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Solving the Math Anxiety Problem

Determining Causes and Expressions May Lead to a New Teaching Methodology

Ask most elementary or high school kids what their least favorite subject is, and chances are they’ll say “math.” But the dislike often doesn’t stem from simply a dislike of calculations; rather, the emotional and sometimes physical responses to doing math are part of a phenomenon known as “math anxiety.” Rudi Bailey, professor of educational psychology, school psychology, and special education; and Jeannie Montagano, associate professor of school psychology, are exploring the manifestations and causes of math anxiety and are garnering renewed interest in the field of educational psychology in what Bailey calls, “in North America, a nearly universal condition.” Math anxiety, simply defined, is an emotional reaction to doing math. It pops up in children of about the third-grade age, but can be found in people of all ages. It can be manifested in many different ways, from a vague uneasiness to a physical feeling of sickness, and translates across genders and ethnic groups. The phenomenon was the subject of some research in the 1980s, but has largely fallen out of focus since then. “We’ve always known that kids are having problems with math, but never seemed to have enough evidence to do something about it,” says Bailey. “Now it’s becoming a renewed area of interest.” Bailey and Montagano have just finished data collection on a series of studies designed to explore manifestations of math anxiety in intermediate-level children. From the two studies they’ve conducted, they have made 19 presentations at national, regional, and international conferences—as well as six posters at Andrews University’s Celebration of Research in fall 2011. They took their research to the Midwestern Psychological Association in the spring of 2012, as well as the American Psychological Association conference in August, 2012. Since their research represents a resurgence of a relatively dormant interest, their studies have been drawing quite a bit of interest from other researchers. Along with a few other researchers, Bailey and Montagano’s studies are helping bring math anxiety research back into the spotlight.

Their first study was derived from Montagano’s doctoral research. A school psychologist in the Bristol-Goshen area for more than 20 years, Montagano minored in math in college and research led her to “always have been interested in anxiety in children, especially test anxiety.” Bailey also began his career as a school psychologist, and has long been interested in attention deficit disorder and its companion as well as visual attention. The first study drew upon several existing math anxiety questionnaires to determine how math anxiety is expressed when it first starts to appear in children. Bailey and Montagano found that no single math anxiety questionnaire was adequate to their research. “Some of them measure performance, while others measure calculation anxiety, while others measure physiological effects.” says Bailey. When creating a survey of their own, they made sure that all those components were included.

The first study was group-administered to 121 students in Grades 4 & 5 in the Middlebury-Slipperyvania, Ind. school district. Teachers read the surveys aloud to students gathered in their homerooms, and the students individually marked their responses to statements and questions such as: “When I have to explain a math problem to my teacher, I feel...” “Playing games where numbers are involved makes me feel...” Two years later, they conducted a follow-up study on 536 students from Grades 4-6 in Elkhart, Ind. This time, they also tested a range of minority children: “The first study was 99.8 percent Caucasian,” says Montagano. In their studies, math anxiety translated equally across ethnic groups: there was no difference in levels of anxiety. Between the genders, however, Bailey and Montagano found that more females were math anxious than males, although they expressed anxiety in the same way. (This may be partially influenced by the commonly held belief that math is not a “girl’s subject” because boys are “just better” at math.)

Their studies showed that the umbrella heading “math anxiety” actually covers a wide range of anxiety types, any of which can combine depending on the situation. Bailey and Montagano found that math anxiety wasn’t pervasive across groups. With his peers, a child may not feel as anxious about his math ability, especially if he sees his friends struggling as well. But with a teacher, a student may have higher levels of anxiety, centered on a desire to please and to appear intelligent—which draws upon performance anxiety as well. Why does math make us anxious? Perhaps the emphasis that there is only one right response and a number of wrong answers, says Montagano. “Their studies showed that the umbrella heading ‘math anxiety’ actually covers a wide range of anxiety types, any of which can combine depending on the situation the math-anxious child is in.”

Above: Jeannie Montagano (left) and Rudi Bailey presented the results of their math anxiety research at the 2011 Celebration of Research held in Bollu Hall.
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“Math anxiety research shows a promising results begins to “hate” math, because it calls up a number of unpleasant emotions and feelings of inadequacy. While some anxiety is good and functions as a motivator, math anxiety also depends on the social context. Children find themselves doing math with their peers, in front of teachers or other authority figures, or with parents—and Bailey and Montagano found that math anxiety wasn’t pervasive across groups. With his peers, a child may not feel as anxious about his math ability, especially if he sees his friends struggling as well. But with a teacher, a student may have higher levels of anxiety, centered on a desire to please and to appear intelligent—which draws upon performance anxiety as well. Why does math make us anxious? Perhaps the emphasis that there is only one right response and a number of wrong answers, says Montagano. When it’s taught to elementary intermediate-level children, the emphasis is often put on getting the right result rather than understanding the fundamental process. Additionally, adds Bailey, there’s evidence that suggests we come to the world with a sort of “math sense.” When people, especially children, feel their innate “math sense” is not operating properly, they experience the emotions traditionally associated with math anxiety. So a third grader who learns to view math as result-driven and finds himself consistently getting the wrong results begins to “hate” math, because it calls up a number of unpleasant emotions and feelings of inadequacy. While some anxiety is good and functions as a motivator, math anxiety also depends on the social context. Children find themselves doing math with their peers, in front of teachers or other authority figures, or with parents—and Bailey and Montagano found that math anxiety wasn’t pervasive across groups. With his peers, a child may not feel as anxious about his math ability, especially if he sees his friends struggling as well. But with a teacher, a student may have higher levels of anxiety, centered on a desire to please and to appear intelligent—which draws upon performance anxiety as well. Why does math make us anxious? Perhaps the emphasis that there is only one right response and a number of wrong answers, says Montagano. When it’s taught to elementary intermediate-level children, the emphasis is often put on getting the right result rather than understanding the fundamental process. Additionally, adds Bailey, there’s evidence that suggests we come to the world with a sort of “math sense.” When people, especially children, feel their innate “math sense” is not operating properly, they experience the emotions traditionally associated with math anxiety. So a third grader who learns to view math as result-driven and finds himself consistently getting the wrong anxiety.”