions. Through robust data collection, our research study identifies the critical factors that support student success in S-STEM projects as well as the opportunities for growth that academically talented scholars from low-income backgrounds commonly navigate.

The findings highlight the meaningful contributions of the S-STEM program to scholar development. Scholars report increased academic confidence, strengthened research skills, and enhanced career preparedness due to faculty mentorship, cohort-based learning, and structured academic and professional development activities. The data, faculty, and institutional leaders confirm that the program not only improves retention and degree completion but also increases the number of talented students who are prepared to join the STEM workforce and face the challenges of the future. At the same time, this research study identifies areas for continued improvement, particularly in expanding financial and logistical supports, addressing experiences of imposter syndrome, and strengthening early engagement strategies in newer projects.

The success of the S-STEM program is a testament to the power of sustained federal investment in STEM education. As this report illustrates, targeted financial and academic support transforms lives, strengthens the U.S. STEM workforce, and enhances the nation's capacity for scientific and technological innovation.

¹ MN Associates (MNA) provides technical assistance to support awardees in evaluating their own projects and building capacity for local assessment and research activities.

We urge policymakers, educators, and stakeholders to continue championing the S-STEM program and maintaining commitments to funding and expanding this vital initiative.

We extend our deepest gratitude to our research partners at AIR, CERSE, QEM, and MNA, as well as the dedicated faculty, scholars, and institutional leaders who participated in this study. Their insights and experiences bring to life the remarkable achievements made possible through NSF's S-STEM program, reinforcing its indispensable role in fostering a more representative and dynamic STEM enterprise.

We hope this report serves as a valuable resource for those invested in strengthening pathways into STEM and advancing access to STEM careers. The future of American innovation depends on the continued success of scholars like those supported by S-STEM, and we remain committed to ensuring that every talented student—regardless of financial background—has the opportunity to reach their full potential in STEM.



Travis T. York, PhD

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Executive Summary

Bridging Potential and Opportunity: The Experiences of NSF S-STEM Scholars

1. **Increased Financial Support:** Address hidden costs such as transportation, meals, and research expenses to reduce financial burdens.
2. **Structured Engagement Pathways:** Establish clear pathways for scholars to access research, internships, and mentorship opportunities.
3. **Mental Health and Well-being Support:** Provide resilience-building workshops, peer support networks, and access to mental health resources.
4. **Continuous Program Adaptation:** Use scholar feedback and data-driven decision-making to ensure ongoing program improvements.

Study Context

This study explores the NSF S-STEM program in its third year of implementation.² The program aims to support low-income, academically talented students pursuing STEM degrees by providing scholarships, mentoring, and co-curricular support. The study used a mixed-methods research design, including surveys of faculty and scholars, interviews, analysis of existing project-level data, and a meta-analysis of prior S-STEM research.

Why Did We Study This?

The S-STEM program is designed to increase retention, academic success, and career readiness among students in STEM with low incomes. This study seeks to understand which project components are most effective, how scholars experience them, and what factors support scholar engagement—as well as what areas may benefit from additional attention to further strengthen outcomes. The findings aim to support ongoing improvements and ensure that the program remains responsive to scholars' evolving needs.

What Questions Did We Ask?

1. What evidence-based practices are implemented by S-STEM projects, and what are the components of these practices?
2. To what extent do S-STEM scholars participate in evidence-based activities?
3. What are the perceptions of scholars and faculty regarding the impact of the S-STEM program on scholar success?

² Note that S-STEM is a program supported by the National Science Foundation. The S-STEM program grants awards to Institutions of Higher Education (IHEs). These awards support S-STEM projects at IHEs.

4. To what extent did scholar, faculty, and institutional outcomes improve among S-STEM program participants?
5. What are the facilitators of and barriers to scholar success within S-STEM projects?

Important Study Results

- **Effective Practices:** S-STEM projects use a range of evidence-based strategies such as academic mentoring, cohort-based learning, and problem-based instruction to support scholar success. These practices, especially when paired with consistent faculty advising and strong peer networks, help students stay engaged and feel less isolated throughout their academic journeys.
- **Participation Patterns:** Most scholars actively participate in mentoring and cohort-based activities, which contribute to a sense of belonging and academic focus. However, participation in co-curricular activities like workshops or research was lower, often due to time constraints, work responsibilities, and financial challenges—particularly among students at 2-year colleges.
- **Perceived Impact:** Both faculty and scholars reported that the S-STEM program helped improve academic performance, build research skills, and strengthen career readiness. However, the benefits varied by field, with students in life sciences and biomedical programs reporting greater gains than those in engineering or computer science.
- **Facilitators and Barriers:** Scholars who experienced strong peer support, had solid mentoring relationships, and had a high level of self-motivation were more likely to persist and succeed. Scholars navigated challenges such as financial pressure, lack of time, and transportation access, with some also reporting feelings of imposter syndrome. Together, these challenges limited participation and progress for some students.
- **Strategic Adaptations:** In response to scholars' diverse needs and feedback, projects have implemented flexible formats such as hybrid participation options and more adaptable event scheduling. In addition, individualized supports like success coaching and ongoing feedback mechanisms have helped projects respond to student needs more effectively and equitably.



Introduction

For 25 years, the National Science Foundation's (NSF) Scholarships in STEM (S-STEM) program has sought to meet the national need for a globally competitive STEM workforce by providing scholarships and critical support to increase the success of academically talented, low-income, domestic scholars who are pursuing degrees in eligible disciplines of strategic importance for the nation. Entering the STEM workforce brings a multitude of benefits, from employment growth to higher earnings and upward mobility (Smith-Barrow, 2018). However, just 22% of bachelor's degrees in the United States are awarded in STEM fields (National Center for Education Statistics [NCES], 2023a; NCES, 2023b), and interest in STEM majors has declined (Smith et al., 2018). Increasing educational opportunities in STEM for low-income scholars can help increase interest and participation in the STEM workforce, which is needed to meet future demand in the field (National Science Foundation, 2016).

Students from low-income backgrounds are less likely than their peers to enroll in and graduate from postsecondary STEM programs. Rates of exiting or "stopping out" in STEM fields are higher among these students (Chen & Soldner, 2013; Smith-Barrow, 2018). A variety of factors contribute to these trends. A recent systematic review by Pearson et al. (2022) highlighted the significant financial burdens that students with low incomes face (for example, needing to balance employment and childcare responsibilities), which decreases the likelihood of persistence in STEM programs. Transportation costs also play a role. For example, the College Board estimates that scholars in postsecondary institutions, especially those who live in off-campus housing, can spend up to one fifth of their living expenses on transportation to and

from campus (College Board, 2025). Students from low-income backgrounds may benefit from additional support in building a strong sense of belonging within STEM programs. Hansen et al. (2023) found that cultivating a sense of belonging in STEM fields is imperative for students from low-income backgrounds, with cohort-based projects, peer mentoring, and proactive advising all helping to improve retention rates for this group. Financial constraints, limited access to resources, the absence of a sense of belonging, and the need for stronger academic support structures can affect low-income students' ability to participate in research opportunities (Ceyhan et al., 2019; Hansen et al., 2023; Pearson et al., 2022).

Recognizing the distinct financial and social dynamics that students from low-income backgrounds may navigate in STEM, Congress has funded the S-STEM program since 1998 to enable academically talented, low-income students to pursue postsecondary pathways in STEM fields. Since its inception, more than 3,000 grants have been awarded, providing scholarships to tens of thousands of scholars.

"Ultimately, the S-STEM program seeks to increase the number of academically promising low-income students who graduate with an S-STEM-eligible degree and contribute to the American innovation economy with their STEM knowledge."

— National Science Foundation, 2024

The S-STEM program comprises (a) financial assistance, intended to reduce or replace scholars' need to work or incur further debt in order to remain enrolled; (b) academic planning, guiding, and mentoring; and (c) curricular and co-curricular activities, and initiatives that have been shown to increase the likelihood of academic success by increasing sense of belonging and



community, noncognitive and critical thinking skills, research opportunities, and exposure to STEM fields, particularly among students with low incomes. Based on analyses specific to the needs of institutions of higher education, each project implements evidence-based practices that are tailored to the population of prospective scholars who would be eligible for an S-STEM scholarship at their respective institutions.

In 2022, NSF funded the first S-STEM Resource and Evaluation Center (S-STEM REC), which was tasked with building, supporting, and expanding the S-STEM community of awardees and synthesizing research findings about scholars', faculty, and institutions' experiences and outcomes. The purpose of this report is to better understand and highlight the varied experiences within the S-STEM community and the observed outcomes for participating scholars, faculty, and institutions. Using a robust mixed-methods design that leverages extant data collection, surveys, interviews, and meta-analysis, we designed this study to explore four overarching research questions:

1. What evidence-based practices (e.g., mentoring, research opportunities) are implemented by institutional participants of S-STEM projects, and what are the components of these practices?

2. To what extent did scholar, faculty, and institutional outcomes improve among S-STEM participants?
3. How do program outcomes vary by the evidence-based practices implemented and by student, faculty, and institutional characteristics?
4. What are the facilitators of and barriers to S-STEM student success? What strategies help participants mitigate barriers to successful participation?

A total of 152 projects provided project-level data, 155 projects provided scholar-level data, and 131 projects provided both. In addition, the research data collection yielded 30 of 338 studies reviewed for meta-analysis. Both samples are underpowered. Therefore, presenting results beyond descriptive statistics, regardless of the representativeness of the sample, may not reflect the true nature of the S-STEM community and the array of experiences and outcomes among scholars.

Both data sources are critical for answering research question (RQ) 3; thus, this report will focus on RQs 1, 2, and 4. For RQ 2, we focus on scholar outcomes. For the final report, we will work with AAAS and NSF to encourage participation from a larger sample of grantees, which will enable the study team to provide robust findings for all research questions.





What You Will Find in This Report (and What You Won't Find)

This report focuses on Research Questions 1, 2, and 4, detailing the evidence-based practices implemented by projects, observed scholar outcomes, and the facilitators of and barriers to scholars' experiences in the project.

In the process of answering our original research questions, some exploratory questions emerged that may help provide context for faculty, scholar, and institutional outcomes:

1. To what extent do S-STEM scholars participate in evidence-based activities?
2. What are scholar and faculty perceptions of the influence of the S-STEM program on scholar outcomes?

This report includes findings from surveys that highlight faculty and scholar perceptions of scholar participation and outcomes in their projects. The final report will include findings to address all four original research questions.



Data Collection and Methodology

The study team undertook four discrete and complementary data collection activities to answer the research questions, summarized in [Exhibit 1](#). We provide a detailed description of each data collection activity and its respective analytic methods in the appendix.

