CCRC COMMUNITY COLLEGE RESEARCH CENTER
TEACHERS COLLEGE, COLUMBIA UNIVERSITY

POLICY FACT SHEET
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Community College STEM Pathways

Increasing the number of college students who earn STEM credentials and enter STEM careers remains a national priority, as does the need to diversify the population of STEM workers by race/ethnicity, gender, and socioeconomic background. Postsecondary STEM credentials lead to some of the highest paying jobs in the labor market.[1] [2]

Community colleges serve as an important entry point for those who want to pursue either a workforce-oriented STEM associate degree or lower-division coursework leading to transfer to a four-year college in a STEM major. And community colleges hold potential for diversifying the pipeline into STEM as they serve a large proportion of the students traditionally underrepresented in STEM fields. However, students who start at community colleges often encounter challenges that make it difficult to complete STEM programs.

What is STEM?[3]

The term STEM education refers to teaching and learning in science, technology, engineering, and mathematics. Yet the specific disciplines that colleges, organizations, and federal agencies count as STEM vary, which can have implications for research and funding. The National Science Foundation sometimes uses a broad definition of STEM that includes psychology and the social sciences but does not include clinical fields such as nursing.[4] Others use a narrower definition that focuses on biology, chemistry, physics, computer and information sciences, engineering, and math.

WHAT THE RESEARCH TELLS US

Few community college students enter or complete STEM programs—and Black, Latinx, and Native American students, women, and lower income students are all underrepresented.

- Twelve percent of associate degrees awarded by community colleges in 2019-20 were in STEM fields, using a narrower definition that excludes social sciences and clinical fields.[5]
- Among students who started in a community college in fall 2010 and earned a bachelor's degree within six years, only 14% earned that degree in a STEM field.[6]
- Women are less likely than men to enter STEM programs in community colleges and more likely to leave them. But women who transfer to four-year institutions in STEM are more likely to attain a bachelor's degree than men.[7] [8]
- Low-income students are less likely to enter STEM programs or to transfer in STEM fields than higher income students[9]; and Black, Latinx, and Native American students are underrepresented in all transfer-level STEM courses in community colleges.[10]
- STEM fields have different barriers to student entry and progression and different patterns of student underrepresentation. For example, women in community colleges are overrepresented in chemistry and biology but underrepresented in physics, engineering, and computer science.[11] [12] [13]

Student on-ramps to community college influence STEM program participation.

- Academically prepared students from low-income backgrounds often lack adequate information about STEM careers and majors and are less likely to consider or enter them.[14] [15] [16]
- Community colleges generally do little to recruit students into STEM.[17]

- High school students who take and pass college algebra through dual enrollment courses are substantially more likely to choose a STEM major—and persist in STEM—in college.[18]
- Large numbers of community college students are referred to prerequisite developmental courses in math, which delays exposure to STEM content in introductory math and science courses.[19] [20]

There are substantial barriers to progress for community college students who enter STEM programs.

- While students who complete transfer-level courses in science, technology, engineering, or calculus in their first year are much more likely to transfer and attain STEM bachelor's degrees, few students do so.[21] Because women and Black, Latinx, and Native American students are more likely to enter STEM programs in the lowest-level courses, they suffer greater attrition from STEM and are less likely to reach or complete critical transfer-level courses.[22]
- Students struggle to navigate STEM program requirements, which require strict adherence to course sequences.[23] Academic or career advising services are often under-resourced in community colleges, further compounding the challenges for STEM students.[24]
- Students seeking to transfer in STEM majors face challenges endemic to transfer from community colleges to four-year colleges, including loss of credit.[25]

Experiences in STEM courses may discourage the pursuit of STEM programs by women and students of color.

- Negative experiences in large introductory math and science courses may discourage students, particularly women and students of color, from entering STEM majors.[26] [27] [28] Students who are historically underrepresented in STEM also have lower odds of passing STEM courses.[29]
- Feelings of isolation in STEM due to a lack of peers or mentors and perceptions of bias or discrimination on the basis of gender or race/ethnicity may discourage women and students of color from remaining enrolled in STEM programs.[30] [31]

KEY CONSIDERATIONS FOR FEDERAL POLICY

- The lack of a common definition of STEM leads to confusion and contradictory findings on the role community colleges and other postsecondary institutions play in preparing and graduating students who enter STEM fields.[32] The White House Office of Science and Technology Policy or similar coordinating body should be tasked with establishing a single definition to guide federal policymaking and research and support the better monitoring of STEM program enrollments and completions across institutions.
- The National Science Foundation provides funding for scholarships and programs to support recruitment, retention, and success of students in STEM, particularly those from historically underrepresented populations.[33] [34] Continued investments in programs like these—and more funding targeted specifically to community colleges and the students they serve—has potential to substantially increase representation in STEM fields by low-income students and Black, Latinx, and Native American students.
- Completing college-level math requirements is a major hindrance for community college students who might be interested in earning a STEM degree. Community colleges can increase the number of students who complete introductory college-level math courses by reforming developmental math.[35] The U.S. Department of Education should encourage wider adoption of evidence-based strategies through its discretionary and competitive grants programs for higher education institutions and systems.

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Endnotes

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[5] CCRC calculations using IPEDS data. STEM is defined here as agricultural sciences, natural resources and conservation, architecture, computer and information sciences, engineering, engineering technologies, biological sciences, mathematics, physical sciences, and management sciences using quantitative methods (see https://www.ccm.edu/wp-content/uploads/2019/03/NSF-STEM-Classification-of-Instructional-Programs.pdf).

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