High-stakes tests a likely factor in STEM performance gap: study

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Credit: University of Minnesota

Male students tend to do better on high-stakes tests in biology courses, but it's not because they are better students. Gaps in performance change based on the stakes of the test. A new study published in *PLOS ONE*

confirms this, finding that performance gaps between male and female students increased or decreased based on whether instructors emphasized or de-emphasized the value of exams.

Sehoya Cotner, associate professor in the College of Biological Sciences at the University of Minnesota, and Cissy Ballen, a postdoctoral associate in Cotner's lab, base their findings on a year-long study of students in nine introductory biology courses. They found that female students did not underperform in courses where exams count for less than half of the total course grade. In a separate study, instructors changed the curriculum in three different courses to place higher or lesser value on high-stakes exams (e.g., midterms and finals) and observed gender-biased patterns in performance.

"When the value of exams is changed, performance gaps increase or decrease accordingly," says Cotner.

These findings build on recent research by Cotner and Ballen that showed that on average, women's exam performance is adversely affected by test anxiety. By moving to a "mixed model" of student assessment—including lower-stakes exams, as well as quizzes and other assignments—instructors can decrease well established performance gaps between male and female students in science courses.

"This is not simply due to a 'watering down' of poor performance through the use of easy points," says Cotner. "Rather, on the exams themselves, women perform on par with men when the stakes are not so high."

The researchers point to these varied assessments as a potential reason why the active-learning approach, which shifts the focus away from lectures and lecture halls to more collaborative spaces and group-based work, appears to decrease the performance gap between students.

"As people transition to active learning, they tend to incorporate a diversity of low-stakes, formative assessments into their courses," Cotner says. "We think that it is this use of mixed assessment that advantages students who are otherwise underserved in the large introductory science courses."

Cotner and Ballen also see their findings as a potential to reframe gaps in student performance.

"Many barriers students face can be mitigated by instructional choices," says Cotner. "We conclude by challenging the *student deficit model*, and suggest a *course deficit model* as explanatory of these performance gaps, whereby the microclimate of the classroom can either raise or lower barriers to success for underrepresented groups in STEM."

More information: Sehoya Cotner et al, Can mixed assessment methods make biology classes more equitable?, *PLOS ONE* (2017). DOI: 10.1371/journal.pone.0189610

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