Exhibit 1. Data Collection Activities and Methods

Data Collection Activity	Methods	Relevant Research Question(s)
Scholar interviews	<ul style="list-style-type: none"> • Used a stratified sampling technique to include a range of scholar perspectives. • Conducted 51 semi-structured, 30- to 45-minute interviews with scholars in fall 2023 and conducted follow-up interviews with a subset of these scholars in spring 2024. • Used provisional <i>a priori</i> coding followed by focused coding to explore emerging themes and key topics such as motivation for applying, support mechanisms, engagement factors, sense of belonging, academic and career trajectories, and feedback for project improvement. 	RQs 1, 2, 4
Surveys	<ul style="list-style-type: none"> • Developed one faculty survey and one scholar survey through focus groups and cognitive interviews to better understand perceptions and experiences of participants, including impacts, scholar outcomes, and resources to implement the projects. • Emailed faculty surveys with a unique link directly to active principal investigators (PIs). Emailed a link to a general scholar survey to all active PIs, requesting that they forward the link to their scholars. In total, 238 PIs and 378 scholars completed their respective surveys.^a 	RQs 1, 2, 3, Exploratory RQs 1, 2





Data Collection Activity	Methods	Relevant Research Question(s)
Extant scholar and project data	<ul style="list-style-type: none"> Developed and emailed an encrypted spreadsheet and a link to a project survey to all active PIs, asking for scholar-level demographic, academic, and retention data. For project data to verify the evidence-based practices being implemented and to provide an opportunity to share their research. In total, 152 active PIs provided data on their projects and 155 active PIs provided data on 2,930 scholars. 	RQs 1, 2, 3
Meta-analysis of project research	<ul style="list-style-type: none"> Downloaded all information on studies funded by the NSF, including abstracts, from the website and then filtered the results to include only Scholarships in STEM awardees ($N = 613$). Created a codebook and database to extract information from each awardee's abstract regarding intervention details and evidence-based practices. Conducted a search for publications linked to the NSF award number on the NSF website and using the Web of Science database ($N = 338$). Conducted full-text screening of all articles, presentations, and other reports to determine studies eligible for inclusion in the meta-analysis ($N = 30$), which required reported quantitative information to calculate an impact estimate. 	RQs 2, 3

^a The response rate for the PI survey was 53%. Because the outreach for the scholar survey required asking PIs to forward a survey link to their scholars, we do not know how many scholars were given the opportunity to take the survey. Thus, we are unable to provide an accurate response rate for the scholar survey.

In [Exhibit 2](#), we compare frequencies and proportions (%) for key institutional characteristics between the full sample of active S-STEM awards as of December 31, 2024 ($n = 645$ awards) and the sample of PIs who responded to one or both of our outreach efforts to obtain scholar and project outcome data ($n = 176$). Note that for some awards in the full sample database, data were missing on these characteristics; therefore, frequencies will not total 645. For this same reason, institutional data on outreach respondents are only available for 159 of the 176 total respondents.

Exhibit 2. Institution/Award Characteristics (Full Portfolio and Outreach Respondents)

Institution/Award Characteristic	Full Portfolio of Awards		Data Call Respondents	
	Frequency	Proportion of Portfolio	Frequency	Proportion of Portfolio
Award Type				
Collaborative Planning	5	1.0%	0	0.0%
S-STEM-Net	15	3.0%	0	0.0%
Track 1	98	19.8%	33	20.8%
Track 2	300	60.7%	105	66.0%

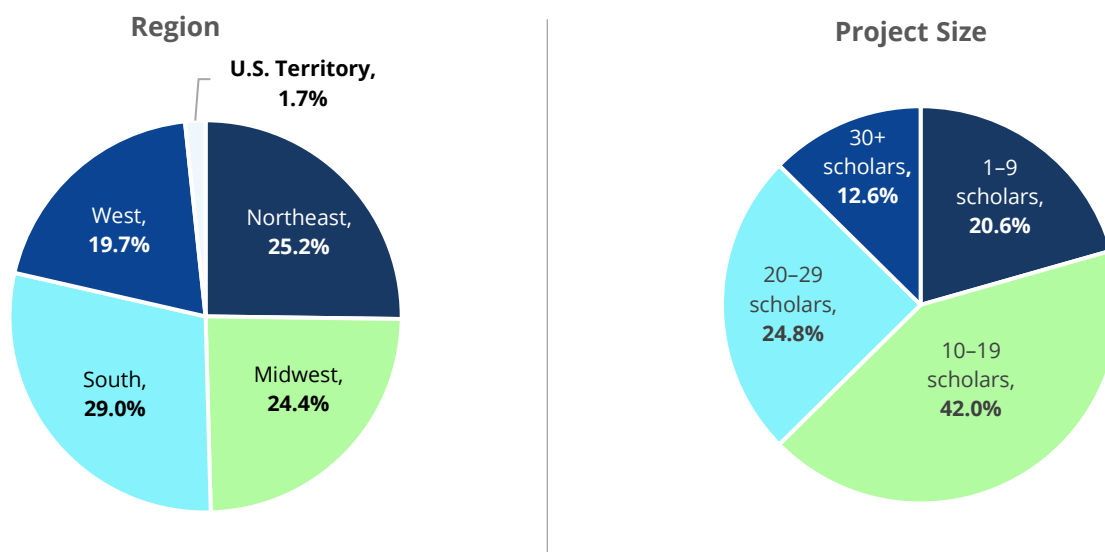




Institution/Award Characteristic	Full Portfolio of Awards		Data Call Respondents	
	Frequency	Proportion of Portfolio	Frequency	Proportion of Portfolio
Track 3	75	15.2%	20	12.6%
Workshop	1	0.2%	1	0.6%
Institutional Focus				
Primarily Undergraduate Institution	336	52.7%	91	57.2%
Research Focused	302	47.3%	68	42.8%
Institution Type				
4-Year	561	87.9%	138	86.8%
Community College	77	12.1%	21	13.2%

PIs who responded to the survey represented a wide range of regions and award sizes ([Exhibit 3](#)).

Exhibit 3. PI Survey Respondent Representation, by Region and Project Size



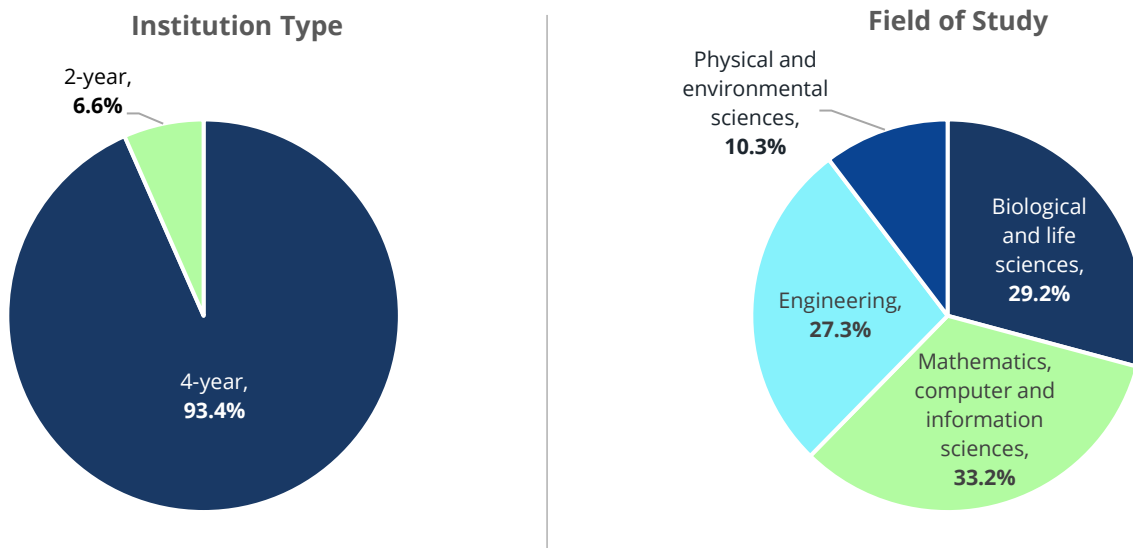
Note. U.S. Territories include Puerto Rico, American Samoa, Guam, Northern Mariana Islands (CNMI), and the U.S. Virgin Islands. *Project size* refers to the current number of active scholarships at the time of data collection.

Scholar survey respondents represented a variety of fields of study and primarily represented 4-year institutions ([Exhibit 4](#)).





Exhibit 4. Scholar Survey Representation, by Institution Type and Field of Study



Scholars who were interviewed for this study represented a wide variety of fields and degree programs ([Exhibit 5](#)).

Exhibit 5. Scholar Interviewees’ Fields of Study and Degree Programs

	Bachelor’s	Associate’s	Master’s	Doctorate
Computer science	5	7	0	1
Biological sciences	6	5	2	0
Engineering	4	4	1	0
Chemistry	4	0	0	0
Mathematics or statistics	3	0	1	0
Agricultural sciences	1	0	0	0
Geoscience or environmental sciences	1	0	0	0

Limitations

Our approach to data collection comes with certain limitations. Our surveys reflect self-reported perceptions from PIs and scholars. These perceptions may be biased (e.g., social desirability bias), especially in the case of PIs reporting on the effectiveness of programming that they personally designed and implemented. In addition, while we have evidence that the response sample of PIs comes from institutions/awards with characteristics that closely mirror those of the full active S-STEM portfolio (see [Exhibit 2](#)), we do not have the same sense of representativeness for all our response samples. Specifically, because no master list of scholars exists, it is difficult to know how similar our responding scholars are to the larger population of scholars within active awards.





What Evidence-Based Practices Are Implemented by S-STEM Project?

The study team conducted two phases of qualitative coding with scholar interviews; first through provisional coding with a predetermined set of nodes based on the interview protocol, followed by focused coding to identify emerging themes. According to scholar interviews, S-STEM scholars are offered a comprehensive suite of resources to support their academic, personal, and professional development. This includes structured faculty advising, peer mentoring, and cohort-based experiences, among other curricular and co-curricular resources, each tailored to meet the specific needs of scholars to ensure their success and well-being (see [Box 1](#)).

Faculty advising and mentoring form a core part of this support system. Scholars benefit from a variety of mentor-mentee relationships (from professional to informal), fostering deep personal connections and emphasizing mentors' genuine interest in scholars' success. In addition, the projects facilitate peer mentoring and cohort-based experiences, enhancing community building and social support among scholars. This is particularly beneficial for those from underrepresented backgrounds.

"[My mentor is] the person who I go to on a day-to-day basis, whenever I have questions, especially now that I'm starting graduate school applications. I've been meeting with her almost every day, asking her questions about what I should be doing, how I should be structuring my applications, and all of that. It's a really good mentor-mentee relationship that [S-STEM] has fostered."

Box 1. Support and Resources Available to S-STEM Scholars

Structured faculty advising and mentoring: S-STEM grantees provide a diverse mentoring structure with academic advisors and career guides.

Peer mentoring: S-STEM projects include a peer mentoring component in which more experienced scholars guide newcomers.

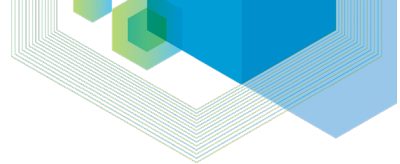
Cohort-based experiences: Scholars benefit from being part of a cohort, fostering a supportive community that enhances learning, collaboration, and productivity through shared experiences in and out of the classroom.

Curricular and co-curricular resources: S-STEM grantees offer comprehensive academic support, including academic planning, individual development plans, study groups, and co-curricular workshops on professional development, financial literacy, and mental health, contributing to scholars' holistic development.



Projects provide academic and co-curricular support structures that cater to the rigorous demands of STEM education. Scholars benefit from academic planning support, individual development plans for setting and evaluating goals, and study groups for collaborative learning. Co-curricular support structures—such as professional development workshops, financial literacy sessions, and mental health services—play a role in scholars' development as well. These resources help prepare scholars for their future careers and academic pursuits,





enhance their financial management skills, foster leadership abilities, and ensure their overall well-being. The S-STEM program's combination of curricular and co-curricular support structures

illustrates its commitment to nurturing well-rounded scholars who are ready to tackle the opportunities for growth of their STEM fields.

