



STRENGTHENING STEM PATHWAYS: LESSONS LEARNED SUPPORTING LOW-INCOME S-STEM STUDENTS

The National Science Foundation’s S-STEM program supports academically talented, low-income students pursuing degrees in science, technology, engineering, and mathematics (STEM). By providing scholarships and a range of support activities through colleges and universities, the program helps students in eligible STEM fields succeed academically and prepare for future careers. Funding is awarded to institutions, which then select and assist students based on both academic promise and financial need.



About the ROPES Hub

The Research on Organizational Partnerships in Education in STEM (ROPES) Hub advances understanding of organizational partnerships that support academic pathways for domestic low-income engineering and computing students through a broad community of practice and a multi-faceted research agenda. To support S-STEM teams, the ROPES Hub created a series of themed office hour sessions that facilitated sharing of best practices and fostered the exchange of experiences among participating teams. This brief is based on those conversations.

Academically Talented, Low-Income Students

Research shows that income is the strongest predictor of whether students graduate within six years—a factor that outweighs race, ethnicity, and gender (Orr et al., 2011). Yet understanding low-income student experiences is essential, particularly for S-STEM programs that serve these populations. Inequality is structural, embedded in systems that limit resource access in interconnected ways (Major, 2022), and how we define “low-income” itself shapes what we are really studying (Atwood et al., 2020). Despite these barriers, many low-income students succeed in STEM. Understanding how they navigate challenges and develop strategies to overcome obstacles is critical to supporting more students on this path.

Content adapted from presentations and discussions during ROPES Hub themed office hours held on November 7, 2025.





Current Project Findings



Big Research Question

If inequality can lead to differences in belonging, and family members are at the center of that experience, then what strains are families experiencing, and how does that impact student belonging?

We know that belonging—and students’ perception of it—are strongly tied to student success outcomes, including retention. To understand this connection fully, we must look beyond income itself and examine the power dynamics surrounding it—**both what creates, and results from, low-income status**. It’s not just about income numbers; it’s about the lived experiences that accompany economic constraints and how those experiences fundamentally shape students on campus. By centering family strain and belonging together, we can develop a more holistic picture of low-income student experiences and what drives engineering success.

Familial Impacts Low-income Student Belonging

For low-income students pursuing STEM, family matters—a lot. When families provide emotional encouragement and practical support like help with housing and childcare, students stay enrolled and motivated (Jabbar et al., 2019; Frontiers in Education, 2022). Even the feeling that a parent believes in their ability to succeed in STEM predicts whether students will stick with demanding STEM majors (Ratelle et al., 2005).

These findings underscore a broader reality: motional resources emerge as a powerful predictor of STEM success. Yet emotional resources do not exist in a vacuum; they are deeply shaped by physical resources. When families lack access to money and material resources, emotional strain becomes more likely. These strains compound: limited physical resources create emotional turmoil, which together shape how students perceive their motivation, confidence, and sense of belonging in engineering spaces.

Families are traditionally the primary source of both emotional and physical support. When families struggle to meet these basic needs, students frequently turn to their **chosen family** to fill the gaps.



Observations from our participants reveal these characteristics:

Chosen Family

Teachers, coaches, advisors, co-workers, and friends

Possess institutional knowledge and understand how systems work to help students navigate them

Healing Journey: Many have experienced their own childhood or adult trauma and, in some cases, were low-income students themselves; the most impactful chosen family members have engaged in ongoing healing work

Relative privilege or distance from certain strains allows them to break down barriers and create space for students

Model healthy relationship building, resilience, and healing

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Emotional relationships are key to developing and sustaining TRUST

Students in this study were hypervigilant in building relationships within engineering—a protective stance born from household trauma. This wariness makes sense, but it also makes it harder for students to take the relational risks that trust requires. That's where chosen family comes in. Teachers, coaches, advisors, and mentors can break through that protective wall and help students develop the emotional connections they need to belong.



But here's the challenge: chosen family members face real institutional barriers that limit what they can offer. Lack of funding, inadequate support, and the fact that mentoring doesn't count toward tenure and promotion means these relationships are stretched thin.

For practitioners -

- **Build emotional relationships.** The connections your scholars create with you, other faculty, and peers directly shape their sense of belonging. Make these relationships authentic, non-judgmental, and grounded in shared vulnerability.
- **Invest in cohorting.** Structured cohorts create the in-person proximity and continuity that trust requires.
- **Share your own struggles.** If comfortable, talk about your mental health challenges, financial stress, and how you've navigated difficulty. This shows students they are not alone and that struggle is normal.
- **Think systemically.** Understand the deep strains students face—racism, classism, sexism, economic hardship. Let that awareness shape how you mentor and advocate for them.
- **Recognize emotional labor.** Mentoring low-income students is demanding work. Advocate for institutional recognition and support to sustain this work long-term.

What can we do to promote participation in co-curricular S-STEM activities?



- **Meet students where they are emotionally.** Low-income students often carry trauma that makes belonging feel risky. They may fear rejection or judgment, which keeps them from physically and emotionally showing up. Acknowledge this openly—creating belonging takes work (from the student and the institution), and that's okay.
- **Build a culture of authenticity.** Create spaces where students can be themselves without pretense. Talk openly about mental health, struggles, and imperfections. When students see faculty and peers being vulnerable, they feel safer being vulnerable too.
- **Make one-on-one connections first.** Do not just advertise events and hope students come. Reach out personally, have real conversations, and let students know you see them and want them there. These individual relationships are the gateway to community participation.

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