

Female Teachers May Pass on Math Anxiety to Girls, Study Finds

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After a year in the classroom with female teachers who say they are anxious about math, girls are more likely to share that attitude — and score lower on tests, researchers say. Girls have long embraced the stereotype that they're not supposed to be good at math. It seems they may be getting the idea from a surprising source -- their female elementary school teachers.

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First- and second-graders whose teachers were anxious about mathematics were more likely to believe that boys are hard-wired for math and that girls are better at reading, a new study has found. What's more, the girls who bought into that notion scored significantly lower on math tests than their peers who didn't.

The gap in test scores was not apparent in the fall when the kids were first tested, but emerged after spending a school year in the classrooms of teachers with math anxiety. That detail convinced researchers that the teachers — all of them women — were the culprits.

“Teachers who are anxious about their own math abilities are translating some of that to their kids,” said University of Chicago psychologist Sian Beilock, who led the study published Monday in Proceedings of the National Academy of Sciences.

The study is the first both to examine the math attitudes of teachers and to show that those feelings can spread to students and undermine their performance, said coauthor Susan C. Levine, also a psychologist at the University of Chicago.

Experts said the findings could have implications for policymakers seeking to draw more women into careers in science, engineering and technology. Instead of focusing their efforts solely on female students, they could devise interventions for teachers as well.

“We always need more excellent scientists and mathematicians,” said University of Wisconsin psychology professor Janet Shibley Hyde, who examines gender differences in math performance and wasn't involved in the study. “They are the force that drives the nation's economy. You don't want to dismiss 50% of the potential scientists because they're girls rather than boys. That's just crazy.”

Beilock and her colleagues recruited seven female teachers from a Midwestern school district and assessed their level of math anxiety — a condition in which the prospect of doing math evokes unpleasant physiological and emotional responses. Such anxiety is more common among women, but isn't related to math abilities.

The researchers also gave math tests to 117 of the teachers' students and assessed their beliefs about math and gender at the beginning and the end of the school year.

By the spring, 20 of the girls subscribed to the math-is-for-boys stereotype; they were more likely to have been taught by math-anxious teachers. The girls scored an average of 102.5 on a test that asked them to count shapes and do simple addition and subtraction.

The average scores were higher for the other students: 107.8 for the remaining 45 girls and 107.7 for the 52 boys.

Beilock said she and her colleagues weren't sure exactly how the angst was transmitted from teachers to students.

Perhaps math-anxious teachers call on girls to solve math problems less frequently; praise boys more effusively; or simply imply that it's not important for girls to be good at math.

The teachers could also telegraph their own discomfort with math by hesitating when answering questions or speaking in a different tone of voice, and some girls internalize that attitude, Beilock said.

When girls see women struggling with math, it "contributes to the stereotype that math is for males," Hyde said. "It's kind of like the Barbie who said, 'Math is hard.' "

Studies have shown that girls have just as much math ability as boys. In a 2008 report in the journal *Science*, Hyde and her colleagues analyzed the math test scores of more than 7 million American students in grades 2 through 11 and found no difference between boys and girls at any grade level.

A study published this month by some of the same researchers examined the math performance of nearly half a million 14-to-16-year-olds in 69 countries. That report, in *Psychological Bulletin*, also found that boys and girls scored essentially the same, and that girls did better if they lived in countries where many women pursued careers in math and science.

The gap that emerged in the new study may seem small, but because math is a cumulative subject, its long-term consequences may be significant, researchers said. By high school, if girls don't take advanced math and science classes, they're effectively shutting themselves out of certain college majors and, thus, many career options.

"There's a snowball effect," Beilock said.

Marcia C. Linn, a professor of development and cognition at UC Berkeley's Graduate School of Education, said the results were "disheartening," though not surprising. But she questioned whether it was fair to single out teachers.

"It's not just their teachers," she said. "It's the textbook, and it's a new conception of mathematics."

But Hyde pointed out that if the main problem were a boring curriculum, boys would be affected in addition to girls.

The study raises important questions about the education of elementary school teachers. Only 33% of kindergarten, first- and second-grade teachers took a course in probability and statistics in college, and only 13% took calculus, Beilock said.

More math training — in college and afterward — might improve teachers' confidence.

But the stereotype will probably persist as long as it remains acceptable for women to express a fear of math.

“You don’t hear people going around bragging about the fact that they can’t read, but you do hear people say, ‘Oh, I don’t want to calculate the bill,’ ” Beilock said.