Support for Emerging Leaders in Engineering

Susan (a pseudonym), a PhD candidate in engineering science, expressed excitement when she shared that she would continue to work on brain imaging with the same professor with whom she worked while earning her master's degree in engineering. Her journey with the S-STEM project began when, during freshman orientation, her faculty advisor recommended that she apply to the project to address financial challenges. What drew her to the project was its mission to support emerging leaders in engineering who require financial assistance.



According to Susan, a large number of faculty at the university are dedicated to supporting S-STEM scholars by providing resources and serving as individual or small-group mentors. She reported that connecting with current and past S-STEM scholars during weekly seminars and the project's peer mentoring initiative had a very positive impact on her. Susan had a peer mentor and served as a peer mentor to other S-STEM scholars. She remarked, "It's been super impactful on me; there's something satisfying about helping the scholars that are coming up . . . I really like that."

Susan told us that, when she received her scholarship, there did not appear to be a sense of community among S-STEM scholars. This was resolved as the project progressed. Susan said that she enjoyed participating in outings with scholars every now and then, like going to a pumpkin patch or cutting snowflakes on snow days. She commented, "I think there's a lighthearted but team-building aspect to the project; I guess it prepares you for life after college."

Susan expressed appreciation for the opportunity to attend several conventions and conferences through her school's S-STEM award, which has exposed her to various areas of science, technology, engineering, and mathematics. When asked where she saw herself in 5 to 10 years, she shared that she would like to work in the semiconductor industry, based on her internships in that area. Eventually, after earning her PhD, she might like to return to academia, where she can encourage other STEM scholars and have a positive impact on them.





In addition to scholar interviews, the study team built a typology of evidence-based practices based on award abstracts that are publicly available on NSF’s award website. We used this typology to create a list of evidence-based practices that fall under curricular and co-curricular activities ([Exhibit 6](#)).

Exhibit 6. Curricular and Co-Curricular Evidence-Based Practices Implemented in S-STEM Projects

	Descriptions
Curricular evidence-based practices	
Project guidance or academic planning/mentoring	Project guidance or academic planning/mentoring involves structured support systems aimed at helping students navigate their academic journeys. This can include personalized academic advising, mentorship programs, and workshops that provide students with the tools they need to succeed academically and professionally. The primary objective is to assist students in setting academic goals, selecting courses, and developing skills that contribute to their educational and career aspirations.
Cohort classes	Cohort classes are organized groups of students who progress through a specific curriculum together, often in a structured and supportive environment. Cohorts are frequently used within S-STEM projects to enhance peer support, retention, and academic success, especially for low-income, academically talented students in STEM fields. Cohort models have shown benefits in fostering a sense of community and facilitating shared academic and professional experiences, which can be crucial for student engagement and persistence in challenging STEM disciplines.
First-year experience course or seminar	These courses or seminars are designed to help new scholars transition into higher education’s academic and social life, often focusing on developing essential skills like critical thinking, time management, and academic planning, as well as fostering a sense of belonging and engagement with the campus community.
Enhanced educational opportunities	These supplemental academic programs and initiatives extend learning beyond standard curriculum requirements, aiming to provide students with enriched, hands-on, and often interdisciplinary experiences. Opportunities include advanced coursework, research internships, experiential learning projects, and academic support services.
General evidence-based curricular activities	These instructional practices and learning strategies are designed to improve student learning and engagement. Activities often include active learning, collaborative projects, formative assessments, and problem-solving exercises that promote critical thinking and the application of knowledge.
Problem-based or active learning instruction	These instructional strategies actively engage scholars in the learning process through real-world problems or interactive activities that require critical thinking, collaboration, and problem solving. Scholars work in groups to solve complex, open-ended problems, promoting deeper understanding and application of knowledge.





	Descriptions
Opportunities for noncognitive development	These strategies are designed to help students develop essential noncognitive skills, interpersonal relationships, empathy, and responsible decision-making practices. Projects create structured environments where students can learn and practice the “soft skills” employers want.
Peer-led team learning	The AAAS defines this as “Providing academic support and building a sense of community through peer-led tutoring. Students learn from each other, build confidence, and realize they are not alone in their struggles. Trained peers offer support in small group settings, enhancing learning and making complex concepts more accessible. This approach also benefits peer tutors by reinforcing their understanding and developing leadership skills” (AAAS, 2024a).
Bridge programs or courses	These programs are designed to help scholars transition smoothly from one academic stage to another, often addressing academic, social, and cultural gaps that may hinder student success. Typically offered in the summer before the first year of college or at key transition points, these programs provide foundational skills in academics and often include workshops on study skills, time management, and college readiness.
Co-curricular evidence-based practices	
Seminars, panels, or lectures	These instructional and interactive formats are commonly used in educational settings to expose students to specialized knowledge, diverse perspectives, and real-world applications in a subject area. They foster engagement and critical thinking by encouraging students to interact with experts, peers, and content in various ways.
Research opportunities	The AAAS defines these opportunities as follows: “Undergraduate research involves scholarly inquiry and investigation conducted by undergraduate students, typically in collaboration with faculty or mentors. It allows students to explore topics of interest, develop critical thinking skills, and gain hands-on experience in their field of study. This research can take various forms, including laboratory experiments, fieldwork, surveys, or creative projects. Engaging in undergraduate research enhances learning, fosters a deeper understanding of the subject matter, and can contribute to the advancement of knowledge in a particular discipline. In addition, it often prepares students for graduate studies or careers in research-related fields” (AAAS, 2024b).
Faculty interactions outside of class	These are various informal and formal engagements between students and faculty members beyond scheduled classroom time, such as office hours, mentorship opportunities, academic advising, research collaborations, and casual conversations in settings such as campus events or social gatherings. Such engagements aim to foster meaningful relationships, enhance student learning, and support academic success.
Peer mentoring	Peer mentoring involves pairing students with experienced peers to provide guidance and support and share knowledge, fostering both academic and personal growth. Peer mentors can help mentees adjust to new environments, develop study strategies, and navigate college life.





	Descriptions
Career counseling	This process helps scholars understand career paths, develop career-related skills, and make informed career choices aligned with their values, skills, and interests. It involves assessments, guidance on goal setting, and the provision of resources for exploring career options.
Field trips	These educational experiences outside the classroom aim to enhance learning by exposing students to real-world applications of their studies.
Tutoring	This academic support involves individualized or small-group instruction aimed at helping students improve their understanding of course material, develop skills, and boost confidence in their abilities.
Innovative approaches to support student cohorts and participation	Creative, research-backed strategies are used to foster group cohesion, increase engagement, and enhance the academic success of student groups. Methods can include learning communities, cohort-based models, peer mentoring, integrated support services, and technology-enhanced communication, all of which help students feel more connected and supported throughout their educational journey.
Innovative approaches to support student-faculty mentor relationships	Structured and sustained interactions foster meaningful connections and provide academic support and career guidance. Strategies include intentional mentorship matching based on shared interests, integrating mentorship training for faculty, and using digital tools to facilitate regular communication.
Graduate school preparation activities	These activities are designed to equip prospective students with the necessary tools and knowledge for a successful application process. Activities can include workshops on writing personal statements, understanding the application process, preparing for standardized tests (like the Graduate Record Examination), and developing effective CVs or résumés.
General evidence-based co-curricular activities	Structured, research-backed programs outside of the traditional classroom support holistic student development by fostering skills such as teamwork, leadership, and resilience. Examples include clubs, sports, volunteer programs, and skill-building workshops, all of which have been shown to positively affect students' academic performance, well-being, and future success.
Providing, securing, or ensuring basic needs	This is a critical concept in educational settings, particularly for enhancing student success and well-being. It refers to addressing fundamental necessities such as food, housing, health care, and financial stability, which are essential for students to thrive academically and socially.
Job placement services	Career support programs are designed to bridge the gap between education and employment by helping students transition smoothly into the workforce. Services typically include résumé workshops, interview preparation, networking events, internship placements, and direct employer connections.





	Descriptions
Mental health services	A spectrum of programs aims to improve mental well-being, prevent mental illness, and provide treatment for mental health disorders. Services may include counseling, therapy, crisis intervention, and community education on mental health issues.
Living-learning community	The AAAS defines this as, “Residential programs that integrate academic content with community living experiences. These communities create immersive learning environments that enhance student engagement, academic performance, and sense of belonging. They often focus on specific disciplines or themes, providing targeted support and collaborative learning opportunities” (AAAS, 2024c).
Financial literacy services	Financial literacy services are educational programs and resources aimed at improving students’ understanding of financial concepts, enabling them to make informed financial decisions. Services often include workshops, one-on-one counseling, and online resources focused on budgeting, debt management, and understanding credit. The ultimate goal is to enhance students’ financial knowledge and foster financial well-being, reducing financial anxiety and improving academic performance.
Family engagement activities	In the college context, these are programs and initiatives designed to involve family members in the educational experiences of students. Activities can include workshops, orientation sessions, family weekends, and informational resources that foster communication between families and educational institutions. The goal is to create a supportive environment that enhances student success and retention by strengthening the connection between the college and students’ families.
Psychosocial interventions	Psychosocial interventions are strategies designed to address psychological and social factors that influence an individual’s mental health and overall well-being. In the context of college students, these interventions may include counseling services, peer support programs, stress management workshops, and initiatives aimed at enhancing social skills and resilience. The primary goal is to improve students’ coping mechanisms, enhance their social support networks, and promote mental wellness.

Note. We recognize that the definitions of these activities may overlap in some places (for example, general evidence-based practices may include some of the same elements as cohort classes).

Using this typology, we surveyed S-STEM PIs, asking them to list the practices they use with their scholars, as a way of verifying the information in the abstracts. [Exhibits 7](#) and [8](#) detail the percentage of projects implementing curricular and co-curricular evidence-based practices among the 152 respondents and compare those figures with information that the study team coded from those 152 respondents’ S-STEM grant abstracts. As these exhibits illustrate, PIs reported implementing far more activities than mentioned in their grant abstracts, providing a clear, robust picture of project activities.



