The Role of Instructors in Creating Math Anxiety in Students from Kindergarten through College

Author(s): Carol D. Jackson and R. Jon Leffingwell

Source: *The Mathematics Teacher*, October 1999, Vol. 92, No. 7 (October 1999), pp. 583-586

Published by: National Council of Teachers of Mathematics

Stable URL: https://www.jstor.org/stable/27971118

Carol D. Jackson and R. Jon Leffingwell

The Role of Instructors in Creating Math Anxiety in Students from Kindergarten through College

"I just don't like math." How often have students uttered these anxiety-based words? The primary purpose of this research was to investigate the types of instructor behavior that created or exacerbated anxiety. In addition, the authors wanted to determine the grade levels (K–college) in which mathematics anxiety first occurred in these students. In this article, the term *instructor* includes anyone who teaches at any level, kindergarten through college.

METHODOLOGY

During three semesters, data were gathered in the form of written responses to the following prompt: "Describe your worst or most challenging mathematics classroom experience from kindergarten through college." The term *challenging* referred to experiences that produced stress in students who had been successful in mathematics. In addition, the respondents were asked to describe factors that would have made their experiences more positive.

A total of 157 student responses were gathered in a senior-level elementary-mathematics class that is required for all students seeking certification in elementary education. These students will be certified to teach first through sixth grade. Some students might work in self-contained classrooms where they will teach mathematics, language arts, social studies, and science. Others might be in departmentalized settings where they will teach only mathematics. All college students who participated in the study were above average in academic achievement, were highly motivated, and were seeking certification in teacher education. More than one-third of the students had received baccalaureate degrees. Many were married and had children. The average age was 26 years, and they worked an average of 31.5 hours per week while going to college.

ANALYSIS OF RESULTS

When the authors analyzed the data, they found that 11 students, or 7 percent of the 157, had only positive experiences in their mathematics classes from kindergarten through college. The authors inspected the responses of the remaining 146 students to determine the grade level at which the anxiety-producing problem occurred. Three clusters of grade levels were evident:

1. Elementary level, especially grades 3 and 4
2. High school level, especially grades 9–11
3. College level, especially freshman year

In addition, instructional behaviors that caused students to have anxiety in mathematics classes were classified as either overt or covert. Descriptions of the three clusters follow.

Elementary level, especially grades 3 and 4

Even though some students were traumatized as early as kindergarten or first grade, 16 percent of students experienced their first traumatic encounter in grades 3 or 4. Research shows that the fourth grade is often when students first experience math anxiety (Tankersley 1993; Swetman 1994). Anxiety-producing responses stemmed from the following factors:

Difficulty of material

- Students found that working with parts of numbers, that is, fractions rather than whole numbers, was stressful.
- Students found that taking timed tests in competition with peers was difficult.
- Students had difficulty memorizing multiplication tables and such formulas as area = length × width.

Only 7 percent had only positive experiences with mathematics from kindergarten through college

Carol Jackson, caroljackson@uta.edu, teaches at the University of Texas at Arlington, Arlington, TX 76019-0227. She is interested in mathematics education, mathematics anxiety, and multicultural education. Jon Leffingwell, leffingwell@uta.edu, is a teacher and psychologist at the same institution. He is interested in the effects of performance anxiety on students and ways to remedy it.

Hostile instructor behavior

- Instructors made derogatory comments to students in front of their peers, for example, "Do not pretend to look smarter than you are; it makes you look stupid."
- Instructors exhibited anger when students requested additional help.
- In pointing out a student's mistakes to the whole class, an instructor yelled, "How many times do I have to tell you . . . ?"

Covert behaviors, although veiled or implied, have the same negative effects as overt behaviors

Gender bias

- Instructors told some females that girls do not need mathematics.
- Girls were ridiculed more overtly than boys when they asked for clarification.
- Teachers did not intervene when girls were verbally abused and belittled by their peers.
- Instructors repeated explanations more often to boys than to girls.

Perception of instructors as insensitive and uncaring

- Instructors did not respond to students' needs for clarification and tutoring.
- Instructors did not stop students from scapegoating and criticizing their peers.
- Instructors showed insensitivity to a students' documented severe allergic reactions to chalk by frequently forcing them to write on the chalkboard.
- Instructors showed anger or disgust when students asked for help.

High school level, especially grades 9–11

The second cluster of grade levels in which students experienced anxiety in their mathematics classes occurred in grades 9, 10, and 11. Approximately 26 percent of the respondents reported that their negative experiences happened during these high school years. The aspects of instructor behavior that had a negative impact on student attitudes and achievement included the following:

Angry behavior

- Instructors exhibited anger when asked for further clarification of problems.
- Students who continued to ask questions were verbally attacked and demeaned.

Unrealistic expectations

- Instructors expected students to understand problems on the first occasion that they were explained. Instructors refused to explain the problems for a second time, asking, "What's wrong with you? Why didn't you get it the first time?"

Embarrassing students in front of peers

- Instructors forced students to go to the chalkboard to demonstrate problems that they did not understand and could not do, saying, "Get up to that board whether you can do it or not."

