

Study finds obstacles for women and minorities in chemistry

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Credit: University of Oregon

Insufficient interactions with advisers and peers, as well as financial problems, are derailing career aspirations of women and minority groups pursuing graduate degrees in the nation's highest-funded chemistry programs.

The challenges are detailed in a study, led by two UO researchers, that is

publishing online this week ahead of print in the *Proceedings of the National Academy of Sciences*.

The hurdles emerged from a deep dive into data compiled in a 2013 American Chemical Society survey of 1,375 chemistry graduate students in the top 100 university chemistry departments, based on research funding reported by the National Science Foundation.

"I think this study is a wake-up call to chemistry departments around the country and especially our most highly ranked departments," said study co-author Geraldine Richmond, a professor of chemistry and the UO's Presidential Chair in Science.

"Many graduate students," she said, "are not getting the quality of support in advising and mentorship that are documented to be essential for a success in the early career stages."

The findings, she said, shed light on gender and racial inequities in U.S. chemistry graduate programs that are at the heart of low retention and completion of doctoral degrees for underrepresented groups in chemistry.

As a result of the inequities, [women](#), especially, "are more likely to drop out and not go on to chase their dream to become professors of tomorrow," said the study's lead author, sociologist Jean Stockard, professor emerita of the UO's School of Planning, Public Policy and Management.

The American Chemical Society's survey initially revealed that women and members of other marginalized groups had periodic, significant differences in their experiences. Stockard used multivariate statistical analyses to parse out variations of those experiences among women and men and women from African American, Latinx and Native American

groups.

Women identifying as members of a marginalized group more often reported negative experiences with advisers than did their majority group colleagues. Women not in such groups were not far behind them in their responses.

Men in marginalized groups said they had less supportive peer interactions with fellow graduate students and postdoctoral researchers. Navigating such interactions, Stockard said, is vital for building opportunities to collaborate on projects and forge publishing co-authorships.

Financially, men and women in marginalized groups were more than twice as likely than those in majority groups to report inadequate support to meet their costs of living. They also were more likely to need supplemental help from loans and personal resources. The discrepancy, the researchers suggest, may reflect economic disparities in the society as a whole.

"On average, the accumulated wealth of families from marginalized communities is only a small fraction of others," Stockard said. "Thus, these students may be far less likely to receive help from their parents when times become difficult."

The troubling graduate school experiences, the researchers said, mirror inequities in other areas of society and threaten the goal of diversifying the STEM fields of science, technology, engineering and math.

"Women identifying as URM (underrepresented minorities) were least likely to report that their advisers encouraged them to take challenges or pursue their goals, advocated for them, gave credit for their contributions, created a 'fair environment,' gave regular feedback,

engaged them in writing proposals and giving presentations, helped develop professional relationships, or indicated that they were satisfied with the student's work," the three co-authors wrote.

A national response is needed to reduce the financial hardships and the problems in peer and adviser relationships, the researchers concluded.

"We need change at all levels," said Richmond, who heads the Committee on the Advancement of Women Chemists, known internationally as COACh, which she co-founded in 1997 with the goal of increasing the number and career success of women scientists and engineers worldwide.

"We need to recognize that our graduate students are not just hired hands or technicians. We need to treat them like professionals," she said. "That means pay them like professionals. This is a serious national issue. We are losing talent that we cannot afford to lose."

More information: Jean Stockard et al. Equity for women and underrepresented minorities in STEM: Graduate experiences and career plans in chemistry, *Proceedings of the National Academy of Sciences* (2021). [DOI: 10.1073/pnas.2020508118](https://doi.org/10.1073/pnas.2020508118)

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