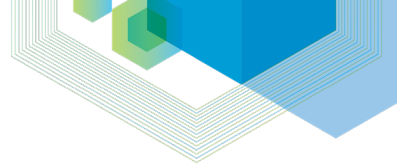
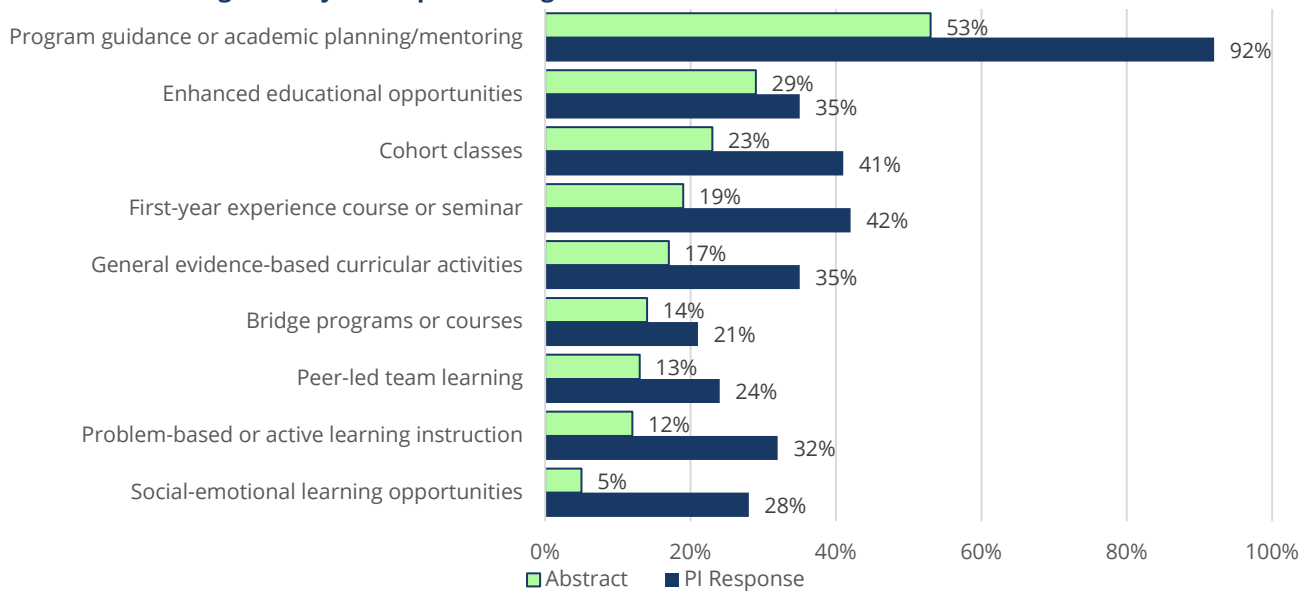
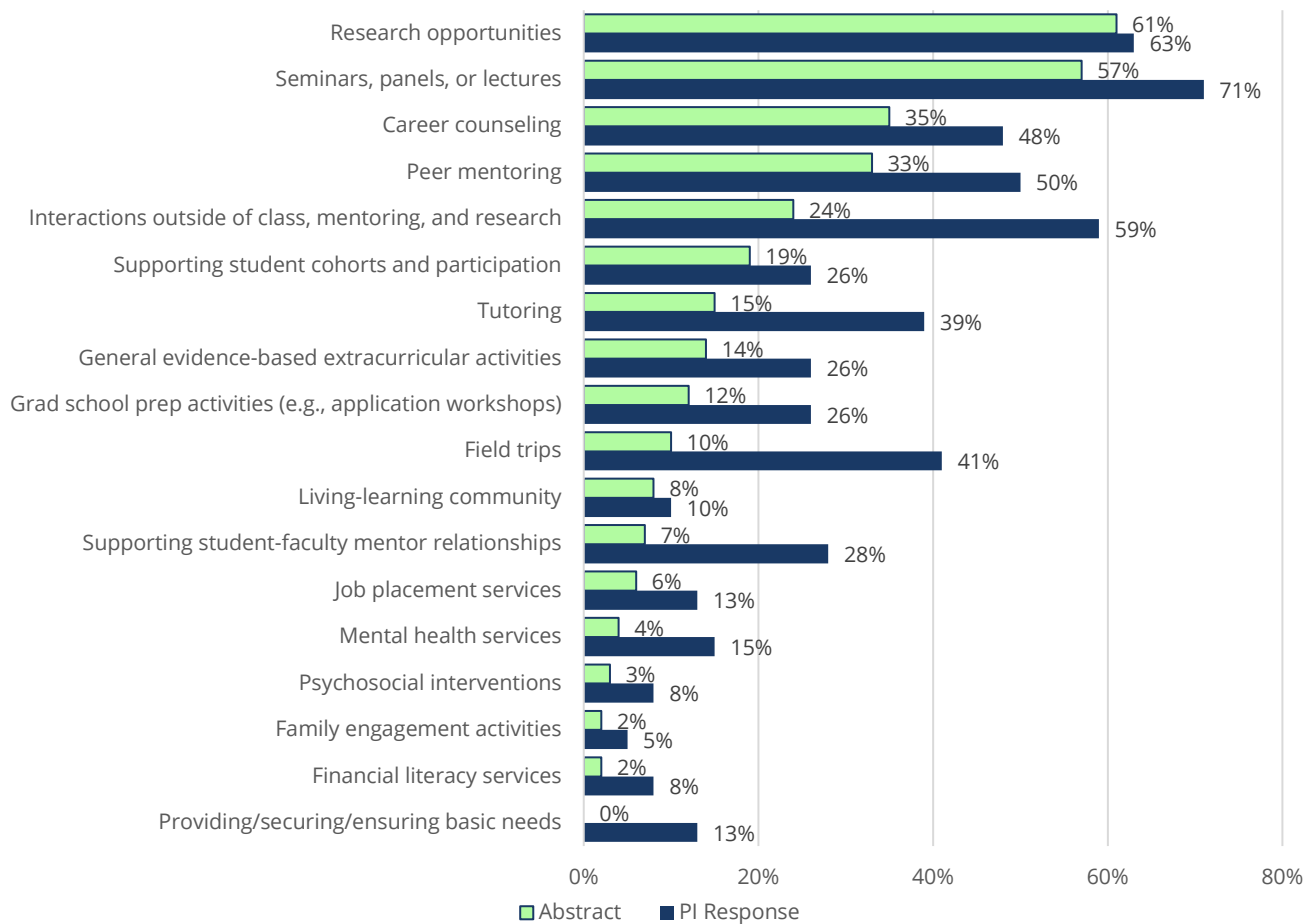


Exhibit 7. Percentage of Projects Implementing Curricular Evidence-Based Practices



Note: Percentages are based on 152 S-STEM PIs who responded to the study team's request for project information.

Exhibit 8. Percentage of Projects Implementing Co-Curricular Evidence-Based Practices



Note: Percentages are based on 152 S-STEM PIs who responded to the study team's request for project information.





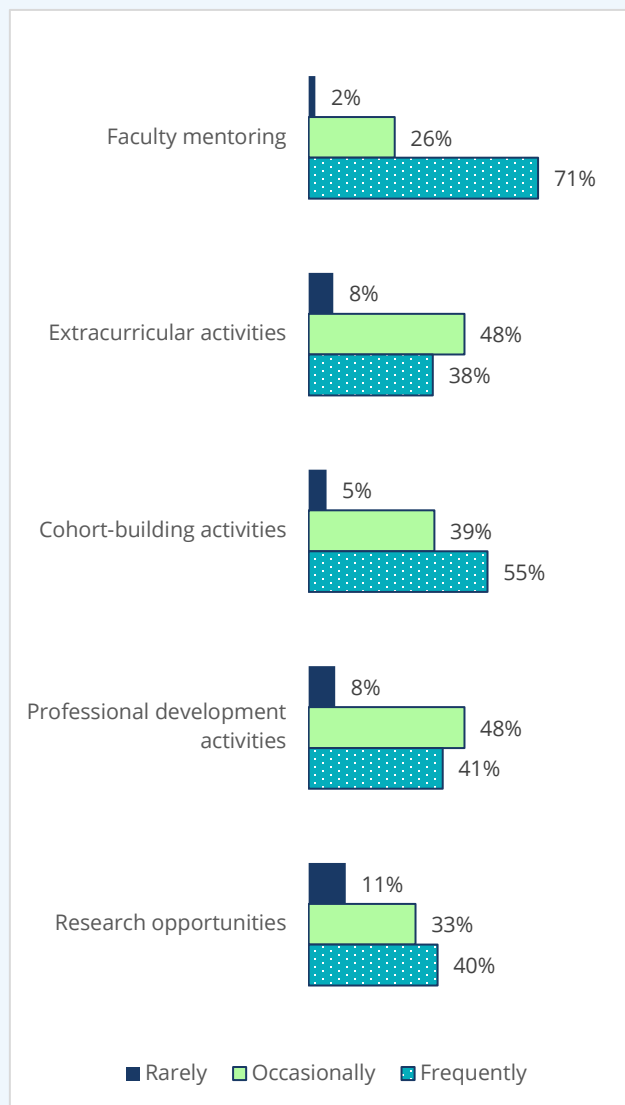
To What Extent Do S-STEM Scholars Participate in Evidence-Based Project Activities?

To develop a rich understanding of S-STEM programs and the activities they implement for scholars, as well as the extent to which scholars participate in these activities, we collected complete survey data from 238 PIs from active S-STEM projects. PIs rated the frequency of scholar award participation across five different types of activities: faculty mentoring, extracurricular activities, cohort-building activities, professional development activities, and research opportunities.

Overall, most PIs reported that their scholars frequently participated in faculty mentoring (71%) and cohort-building activities (55%). Fewer PIs reported that scholars frequently participated in co-curricular activities (38%) and professional development activities (41%), as well as research opportunities (40%; see [Exhibit 9](#)). However, of the 84% of PIs who reported that their S-STEM project included research opportunities for scholars, less than half reported that their scholars frequently participated in those opportunities.

We found no significant differences in PI-rated scholar participation across regions of the country or institution type. However, across all activities, PIs from 2-year colleges were more likely to report that their scholars frequently participated in activities, compared with PIs from 4-year colleges.

Exhibit 9. Frequency of Participation in Scholar Activities, as Reported by PIs





What Are Scholar and Faculty Perceptions of the S-STEM Project?

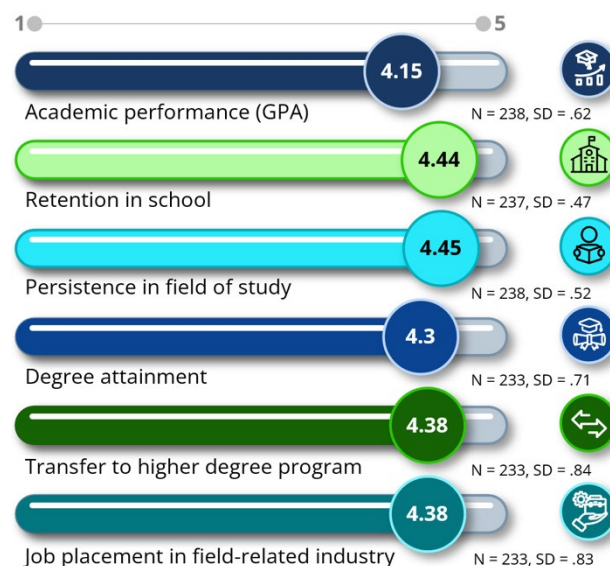
We asked scholars and PIs about the extent to which they believed participation in project activities improved scholar outcomes. The development of these surveys included soliciting feedback from former S-STEM PIs via focus groups, where participants provided the study team with critical insights into the different perspectives that faculty and scholars hold. Based on these insights, we designed each survey to capture the unique perceptions of these two groups, which resulted in items related to different outcomes for the two groups. PIs were asked about outcomes related to scholars' progress and completion of projects. Scholars were asked about outcomes related to their perceptions of their own performance and their experiences with their projects.

Principal Investigator Perceptions

PIs indicated their level of agreement, on a scale from 1 (strongly disagree) to 5 (strongly agree), with statements regarding the extent to which award activities improved scholar success in the following areas: academic performance, retention, persistence, degree attainment, transfer to higher degree, and job placement. Overall, PIs overwhelmingly agreed that participation in evidence-based program activities improved these scholar outcomes. [Exhibit 10](#) shows mean scores for each outcome, all of which fell between agree (4) and strongly agree (5).



