ROPES HUB
Research on Organizational Partnerships in Education & STEM

Research to Practice Briefs

Taylor Johnson, Amy Richardson, Sarah Rodriguez, & Walter Lee

STRENGTHENING S-STEM PATHWAYS: LESSONS LEARNED FROM WORKING ENGINEERING 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.

Why do Students Work?

Working while enrolled in college has become a normative aspect of the undergraduate experience, particularly as financial pressures on students have intensified. A substantial body of research demonstrates that students engage in paid employment for a range of interconnected reasons, including rising costs of living, escalating tuition and fees, and the declining purchasing power of financial aid (Perna & Odle, 2020). For many students, employment is not optional but a necessary strategy to meet basic needs and persist in higher education.

National data underscore the prevalence of student employment. According to the National Center for Education Statistics, in 2022, 74% of part-time students and 40% of full-time students were employed while enrolled. Increasingly, working 15 to 30 hours per week has become the "new normal," reflecting a shift in the structure of the college experience. These trends suggest that employment is deeply embedded in how students navigate both the financial and academic demands of higher education.

Content adapted from presentations and discussions during ROPES Hub themed office hours held on April 10, 2026.

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This material is based upon work supported by the National Science Foundation under Grant No. DUE-2138188: Collaborative Research: A Research Hub for Understanding Inter- and intra-institutional partnerships that systematically support low-income engineering students. Any opinions, findings, interpretations, conclusions or recommendations expressed in this material are those of its authors and do not represent the views of the National Science Foundation.

Key Findings

What Work Looks Like—and What It Costs

Students who work while enrolled in engineering programs are employed across a wide range of roles, both on and off campus. Common forms of employment include positions in retail and food service, as well as academically aligned roles such as tutoring, undergraduate teaching assistantships, and undergraduate research. Some students also secure campus-based positions that offer greater flexibility, though these opportunities are often limited and competitive. As a result, many engineering students balance academically demanding programs alongside jobs that may not align with their field of study but are necessary for financial stability. While employment can provide critical financial support, it also introduces significant barriers to student success:

- Negative perceptions from engineering faculty and staff, who may view employment as a distraction from academic commitment (Tyson, 2012).
- Time constraints that create competing demands between coursework and work responsibilities (Clemmensen & Harder, 2015; Perna & Odle, 2020; Tyson, 2012).
- Reduced participation in co-curricular and extracurricular activities, such as student organizations, internships, and professional development opportunities critical to engineering identity development (Olewnik et al., 2023; Tyson, 2012).
- Impacts on persistence in engineering pathways, particularly for students navigating financial and structural constraints (Lichtenstein et al., 2010; Minichiello, 2018).

Big Research Question
How does working while enrolled in engineering disciplines and/or courses impact student educational experiences?

Computing Identity & Work - Work experiences served as a meaningful context for developing a computing identity. Students described opportunities to demonstrate technical competence on the job, while interactions with coworkers and supervisors reinforced their recognition as "computing people." In some cases, workplace tasks also sparked or deepened interest in computing, as students were motivated to optimize processes or solve practical problems encountered in their roles.

Navigating Engineering and Work - Students actively negotiated the competing demands of engineering education and employment, with impacts flowing in both directions. Engineering coursework often shaped employment decisions, leading students to adjust hours, rely on summer work, or leave positions altogether. At the same time, work obligations constrained academic engagement, contributing to reduced participation in out-of-class activities, course withdrawal, challenges with schedule management, and, in some cases, a temporary lapse in enrollment.

Advising Working Students - Academic advisors identified several structural and curricular factors that disproportionately challenge working engineering students, including time-intensive coursework, inflexible scheduling, high credit loads, limited institutional supports, and teamwork expectations. These barriers were associated with downstream impacts on student outcomes, particularly reduced participation in co- and extracurricular activities, extended time to graduation, and diminished academic performance.

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What can we do?

Time as Capital

For working engineering students, time operates as a form of capital that must be continually allocated across coursework, paid employment, co-/extracurriculars, rest, and care responsibilities. Framing this as *time navigation*—rather than simply time management—highlights the complex decisions students make within their specific financial, familial, and institutional constraints, and keeps systemic barriers at the center rather than individual deficits.

Is the amount of out-of-class work equitable?

Standard expectations about hours spent on coursework outside of class often assume students have the financial flexibility not to work, which is not true for many working engineering students.

Viewing Work as an asset

Employment is often framed as competing with high-impact engineering experiences, but for many students, work is already a central site of learning. Even roles that seem unrelated to engineering can build skills in communication, systems thinking, problem solving, and working with customers or clients that are directly relevant to engineering practice and professional identity.

Practical Tips

- **More holistic advising** that explicitly surfaces conversations about time, finances, and family responsibilities, supporting students as they make decisions about course loads, work hours, and engagement in co-/extracurriculars.
- **Curriculum design** that takes students' real-time constraints seriously, including rethinking credit loads, sequencing, and when key courses are offered. Such as hybrid, online, or flipped formats—can preserve rigor while giving working students more control over when and how they engage with course content.
- Students see work as a necessary evil –instructors can **integrate students' existing work experiences** into classroom activities, assignments, and examples so that employment is treated as a meaningful learning context.
- Institutions can **proactively advertise on-campus job** opportunities—especially tutoring, teaching assistant, research, and technical roles.
- **Consider co-op programs,** including part-time options, as structured pathways that can both strengthen students' sense of belonging in engineering and contribute to their financial stability.

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Acknowledgements

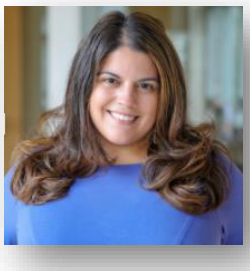
This research was based on work supported by the National Science Foundation Awards #2115153 and #1943811. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

About Authors

Taylor Johnson is an Internship Program Manager at an MEP engineering firm in Arizona. Her work bridges the gap between the engineering classroom and the professional workplace, focusing on enhancing career exploration and support for students, including students who work while in college.

Amy Jo Richardson is a research scientist in the Engineering Education Department at Virginia Tech. Her research focuses on the transfer process from community college to university and the interinstitutional partnerships necessary to facilitate it.

Walter Lee is aa Professor of Engineering Education and an affiliate faculty member in the Higher Education Program at Virginia Tech. He also serves as Executive Director of the Center for Engineering Excellence and Discovery (CEED). His work focuses on understanding the lived experiences of engineering students and improving systems that support them.



Sarah L. Rodriguez is an Associate Professor of Engineering Education and an affiliate faculty member with the Higher Education Program at Virginia Tech. Her work centers STEM environments and identity development for historically marginalized populations at higher education institutions.

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