

# Inoculation Against Stereotype

The study found notable benefits for female students (and for male students as well, though to a lesser degree) to being taught by women -- and may point to strategies that would keep more women in STEM fields. The idea behind the research is that certain strategies "inoculate" female students against the sense that they don't belong or are not likely to succeed in math and science courses. The Amherst study was able to find a natural division of men and women, among students and instructors, because students sign up for a section without knowing who the instructor will be -- so none of the male or female students ends up by choice with a professor of a particular gender.

Students in the sections were then tracked on key indicators of level of engagement and confidence, and the findings suggest a powerful effect for having female instructors.

For example, the researchers tracked which students responded to questions posed to the class as a whole, not one particular student. At the beginning of the semester, female students were much less likely than male students (9 percent vs. 23 percent) to respond to such questions, regardless of the gender of the instructor. But as the course progressed, female students became much more likely to respond to such questions posed by female instructors (46 percent of female students were responding) than to male instructors (only 7 percent of female students were responding). Likewise, a larger percentage of male students answered questions posed by female instructors (42 percent of men) than by male instructors (only 26 percent of men). Notably, however, the impact of having a female instructor vs. a male instructor was much greater for women.

The researchers tracked other measures as well. At the beginning of the courses, there were not notable differences in whether female students approached female instructors (12 percent did) or male instructors (13 percent did) with questions after class. But as the course progressed, the percentage of female students approaching female instructors stayed constant, while the number approaching male instructors dropped -- all the way to zero.

On another measure -- asking questions in class without prompting -- male and female students had the same pattern, throughout the course. While 22 percent of students asked questions in sections taught by women, only 15 percent did so in courses taught by men.

Skeptics might wonder if some of the differences among students relate to how well the

students know the material. The researchers checked for that and found that, across sections, women outperformed men on grades. So the data point to women losing confidence with male instructors -- even if female students know the material as well as or better than their male counterparts.

Nilanjana Dasgupta, associate professor of psychology at UMass, is the lead author of the paper (with graduate students Jane G. Stout, Matthew Hunsinger and Melissa A. McManus), and she said in an interview that she sees the findings as significant in the ongoing debate over [why women are not better-represented](#) in STEM fields.

Several recent studies have suggested that the gender gap in STEM fields is caused not by bias, but simply by different choices made by men and women. What the new research shows, Dasgupta said, is choice isn't as simple as people think. "People assume that these choices are free choices, based on talent and interest and motivation," Dasgupta said. "But these data suggest that the meaning of choices, of what it means to choose math or science, is more complicated. Even talented people may not choose math or science not because they don't like it or are not good at it, but because they feel that they don't belong."

So what should departments do? Dasgupta said that the evidence suggests that women who are exposed to women doing math and science successfully end up with "stereotype inoculation" in which they gain confidence. The obvious solution from the new research -- which Dasgupta said wasn't realistic -- would be to have only women teach introductory STEM courses. Since many professors value their more specialized seminars, forcing women to teach all the intro courses would be unfair, Dasgupta said. And many STEM departments remain lopsided in gender make-up, with relatively few women.

"The issue is not to have only women teach women -- I don't think we need to go that far," she said.

However, female faculty members should certainly be in the mix, and having enough female faculty members so that teaching introductory courses doesn't fall on a few individuals is important, she said. Other strategies can work for male instructors, she said. Dasgupta said that more research is needed, but she believes women in those courses may be influenced by seeing women as teaching assistants, or having female undergraduates a few years older play some role in class. She also advised periodically referencing the work of female mathematicians and scientists, by name, so that there is an awareness of female success in STEM fields.

Dasgupta said that these efforts need to be regular and low-key -- in the same way that having someone as an instructor is not a special event. "It's better to have the intervention be integrated into the atmosphere, rather than a special week or month. It's the regular, humdrum exposure that makes a difference," she said.