Exhibit 10. Composite Scores for PI Perceptions of the Relationship Between Participation in Programming and Improved Scholar Outcomes



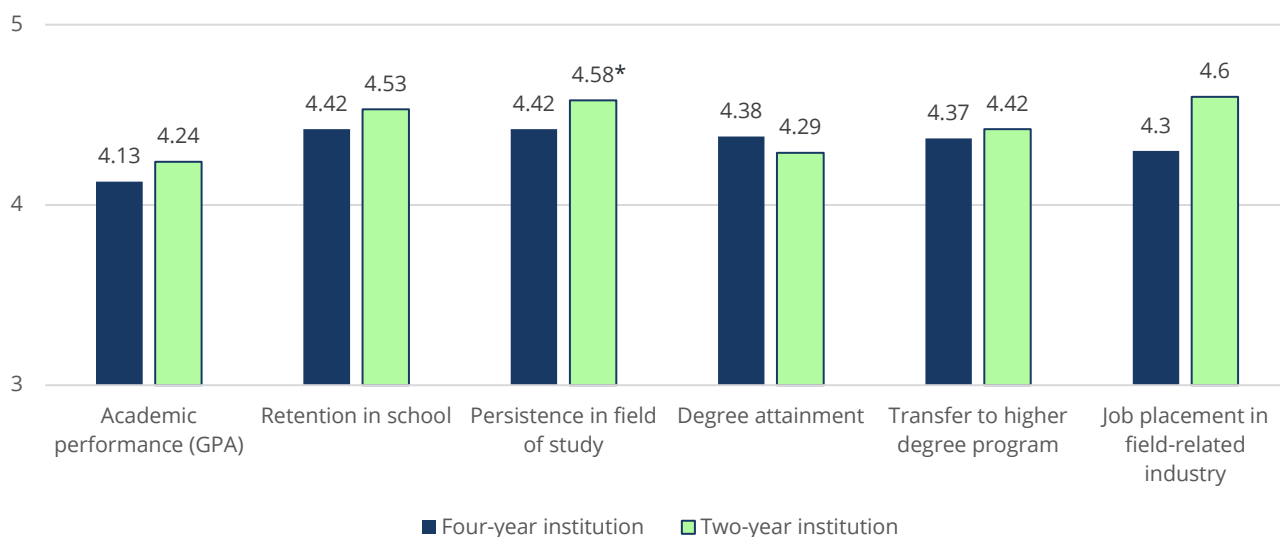
Note. SD is standard deviation.



Some notable patterns emerged among PIs from 2-year and 4-year institutions. PIs from 2-year institutions had slightly more positive perceptions of scholar success than those from 4-year institutions across all outcomes, with two

exceptions. PIs from 2-year institutions rated scholar success significantly higher for persistence in scholars' field of study, while PIs from 4-year institutions rated scholar success slightly higher for degree attainment ([Exhibit 11](#)).

Exhibit 11. PI Ratings of Scholar Success by Outcome, by Institution Type



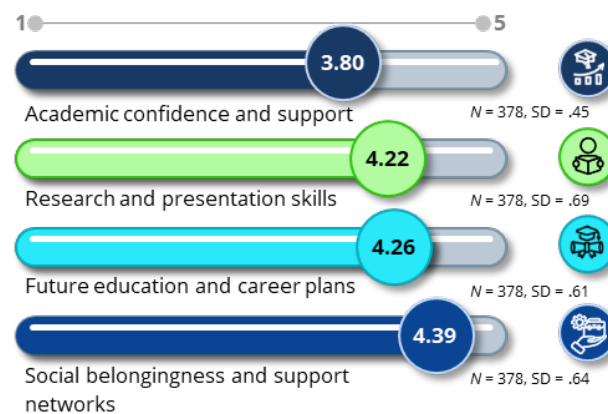
Note. GPA is grade point average. * $p < .05$.

Scholar Perceptions

Scholar survey questions were grouped into four distinct themes: (a) academic confidence and support, (b) research and presentation skills, (c) future education and career plans, and (d) social belongingness and social supports (see the appendix for details on survey questions and categorization by theme). A total of 378 scholars indicated their level of agreement with questions on a scale from 1 (strongly disagree) to 5 (strongly agree). Overall, scholars agreed that participation in the S-STEM project positively affected their research and presentation skills and their sense of belonging. They agreed that their S-STEM project provided helpful social support networks and increased their planned persistence in their chosen field. Scholars were

slightly less positive about their project's academic support structures and its impact on their levels of academic confidence ([Exhibit 12](#)).

Exhibit 12. Scholars' Composite Scores, by Outcome Theme

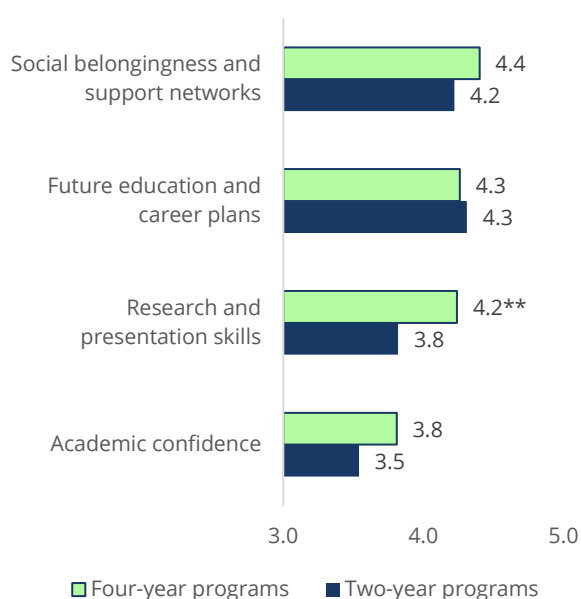


Note. SD is standard deviation.



We examined differences in perceptions by scholar characteristics, for which a few notable themes emerged regarding institution type and field of study. First, scholars attending 4-year institutions held more positive beliefs about their academic confidence and social belongingness, and significantly more positive beliefs about their research and presentation skills than scholars from 2-year institutions ([Exhibit 13](#)).

Exhibit 13. Scholars’ Perceptions of the Impact of Their Project, by Institution Type



** $p < 0.001$.

This trend tracks with established differences between postsecondary scholars attending 2-year versus 4-year institutions. In a study of

organizational characteristics of 51 higher education institutions, Strauss & Fredericks Volkwein (2002) found that scholars attending 4-year institutions generally have more opportunities for research, peer support, and academic confidence than their community college peers.

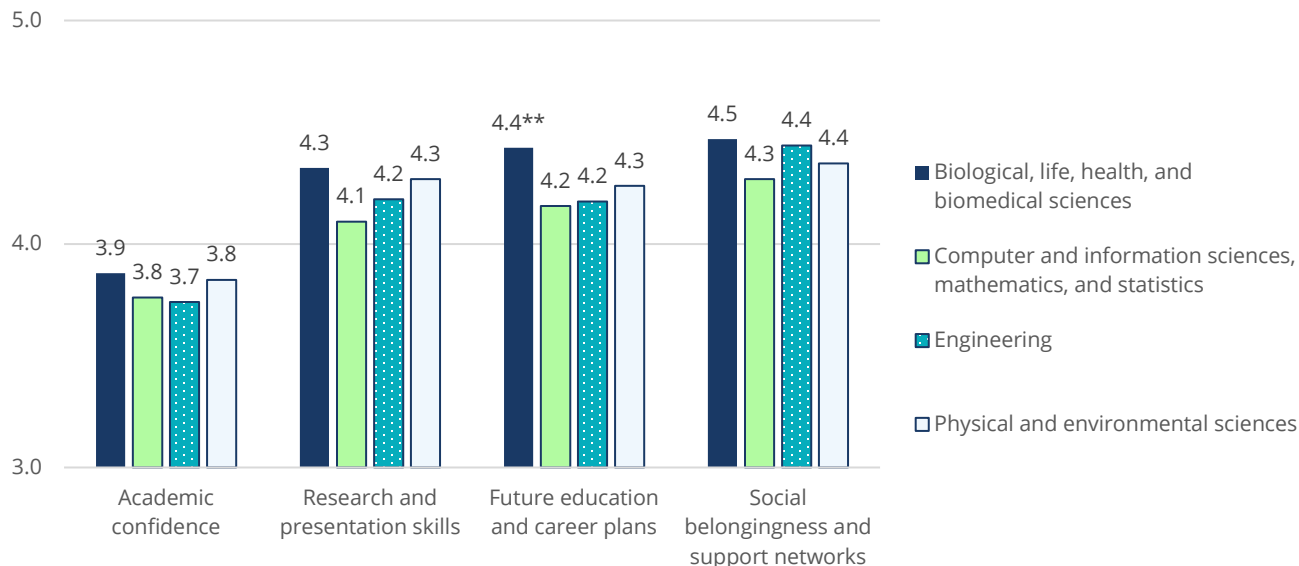
Second, scholars enrolled in biological and life sciences, biomedical sciences, and health programs had more positive perceptions of how program participation improved outcomes across all categories. Most notably, scholars in the biological and life sciences fields were more likely to agree that participation in the S-STEM project positively affected their future education and career plans, compared with scholars in mathematics, computer and information sciences ($p < 0.01$), engineering ($p < 0.01$), and physical and environmental sciences ($p = 0.01$) ([Exhibit 14](#)).

Based on these survey results, it is clear that both PIs and scholars believe that participation in S-STEM projects positively affects scholar success. To better understand the facilitators of successful participation in S-STEM—as well as factors that may hinder scholar success and how scholars can mitigate those barriers—we conducted interviews with scholars over the course of the 2023–24 academic year. We present the findings from these interviews in the next section.





Exhibit 14. Scholars' Perceptions of the Impact of Their Project, by Field of Study



** $p < 0.01$.

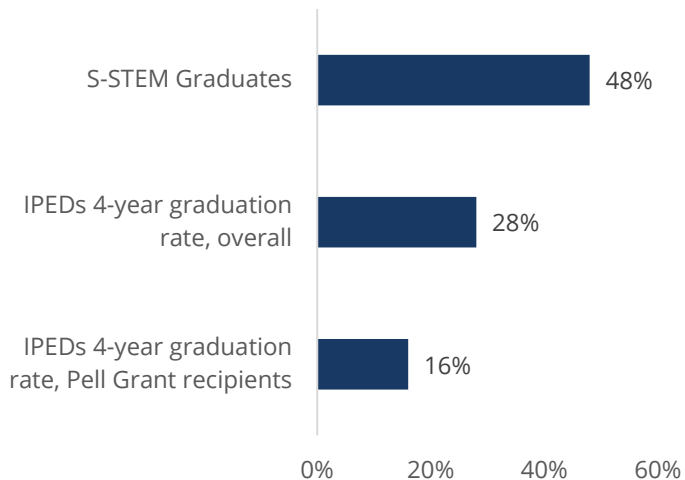
To What Extent Did Scholar Outcomes Improve Among S-STEM Participants?

To understand the extent to which participation in the S-STEM improved scholars' success, including graduation, continuing education, and entry into the workforce, we collected scholar-level academic and workforce data from 155 active projects representing 2,930 scholars.

