



Believing Stereotype Undermines Girls' Math Performance: Elementary School Women Teachers Transfer Their Fear of Doing Math to Girls, Study Finds

ScienceDaily (Jan. 26, 2010) — Female elementary school teachers who are anxious about math pass on to female students the stereotype that boys, not girls, are good at math. Girls who endorse this belief then do worse at math, research at the University of Chicago shows.

These findings are the product of a year-long study on 17 first- and second-grade teachers and 52 boys and 65 girls who were their students. The researchers found that boys' math performance was not related to their teacher's math anxiety while girls' math achievement was affected.

"Having a highly math-anxious female teacher may push girls to confirm the stereotype that they are not as good as boys at math, which in turn, affects girls' math achievement," said Sian Beilock, Associate Professor in Psychology and the Committee on Education at the University of Chicago, lead author of a paper, "Female Teachers' Math Anxiety Affects Girls' Math Achievement" published in the January 11 issue of the *Proceedings of the National Academy of Sciences*. Beilock is an expert on anxiety and stress as they relate to learning and performance.

Other authors were University graduate students Elizabeth Gunderson and Gerardo Ramirez as well as Susan Levine, Stella M. Rowley Professor of Psychology, Comparative Human Development, and the Committee on Education at the University of Chicago.

More than 90 percent of elementary school teachers in the country are women and they are able to get their teaching certificates with very little mathematics preparation, according to the National Survey of Science and Mathematics Education. Other research shows that elementary education majors have the highest rate of mathematics anxiety of any college major.

The potential of these teachers to impact girls' performance by transmitting their own anxiety about mathematics has important consequences. Teachers' anxiety might undermine female students' confidence in learning mathematics throughout their years of schooling and also decrease their performance in other subjects, such as science and engineering, which are dependent on mathematical understanding.

To determine the impact of teachers' mathematics anxiety on students, the team assessed teachers' anxiety about math. Then, at both the beginning and end of the school year, the research team also tested the students' level of mathematics achievement and the gender stereotypes the students held.

To assess stereotypes, the students were told gender neutral stories about students who were good at mathematics and good at reading and then asked to draw a picture of a student who was good at mathematics and one that was good at reading. Researchers were interested in examining the genders of the drawings that children produced for each story.

At the beginning of the school year, student math achievement was unrelated to teacher math anxiety in both boys and girls. By the end of the school year, however, the more anxious teachers were about math, the more likely girls, but not boys, were to endorse the view that "boys are good at math and girls are good at reading." Girls who accepted this stereotype did significantly worse on math achievement measures at the end of the school year than girls who did not accept the stereotype and than boys overall.

Girls who confirmed a belief that boys are better in math than girls scored six points lower in math achievement than did boys or girls who had not developed a belief in the stereotype (102 for the girls who accepted the stereotype, versus 108 for the other students).

Other research has shown that elementary school children are highly influenced by the attitudes of adults and that this relationship is strongest for students and adults of the same gender. "Thus it may be that first- and second-grade girls are more likely to be influenced by their teachers' anxieties than their male classmates, because most early elementary school teachers are female and the high levels of math anxiety in this teacher population confirm a societal stereotype about girls' math ability," Beilock said.

The authors suggest that elementary teacher preparation programs could be strengthened by requiring more mathematics preparation for future teachers as well as by addressing issues of math attitudes and anxiety in these teachers.

The National Science Foundation provided funding for the study.