

**CALL TO ACTION
FOR SCIENCE
EDUCATION**

**BUILDING
OPPORTUNITY
FOR THE FUTURE**

A New Vision for Higher Education

High-quality science education is not the national priority it needs to be. There are also deep disparities that have shut too many students out of science learning and careers.

The National Academies of Sciences, Engineering, and Medicine convened a committee of experts to present a detailed vision of better, more equitable science learning from kindergarten to postsecondary education, and to outline recommendations for how policymakers can achieve this vision.

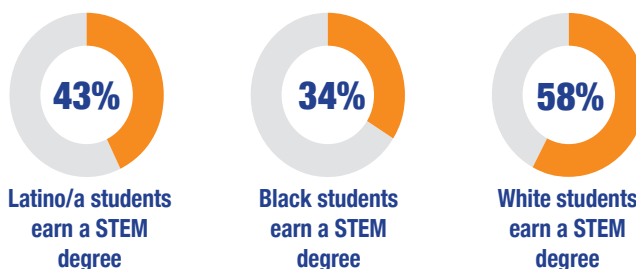
VISION FOR HIGHER EDUCATION

The Call to Action report's vision for K-16 science is that every student experiences the joy and wonder of science, learns how science can be used to solve local and global problems, sees the pathways they can take into science-related careers, and feels welcomed and valued in science classrooms.

Faculty are the engines of better, more equitable postsecondary science education. Students need educators who not only understand science but also know how to teach it in engaging, student-centered ways that reflect current evidence about how people learn.

Those teaching in our colleges and universities must have the opportunity to engage in ongoing professional learning and networking where members observe each other's practice and provide feedback, solve problems together, and refine classroom activities and units. Increasing the diversity of faculty and instructors so that they look more like their students is also key to making science education more accessible and equitable.

Percentage of student earning STEM degrees by race/ethnicity



SOURCE: Riegle-Crumb, C., King, B., and Irizarry, Y (2019). Does STEM stand out? Examining racial/ethnic gaps in persistence across postsecondary fields. *Educational Researcher*, 48(3), 133–144.

ADDRESSING CHALLENGES IN HIGHER EDUCATION

Postsecondary education is where students with an interest in science can access the in-depth, exciting learning that prepares them for a career in STEM. There are wide disparities in access to high-quality learning experiences, well-prepared science instructors and well-resourced institutions of higher education.

Positive, Impactful and Quality Courses Are Proven to Support Students

Scholarly studies cite that the more positive, engaging, and quality education courses—those that include high-impact practices—support all students, particularly those from underrepresented populations. “Weed-out” courses disproportionately discourage and shut out these students from a future in STEM, robbing them of lucrative job options and depriving the field of their talent.

Quality science instruction can level the playing field for students. When lecturing is still prominent in undergraduate science courses, White students reported the fewest negative



effects, while students of color were more likely to blame themselves for learning problems instead of the ineffective teaching.

Our call to action can leverage and accelerate efforts to transform undergraduate science education. It can lead to more students engaged in relevant, rewarding science learning experiences in which they lead discussions, analyze case studies, learn as a team, and problem solve in the process of learning scientific principles and practices.

Need for Diverse, Engaging Higher Education Faculty

Examples from across the country reinforce the imperative to create pathways for faculty of color. Yet higher education faculty are less likely to be people of color than their students (24 percent of faculty not White versus 45 percent of students).

In addition, the training of higher education faculty often focuses on research rather than teaching. Many incentives push them to devote more energy to research than improving their pedagogical skills and teaching strategies. These realities reinforce traditional lecture-heavy approaches to teaching that fail to engage students in science.

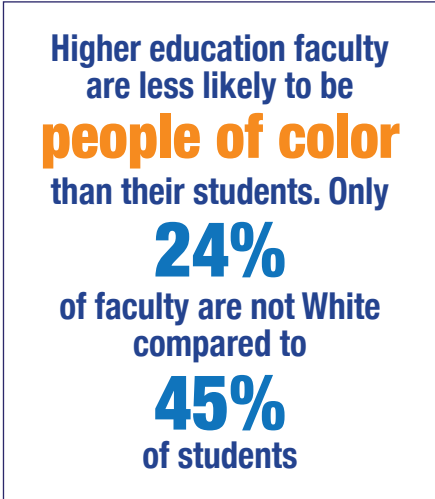
Multiple changes, including professional learning about pedagogy, are needed to raise the quality of teaching among all faculty. Faculty, instructors, education researchers, and directors of Centers for Teaching and Learning have been devoting countless hours and resources to transforming undergraduate science and STEM education. They are working to help faculty and others who teach postsecondary students adopt a more inclusive evidenced-based approach to their teaching. They are establishing diverse networks locally and nationally focused on a particular discipline (such as physics, biology or geosciences) or approach (such as course based undergraduate research or higher quality instructional resources) that can make instruction engaging to a wide variety of learners. New reward structures and professional development are being created and used to incentivize faculty in these programs.

Break Down Silos Between K-12 and Higher Education

Pathways into and through postsecondary science are complex. Students may find themselves inadequately prepared for the rigor of college coursework or they may face stereotypes from faculty or peers. The environments students encounter when they begin college may not be welcoming, in addition to the lack of quality teaching described above. These barriers, which have been exacerbated by the COVID-19 pandemic, apply to classroom experiences as well as impacting other aspects of campus life. Women, first generation and underrepresented minorities have been impacted in greater numbers.

University-based community engagement in K-12 is very promising for university, community, and students alike. Leaders across both spaces must turn to community-based models to create new alliances and prioritize opportunities to communicate and collaborate to support students who have an early interest in STEM have a successful transition to higher education and beyond that allows them to stay the course.

Higher education must make it a priority to broaden opportunity for populations of students underrepresented in STEM professions. Leaders across both spaces must turn to community-based models to create new alliances and prioritize opportunities to communicate and



SOURCE: National Center for Education Statistics, U. S. Department of Education. (2018). *Digest of Education Statistics*.

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collaborate in a way that supports students who have an early interest in STEM so they can successfully transition to higher education and beyond.

How to make it happen:

To achieve this vision and prioritize scientific literacy for all, we must:

- Develop and support a strong, diverse science teaching workforce, including broadening the diversity in college/university classrooms.
- Support faculty through ongoing professional development.
- Establish reward structures that incentivize teaching and motivate faculty to engage students in the classroom.
- Create pathways for future faculty from underrepresented communities to pursue STEM teaching careers in higher education.
- Work to achieve both gender and racial diversity among faculty and instructors.
- Bring together diverse networks to focus on a particular discipline or approach that can make instruction engaging to a wide variety of learners.
- Break down the silos between K-12 and higher education
- Establish effective mentorship and sponsorship programs.
- Help students learn the concepts and approaches of science by engaging them with real world examples and making connections that show how science is relevant to their daily lives.
- Cultivate welcoming and inclusive classroom and campus environments that recognize the prior knowledge and experiences students bring.
- Expose students early to undergraduate research.
- Create regional coalitions to advance collective work in locally relevant ways.
- Investigate existing area programs and discuss new funding, supplemental funding, or reallocation of funds.
- Rally stakeholders to elevate the importance of science education, develop plans, set priorities, collect and synthesize data to measure progress, make adjustments to strategies based on evidence, and hold partners accountable.

The Call to Action committee has provided clear, actionable recommendations for federal and state lawmakers, education leaders, advocates and local communities. To learn more, visit nationalacademies.org/cta-science-education.