Graduation Rates

We received scholar-level data on 846 scholars at 4-year institutions in their fourth year of school, 48% of whom graduated at the end of the 2023–24 academic year. To provide context, it is important to compare this rate with the larger population of students in STEM majors. Although public information is limited on the 4-year graduation rate for students who persist to their fourth year, data published by the Integrated Postsecondary Education Data System (IPEDS) indicate that about 28% of all first-

Exhibit 15. Graduation Rates Among S-STEM Scholars, 4-Year Graduation Rate Overall, and 4-Year Graduation Rate for Pell Grant Recipients





time, full-time undergraduate students obtain a bachelor's degree within 4 years of entry (IPEDS, n.d.) ([Exhibit 15](#)). The 4-year graduation rate is even lower (16%) for Pell Grant recipients, a group whose financial background is likely to more closely resemble that of S-STEM scholars. Given that graduation rates among STEM students tend to be lower than overall graduation rates for all students (e.g., Sithole et al., 2017), the 4-year graduation rate for STEM students with additional financial need is likely less than 16%.

Although the 4-year graduation rate among S-STEM scholars is likely below 48%—given that our data are based on students who already have persisted to the fourth year of college and do not include those who may have stopped out before our data collection—our findings suggest that S-STEM scholars may graduate at a higher rate than other STEM students with low incomes who do not receive an S-STEM scholarship. Among the 241 S-STEM recipients at 2-year institutions, about 39% complete their degree by the end of their second academic year. By comparison, data from IPEDS (n.d.) show that about 30% of Pell Grant recipients attending 2-year institutions complete their degree within 3 years. Together, these rates suggest that S-STEM scholars at 2-year institutions complete their degrees more often and in less time than other community college students who qualify for need-based financial support.

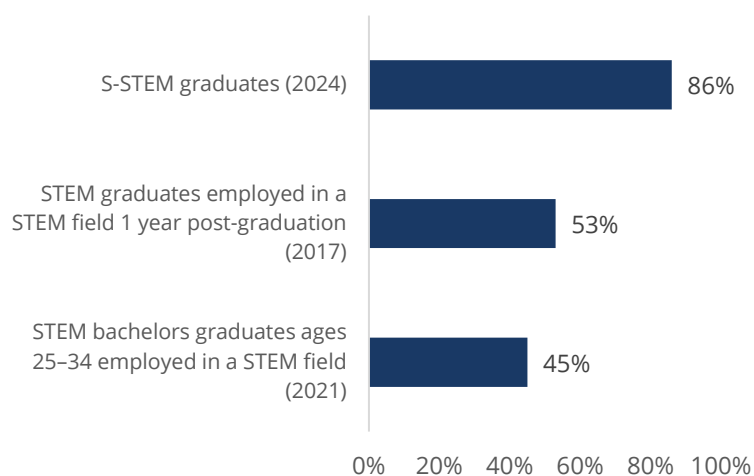
Continuing Education

Of all students at 4-year institutions who graduated at the end of their fourth year, about 54% entered the workforce, while an additional 38% continued their education (such as in graduate school). According to responding PIs, the remaining 8% of graduating students did not enter the workforce or continue their education. This percentage is slightly higher than the 7.2% unemployment rate for 20- to 24-year-olds with a bachelor's degree reported for 2021 in the *Digest of Education Statistics* (NCES, 2022a). Although information on graduate school entry among recent college graduates is limited, our data suggest that the unemployment rates among recent S-STEM graduates likely are similar to those among comparable students.

Entering the Workforce

Eighty-six percent of all S-STEM scholars who graduated from 4-year institutions entered the workforce after their fourth year ([Exhibit 16](#)). Although information on this outcome for the average STEM student is limited, data from the *Digest of Education Statistics* suggest that in 2017, roughly 53% of STEM graduates employed 1 year after graduation held a job in a STEM occupation (NCES, 2022c). Furthermore, the STEM employment rate immediately after graduation is reflected in data from 2021, which shows that 45% of employed 25- to 34-year-olds with a bachelor's

Exhibit 16. Rates of Entering the STEM Workforce





degree in a STEM field were employed in a STEM occupation (NCES, 2022b). Overall, these comparisons suggest that S-STEM scholars who enter the workforce after graduation likely have higher rates of employment in the STEM workforce than comparable students.

Data published by the Community College Research Center (2025) suggest that about 26% of students with low incomes who enter a community college as a first-time student eventually transfer to a 4-year institution. Given that about 39% of S-STEM scholars at 2-year institutions graduate at the end of their second academic year, and that 85% of those scholars continue their education at a 4-year institution, we estimate that roughly 33% ($85\% \times 39\%$) of S-STEM scholars at 2-year institutions transfer to a 4-year institution after 2 years of starting community college ([Exhibit 17](#)).

Exhibit 17. Graduation Rates and Post-Graduation Directions for S-STEM Scholars

	Seniors at 4-Year Institutions		Sophomores at 2-Year Institutions	
	Count	Percentage	Count	Percentage
Overall Graduation Rate	406	48%	94	39%
Percentage of all graduates who . . .				
Entered workforce	152	54%	*	*
Are continuing school	107	38%	28	85%
Percentage of all graduates entering the workforce who . . .				
Entered a job in STEM	131	86%	*	*
Computer Science	46	35%	*	*
Biological Sciences	21	16%		
Engineering	20	15%	*	*
Health Sciences	10	8%		

* The cell size is too small to be reported.





What Are Facilitators and Barriers for Scholar Success?

To better understand scholars' perspectives on what aspects of their S-STEM projects helped them succeed, the barriers they experienced, and what helped to remove those barriers, we interviewed 51 scholars in fall 2023 and a subset of those same scholars in spring 2024. See the appendix for detailed information related to data analysis methods.

Facilitators of Scholar Engagement in S-STEM Project Activities

In an earlier section of this report, we described the support structures and resources available to S-STEM scholars. These include structured academic advising, cohort-based experiences, and curricular and co-curricular resources. When asked about specific factors that helped strengthen their engagement in S-STEM project activities, scholars identified peer support, intrinsic motivation, and faculty mentorship as key factors.

Peer Support and Camaraderie

According to several scholars, having a strong peer support network helped maintain their interest and engagement in project activities. During interviews, these scholars emphasized the significance of being part of a supportive community that was deeply invested in one another's success and well-being.

One scholar explained, "The camaraderie that we've cultivated in our group is heartwarming. I don't know how else to put it. It keeps me going."



Shared academic and personal goals reinforced this camaraderie. Scholars highly valued being part of a community that understood and shared similar challenges and ambitions, which fostered a strong bond and a system of mutual support. One scholar noted, "We all have our goals . . . We're all going to make sure that everyone's doing good. And if one of us is not doing okay, there's always somebody that we can talk with to help us with that."

Scholars observed that S-STEM projects provide opportunities for informal interactions that facilitate personal connections beyond academics. Interactions in more relaxed settings contributed to scholars' sense of camaraderie, enhancing their engagement in the award. A scholar described the award's atmosphere as "supportive and more casual" and characterized meetings as collaborative sessions in which scholars "can all bounce ideas off of each other." S-STEM scholars used these interactions as academic check-ins and relied on them for



emotional and mental support, helping them stay engaged in S-STEM program activities as they managed school-related pressures.

Intrinsic Motivation

During interviews, intrinsic motivation emerged as another factor driving scholars' engagement in their schools' S-STEM projects. Scholars discussed various aspects of this inherent drive, including personal growth, curiosity, determination, and academic ambition. For instance, one scholar underscored the importance of deriving personal benefit from learning and development, explaining that attending classes and activities helped them learn and grow as a person. For some scholars, the drive to understand and learn more was another significant intrinsic motivator.

One scholar expressed a persistent need to understand the reasons for various phenomena, repeatedly asking "why" to delve deeper. This motivation to learn encouraged them to maintain their engagement in S-STEM project activities. Personal determination was another compelling factor. One scholar shared a powerful story of overcoming significant life challenges, crediting their determination for their progress. This transformation fueled their daily motivation to learn, to grow, and to have a positive impact on others. Finally, the aspiration to achieve higher academic goals, such as obtaining an advanced degree in the STEM field, played a role. One scholar mentioned that active engagement prepared them for taking their education to the next level: "I would say it is just the drive to continue doing research and apply to a PhD program."

Facilitators of Scholar Engagement

Peer support and camaraderie: Scholars emphasized the importance of a strong peer support network in maintaining interest and engagement in project activities.

Intrinsic motivation: Intrinsic factors such as personal growth, curiosity, determination, and an aspiration for higher academic achievement drove scholars' engagement with the S-STEM program.

Faculty mentorship and research advising: Faculty mentors and research advisors played an important role in scholars' engagement by providing emotional support, practical guidance, and resources.

Faculty Mentorship and Research Advising

Scholars recognized the significant impact that faculty mentors and advisors had on maintaining their engagement in project activities. They expressed deep gratitude for the dedication and effort their mentors invested in their development, which inspired them to work harder. This sense of appreciation extended to the ongoing encouragement they received from their advisors, who played a key role in helping them overcome various academic challenges. In addition to emotional and motivational support, mentors provided resources and strategies that helped scholars manage academic and personal challenges. For instance, mentors often assisted scholars in developing effective time management strategies.

Scholars discussed how research advisors had been particularly beneficial for students who were new to research. Support from faculty and

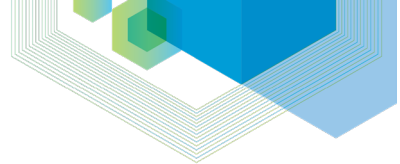


peers, intrinsic motivation, and authentic academic engagement are well established as inextricably linked in the engagement literature and are especially critical for scholars with low incomes. Support from peers and faculty increases motivation and authentic academic engagement in scholars (e.g., Prananto et al., 2025; Yang & Xiang, 2024), which improves academic confidence and success (Solomon & Munsell, 2024). Participation in the S-STEM program creates a network of relationships that helps scholars achieve their academic, research,

and career goals, building social capital through community (Coleman, 1990).

"Before joining the program, I didn't even know what research was. It wasn't something I had considered. But through S-STEM, I learned not only how to conduct research but also how to present at conferences and advocate for it. Now, I want to make research my life's mission."





Perseverance Through Success Coaching and Other Support

Marina (a pseudonym) was thrilled to secure a spot as an S-STEM scholar. After dedicating time and energy to many scholarship applications and facing disappointment each time, her persistence had finally paid off.



Marina emphasized during her interview that being an S-STEM scholar goes beyond just receiving financial support; it is a valuable opportunity to demonstrate a commitment to academic excellence because scholars are expected to maintain strong academic performance throughout their studies. Fortunately, the S-STEM program at Marina's community college provides essential support to help scholars succeed, including regular meetings with a success coach and formal check-ins each semester with a faculty mentor. According to Marina, the program's success coach has been one of the program's most valuable resources:

My success coach really does put in a lot of care and effort into giving me as much support as she can . . . When I told her about the stress I was feeling from school, I was pleasantly surprised to see that she had prepared resources and printouts, giving me directions on how to . . . manage [stress] better . . . Meeting with her regularly gives me a clearer view of what I can do, helping me feel like things aren't as bad as they might seem.

The S-STEM project offers an informal cohort network facilitated by the success coach to connect S-STEM scholars through shared classes and virtual introductions. Marina explained, “[My success coach] connects me with the other S-STEM scholars . . . She allows us to get to know each other.”

In addition, Marina's S-STEM project offers specialized professional development workshops and events, empowering scholars to tackle challenges and excel not only in their studies but also in their future careers. Marina described how the S-STEM program has helped her develop soft skills:

Being in the S-STEM program has given me a lot of opportunities to network and meet new people . . . It helps build my character and shows me things I don't learn in the classroom . . . how to build my résumé and how to get to know more people. [S-STEM] is teaching me the soft skills I need outside of class.





Marina said that the S-STEM project has been instrumental in supporting her in moments of self-doubt and encourages her to remain adaptable and committed to her rigorous studies. She shared that she sometimes experiences self-doubt when comparing herself to other S-STEM scholars. She wonders whether she is “supposed to be pursuing” STEM because she often feels that her “abilities are not as good” as those of her peers and senses that she lacks the same level of passion. While this internal pressure occasionally leads her to question her path, she acknowledges that S-STEM provides crucial guidance and support. Marina feels that without this guidance and support, her goals would be “kind of changing around,” making her uncertain about her path in STEM. The scholarship reassures her, providing a steady foundation and helping her feel “very supported” amid the rigorous demands of the field.

After earning her associate’s degree, Marina is pursuing her bachelor’s degree at a different institution. She shared that she is honored to have been an S-STEM scholar and appreciates the support that she received from her faculty mentor and success coach:

I know that they’re there for me if I need them here. And financial-wise, I do feel supported greatly as well. I feel like I don’t have to be held back from my education. I can keep going. I can keep pursuing what I’m doing right now.





Barriers to Scholars' Engagement in S-STEM Project Activities

Scholars discussed several factors that influenced their ability to fully engage in project activities, including managing time effectively, balancing academic and work responsibilities, navigating financial and logistical considerations, and addressing psychological and academic demands.

Time Management

Time management emerged as an important area where scholars expressed a need for additional support, particularly in balancing academic responsibilities with employment.

Scholars demonstrated strong commitment to their academic and professional growth, yet many described the complexity of managing participation in project activities alongside work obligations. Several noted that taking time off work to attend events could result in financial strain or missed income. One scholar shared that their full-time work schedule often conflicted with project activities held during standard business hours. In addition to work-related considerations, scholars frequently emphasized the importance of prioritizing their academic success. Some scholars found it challenging to attend project events due to night classes or other academic commitments. One scholar described this balancing act between educational and S-STEM program activities:

I would say that my course load or the amount of time I'm spending on my homework . . . I feel like that has been taking up a very, very big portion of my time. If I didn't worry about that as much, I would probably be engaging with [program activities] more.

These reflections highlight the value of flexible programming and scheduling that aligns with scholars' diverse responsibilities, enabling them to remain engaged while continuing to excel academically and professionally.

Barriers to Scholar Engagement

Time management: Scholars balanced multiple responsibilities—including work, academics, and S-STEM activities—and expressed a need for flexible scheduling to support sustained engagement.

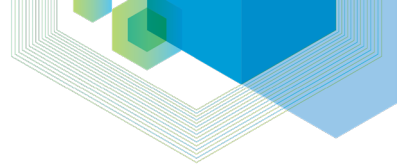
Financial considerations: Scholars identified opportunities to strengthen support for uncovered costs such as travel, research funding, and timing of scholarship disbursements, especially when balancing employment.

Logistical access: Long commutes and limited transportation options shaped scholars' ability to attend in-person or off-campus activities, highlighting the value of accessible and hybrid programming.

Award visibility and structure: Scholars in newer projects noted opportunities to enhance communication and structure around available activities and resources to support early and consistent engagement.

Psychological and academic pressures: Experiences of imposter syndrome and pressure to maintain high academic performance highlighted the importance of affirming environments and proactive academic support.





Financial Challenges

Scholars shared that financial considerations often influenced their ability to fully engage in project activities. A common theme was the opportunity cost of participating in full-day events, particularly for those balancing employment. One scholar explained:

If I want to do a full-day activity, I'll have to take that away from work. And that's me losing money . . . I feel like I can feel not as productive, even though it is. And it's always a great experience, and I always love it. Sometimes getting home at the end of a long day, I will just be a little bit stressed.

In addition to time-related trade-offs, scholars highlighted hidden costs, such as travel and meal costs, that were not always covered by the project. Some also noted the need for additional funding to support independent research. As one scholar shared: “Unfortunately, S-STEM . . . does not offer any form of funding. So, I have had to apply left and right to several other scholarships to find funding to support research.”

Delays in scholarship disbursement also presented a challenge, requiring scholars to self-fund temporarily while awaiting financial aid. One scholar noted: “The biggest barrier is getting that jump from when you actually get scholarships as well as the time it takes for the scholarships to be paid out . . . you have to fund yourself.” These insights underscore the importance of timely financial support and supplemental resources to ensure that scholars can fully participate and benefit from all aspects of the S-STEM project.

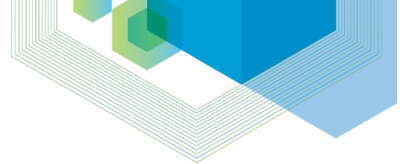
Transportation Challenges

During interviews, scholars also described transportation and logistics as important factors shaping their engagement. For instance, one respondent mentioned that their long commute time reduced their ability to participate in activities. Another scholar, whose campus was more than an hour away, spent 2 hours commuting for in-person events, which made regular attendance difficult. Additional responsibilities, such as childcare, further influenced availability—particularly for morning events. One scholar shared that navigating traffic and caregiving responsibilities limited their participation in early-day programming. Others noted that off-campus activities could be difficult to attend without access to personal transportation. These reflections highlight the value of flexible, accessible programming and the potential benefit of transportation support to ensure equitable participation for all scholars, regardless of location or personal circumstances.

Project Communication

Interview responses from some S-STEM scholars suggested that they were not always aware of the range of activities and resources available through their S-STEM projects. One scholar explained, “I’d say that one of the barriers is mainly just it isn’t advertised that much . . . not a lot of people realize it’s even a thing.” This limited visibility contributed to uncertainty about available scholarships and support structures. According to one scholar whose school’s S-STEM program was relatively new and under new leadership, there was a general lack of clarity regarding specific award details. Another scholar echoed this sentiment: “I think maybe just a little bit of a lack of information . . . we don’t really know what that would look like, how hard it might be to find [that resource].” These insights





underscore the opportunity for S-STEM projects to strengthen communication and outreach strategies, ensuring that all scholars are aware of and can access the full range of supports available to them.

Structured Activities Among Newer Projects

Scholars in newer projects described opportunities to enhance the structure and visibility of engagement activities. One scholar observed: “They don’t really have that many activities, I suppose.” Another scholar described some initial uncertainty about how to get involved in research opportunities or internships:

The program was also fairly new at the time, so there was the expectation for [scholars] to start getting into the research opportunities . . . or internships, or [find] ways to apply ourselves outside of the classroom. But we weren’t exactly sure how to do that . . . I think there was just a little bit of confusion there.

A third scholar noted the need for more structured opportunities to bring S-STEM scholars together: “Yeah, I wouldn’t say they’re very structured, no.” This suggests that newer S-STEM projects may benefit from additional support in developing clear, well-communicated pathways for scholar engagement, particularly in research, internships, and community-building activities.

Navigating Imposter Syndrome

Interview responses suggest that structures and systems within the STEM field, as well as dynamics within S-STEM programs, can contribute to experiences of imposter syndrome among scholars—a behavioral health phenomenon in which highly successful individuals persistently feel intellectually inadequate and fear exposure as

frauds, attributing their achievements to external factors despite evidence of high competence (Clance & Imes, 1978). One scholar described this experience: “It can be a little intimidating sometimes . . . as a STEM major, imposter syndrome is where you’re struggling to feel like you fit in because you might feel like you don’t belong there.” This highlights how the S-STEM project environment and its perceived expectations can be particularly complex for new scholars, who may initially question their sense of belonging or readiness.

For older students, these feelings can be amplified when interacting with younger peer mentors. One scholar reflected on the age and experience gap, noting that it sometimes led to self-doubt: “Sometimes it can make me feel a little bad about myself.” This suggests that internalized comparisons and expectations can shape how scholars perceive their place and value within the project.

Despite these challenges, scholars also shared moments of affirmation and connection. Several shared that being surrounded by like-minded, passionate individuals was both inspiring, and at times, overwhelming. One scholar captured this duality:

Sometimes, I feel really good about it . . . with that sense of being around like-minded people with similar passion and drive for what they want to do can be very rewarding. But at the same time, it can be intimidating. And I guess I wouldn’t say demotivating, but I haven’t quite found the balance yet on positivity and negativity. I feel like sometimes that ambition and passion can turn into competition, and that can be a little bit of a deterrent.





In large cohorts, some scholars noted that social integration could be more difficult, especially for new freshmen. For example, one scholar noted that the larger cohort size resulted in quieter interactions and smaller cliques, which could make it harder for others to connect. This highlights how cohort dynamics can shape scholars' sense of connection and belonging within the context of imposter syndrome in S-STEM projects. These insights suggest that while the S-STEM program offers valuable opportunities, there remains an opportunity to strengthen structural and social supports to ensure all scholars feel confident and included—an area of focus across many STEM fields (e.g., Radunzel et al., 2016).

Academic Challenges

Scholars also discussed the academic rigor of STEM coursework as a factor influencing their

engagement. One scholar shared that when coursework became particularly demanding, they needed to focus on maintaining strong academic performance, which sometimes limited their participation in award activities. Another scholar noted that GPA requirements—such as maintaining a 3.0—could be a source of pressure. In some cases, students who struggled to meet these requirements and did not access available support ultimately left the program.

These insights highlight the importance of proactive academic support and early intervention strategies to help scholars navigate rigorous coursework while remaining engaged in broader opportunities offered by the S-STEM projects. In the next section of this report, we highlight the strategies that S-STEM projects use to mitigate these challenges.





What Strategies Help Scholars to Thrive in S-STEM Projects?

S-STEM scholars suggested a variety of strategies that educational institutions have adopted to support their engagement and success. This section of the report outlines the different approaches that schools have taken to ensure that students actively participate in and benefit from their S-STEM projects.

Flexibility and Adaptability

According to several scholars, S-STEM project activities are designed with a high degree of flexibility and adaptability to accommodate scholars' needs and schedules. Faculty make concerted efforts to accommodate work schedules and other obligations by adjusting participation requirements and carefully scheduling events, ensuring that scholars can balance their other commitments with S-STEM program requirements. This often involves offering events outside standard working hours or providing multiple formats, such as in-person and online options, to cater to different needs.

S-STEM project staff understand scholars' multiple commitments and encourage scholars to communicate any challenges they face in attending meetings or activities. In response, faculty provide proactive communication and work diligently to accommodate scholars' schedules by allowing for late arrivals and absences from activities, sometimes offering their own time to provide the necessary support.



Flexibility, Adaptability, and Comprehensive Support Systems

- Adjusting participation requirements and event scheduling
- Establishing multifaceted support systems, including individualized academic support, proactive mentorship, logistical assistance, and regular check-ins
- Actively seeking scholars' input on activities and barriers to engagement

Multifaceted Systems of Support

Many faculty ensure that comprehensive and adaptive support systems are in place for S-STEM scholars, including individualized academic support, proactive mentorship, regular check-ins, and logistical support. Scholars described the attention that mentors give to their academic progress. One scholar observed that their S-STEM faculty actively monitor each student's academic progress, regularly checking in with inquiries about their well-being and offering assistance as needed:





[S-STEM faculty] keep track of you, asking, “Hey, do you need help? Are you okay?” . . . STEM can get very difficult, the classes, there’s a lot of coursework, a lot of requirements that you have to do that could be in the way of them . . . [The faculty] will look through everything for you and say, “Okay, you’re missing this,” “You’re not looking that great in this,” or “What can we do to get that grade up?” [They] want you to succeed. [They] want the best for you.

Another scholar mentioned that individualized academic support was complemented by a success coach system. They described the contrast between the wide-ranging guidance offered by success coaches, which covers overall academic and personal development, and the specialized, discipline-specific support given by faculty mentors. They added that they tackled “more of the broad issues with [their] success coach and major-specific issues with [their] faculty mentors.” Scholars indicated that S-STEM project staff actively reached out to them and that they appreciated the regular check-ins, illustrating the project’s commitment to scholars’ academic success and well-being.

Logistical support played a significant role in mitigating barriers to scholars’ engagement in the activities. For instance, one scholar noted that faculty arranged transportation for field trips and promptly addressed needs for additional funding. This exemplified the project’s awareness of and responsiveness to the logistical challenges that scholars face.

Feedback Mechanisms and Continuous Improvement

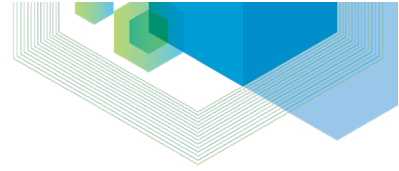
During interviews, scholars provided examples of how S-STEM project teams use feedback

mechanisms for continuous improvement. For example, one scholar explained how their project team actively sought direct feedback, specifically inquiring about any negative experiences or obstacles they faced. The scholar, recognizing the unique challenges faced by students in STEM, proposed organizing a session to discuss specific issues. The project team implemented an initiative based on the scholar’s feedback to help prepare students for challenges they might encounter, demonstrating the project’s responsiveness to student needs.

Meetings with high-ranking university officials, such as the president of the institution, offered another avenue for feedback. The meetings were informational and gave S-STEM scholars the rare opportunity to voice their concerns and suggestions directly to top decision-makers. Another scholar stated that structured feedback delivered through questionnaires was a key component of the improvement process in their school’s S-STEM program. The scholar explained that one of their faculty members regularly disseminated feedback questionnaires on specific project areas and then compiled and shared anonymized results with other S-STEM faculty engaged in the project.

Scholars observed that their S-STEM project teams not only gathered feedback but also acted on it, making noticeable changes to enhance support for students. These adaptations could be seen in various aspects of the project, such as improving the way academic requirements were communicated, adjusting financial aid processes, or refining the mentorship system. These examples—direct feedback solicitation, high-level dialogues, structured questionnaires, and program adaptability—illustrate the comprehensive approach that S-STEM project teams use to incorporate scholars’ feedback.





Key Takeaways

Based on results from the faculty and scholar surveys, scholar interviews, and project reporting, we provide the following takeaways.

S-STEM projects provide comprehensive support structures tailored to the needs of their scholars, mitigating unique challenges faced by students from low-income backgrounds.

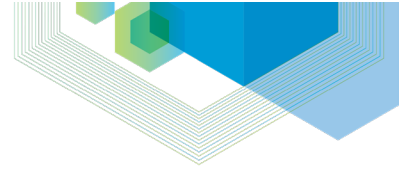
S-STEM projects are adapted to suit the capacities of each institution and the needs of their scholars. Although all projects incorporate evidence-based strategies such as financial aid, mentorship, professional development, research opportunities, and cohort-based learning, our data from interviews and surveys suggest that the projects vary in the design and implementation of these strategies. Some schools emphasize faculty mentoring and research opportunities, whereas others focus on career development, peer support, or nonacademic curricular workshops. This flexibility enables S-STEM projects to meet scholars where they are, making the most of institutional resources to strengthen accessibility and engagement. Although varied, these evidence-based activities aim to keep scholars engaged, build community, and ensure that scholars stay on track academically and develop skills and confidence in their field.

Scholars cited several factors that shaped their engagement, including time management, financial considerations, transportation logistics, and program academic expectations. S-STEM projects have responded to these dynamics by implementing flexible structures and comprehensive support systems, and using continuous feedback mechanisms that promote scholar success.

Projects proactively accommodate diverse schedules by offering hybrid participation options and adjusting requirements to balance academic and work commitments, such as offering activities outside of working hours and providing online options for participation. Scholars benefit from proactive mentorship, individualized academic advising, and logistical support such as transportation assistance. In addition, project teams actively solicit and act on scholar feedback, making data-informed improvements to mentorship, financial aid, and engagement opportunities. These strategies help scholars overcome logistical, financial, and academic challenges, fostering stronger engagement and long-term success.

S-STEM projects proactively accommodate diverse schedules by offering hybrid participation options and adjusting requirements to help scholars balance academic and work commitments. Examples include offering activities outside of working hours and providing online options for participation.





S-STEM projects help scholars succeed academically, engender a sense of belonging and community, and expose scholars to opportunities for research, continued education, and field experience.

According to survey results, faculty and scholars alike agree that participation in the S-STEM program positively affects the success of S-STEM scholars. Faculty survey respondents reported strong agreement with statements about the program's positive impacts on academics, retention, persistence, degree attainment/further study, and job placement. Furthermore, scholars who responded to the survey said they strongly agreed that their project had a positive impact on their research and presentation skills, future talent development and career plans, and social belongingness, although agreement among scholars was not as strong regarding the effect of their project on academic confidence and support. The survey results showed that scholars from 4-year institutions and those enrolled in biological, life, health, and biomedical sciences viewed their projects more positively in all four outcome domains, compared with their peers from 2-year institutions and other STEM fields, respectively. These results were echoed in scholar interviews.

Scholars reported greater confidence in career planning; stronger professional networks; and expanded exposure to different STEM careers and pathways, including graduate school, research positions, and industry roles.

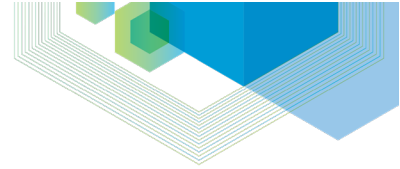


According to scholar interviews, participation in the S-STEM program helped improve scholar outcomes, particularly in academic retention, research engagement, and career preparedness. Scholars reported greater confidence in career planning; stronger professional networks; and expanded exposure to different STEM careers and pathways, including graduate school, research positions, and industry roles. For first-generation college students, the program fostered a stronger sense of belonging, helping them navigate STEM spaces where they otherwise

might have felt isolated. Financial support played a crucial role in reducing barriers to full academic participation, enabling scholars to prioritize learning and career development over financial concerns.

Facilitators of scholar success included peer support and camaraderie, intrinsic motivation, and faculty mentorship. Scholars emphasized the importance of being part of a supportive community, where shared goals and informal interactions fostered engagement and well-being. Intrinsic motivation, driven by personal growth, curiosity, determination, and aspirations for advanced degrees, played a key role in keeping scholars engaged. In addition, faculty mentors and research advisors provided emotional encouragement and practical support, helping scholars develop time management strategies, navigate academic challenges, and gain confidence in research settings.





Newer projects may benefit from additional support to engage scholars early in their development.

Newer projects were still in the process of developing their structure, which meant that some opportunities were not yet fully formalized. Scholars in these newer projects noted that information about scholarships, research opportunities, and internships was not always widely advertised or clearly communicated, making it more difficult to navigate and fully engage with the project. In addition, some scholars felt unsure about how to take advantage of available opportunities, suggesting that more structured pathways and consistent communication could enhance participation. As newer projects evolve, it will be important for them to finalize engagement opportunities early and to strengthen outreach regarding scholar opportunities and resources to ensure that all scholars can fully benefit from S-STEM support. To this point, NSF 25-514, the S-STEM solicitation for 2025 applications, has added a mandatory planning/capacity-building period before any scholarships are awarded.³

As newer projects evolve, it will be important for them to finalize engagement opportunities early and to strengthen outreach regarding scholar opportunities and resources to ensure all scholars can fully benefit from S-STEM support.



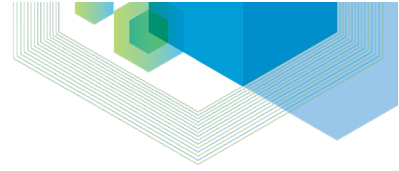
S-STEM projects help prepare STEM majors to graduate on time and enter the STEM workforce.

Data provided by S-STEM PIs suggest that scholars experience successful education and employment outcomes at higher rates than their peers. For S-STEM scholars, 2-year graduation rates at community colleges and 4-year graduation rates at 4-year institutions far exceed national averages for comparable groups of students. This is particularly true at 4-year institutions, where the 4-year graduation rate of fourth-year S-STEM scholars (48%) is three times the national 4-year graduation rate of Pell Grant recipients (16%). Moreover, narrowing the focus to students who graduate from a 4-year institution with a degree in STEM highlights the potential labor force benefits of the S-STEM program. S-STEM scholars graduating from a 4-year institution enter the STEM workforce at a significantly higher rates than their newly employed peers.

Our analysis suggests that about 86% of newly employed S-STEM graduates work in STEM, a rate roughly 30 to 40 percentage points higher than the average STEM graduate. Given that American employers regularly report having insufficient numbers of new STEM graduates to fill job openings ([U.S. Chamber of Commerce](#)), the S-STEM program likely helps to ameliorate these gaps by increasing the number of on-time STEM graduates prepared to begin a career in the STEM workforce.

³ Program solicitation, National Science Foundation (2024, December 2). NSF 25-514: NSF Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM). Directorate for STEM Education, Division of Undergraduate Education.

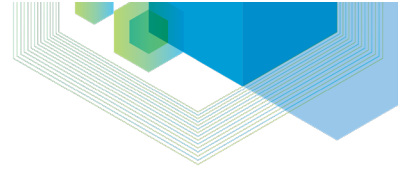




Conclusion

The S-STEM program increases participation in STEM talent development pathways and the workforce by addressing common challenges to access and success experienced by college scholars from low-income backgrounds. S-STEM projects use a variety of evidence-based practices tailored to each institution's resources and their scholars' needs. These practices help ensure that scholars from low-income backgrounds have a fair chance to succeed and contribute to the STEM enterprise by providing flexible, supportive structures that strengthen academic retention, research engagement, and career preparedness. These flexible structures maintain the academic rigor of these projects while giving institutions the opportunity to innovate, providing robust support to all scholars and ultimately strengthening the U.S. STEM workforce.

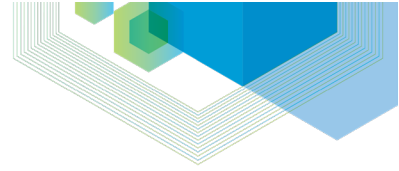




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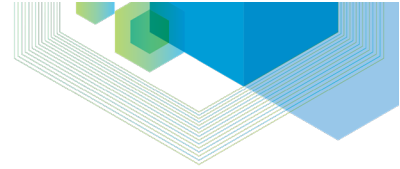
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