Gender bias

- Boys, regardless of ability, were helped to a substantial degree more than girls. This finding is supported by Stanford (1996), whose research showed that boys received more positive and negative responses from both male and female teachers than girls did.
- Girls were often ridiculed for not understanding the material.
- When girls asked questions, some teachers laughed at them or told them in class that they were stupid.

Insensitive and uncaring attitude

- Some instructors relied heavily on worksheets but did not explain content.
- When students asked for help, instructors sighed as if to say, "Not you again, dummy" or pretended to be so busy that the students' needs were ignored.

College level, especially freshman year

The freshman year in college was the starting point of mathematics-related stress for 27 percent of the respondents. Their instructors' behaviors varied from those of the instructors in previous grades in the following ways:

Communication and language barriers

- Students could not understand some instructors because of their poor pronunciation. In some cases, English was not the instructor's first language.
- The speed at which lectures were delivered was too rapid for some students.

Insensitive and uncaring attitude of instructor

- Students were told to leave class if they did not understand the material.
- Instructors belittled students for not having the prerequisite knowledge.
- When seeking assistance, students were often told that the instructor did not have enough time to help them. One instructor said, "If you don't like math, get out."

- Students were told to go to the math lab if they were that "dumb."
- "Slow" mathematics students were often ridiculed, chastised, or teased while their peers were present.

Quality of instruction

- Instructors gave poor explanations or rushed through explanations.
- Relying on assumed prerequisite knowledge, instructors told students that they should know the material. If they did not, then the instructor did not have time to waste on them.
- Instructors did not explain material sequentially or at an instructional pace that was understandable. One college instructor wrote equations with one hand and erased them with the other hand as he proceeded, without concern for students' needs.

Evaluation of instruction

- Students saw long and complex tests as punishment and as a vindictive form of retaliation against students who asked questions.
- Some test material did not match the lecture material or the syllabus.

Instructor's dislike for level of class

- Some instructors were offended at having to teach entry-level mathematics classes and vented their frustrations on students.

Gender bias

- Instructors told female students that girls should not take mathematics classes.
- Instructors used a condescending and demeaning manner to tell female students that since they did not understand the lesson in class, the instructor would explain it after the lecture.

Age discrimination

- Instructors showed insensitivity to students who were older than the traditional 18-to-22-year-old bracket when these students expressed anxiety about returning to school after many years.

THREE-CLUSTER ANALYSIS

The common instructor behaviors that produced anxiety responses in students, regardless of age, can be categorized as overt and covert behaviors. Overt, or observable, behaviors can be either verbal or nonverbal; for example, an instructor might scowl or make a derogatory comment. Covert behaviors, although veiled or implied, can have the same detrimental effects as the overt behaviors. As an example, an instructor who is standing near to a student might pretend not to hear that student's request for assistance. Whether the instructor behaviors were overt or covert, they interfered with the students' ability to concentrate in mathematics classes. Since mathematics requires sequential-thinking skills, any stress in the mathematics classroom will have even more adverse effects because of the nature of the subject (Zaslavsky 1994). The following overt and covert behaviors contribute to the creation of anxiety.

Overt behaviors

Instructor verbal statements

- "If you read your textbook, you would not have any problems."
- "Fractions, fractions, why can't you learn fractions?"
- "You should know this."

Instructor behaviors

- Instructors refused to answer students' questions; that is, feedback was nonexistent.
- Instructors failed to support students' attempts to have their questions answered; that is, feedback was inappropriate.
- Instructors allowed insufficient explanation or tutoring time.
- Instructors avoided proximity to students.

Covert behaviors

Instructor behaviors

- Instructors sighed in a demeaning manner.
- Instructors avoided eye contact with students.
- Instructors often explained their failure to help students by saying, "I didn't see you."

Instructors must be aware of their impact on students

IMPLICATIONS FOR INSTRUCTORS

The results of this survey have significant implications for all instructors who teach mathematics. Instructors must be aware of their impact on students. Students tend to internalize their instructors' interest in, and enthusiasm for, teaching mathematics. Conversely, if students think that the instructor is not happy teaching and does not enjoy being with them in the classroom, they will be less motivated to learn. The survey of student responses showed that the negative memories were so profound that mathematics anxiety could persist for twenty or more years. Obviously, many of the students in the survey overcame their math anxiety to the point of becoming successful as preservice elementary teachers. However, their painful experiences at the hands of some instructors made a lingering and lasting impression.

Awareness without active solutions and change in behavior is meaningless. Instructors who care about students must realize that rational and realistic methods can create a positive environment in which to teach and learn mathematics. Instructors can take an active role in reducing performance anxiety and can facilitate learning and enjoyment in mathematics by—

- disclosing that they may have overcome math anxiety as students and discussing specific strategies of remediation that they have used to be successful in mathematics;
- making a conscious choice to project to students their own interests in, and enjoyment of, mathematics;
- offering additional reinforcement and time to students who suffer from anxiety and need help;
- making mutual respect a pervasive rule to ensure that the classroom environment is psychologically safe;
- offering one-on-one tutoring sessions for students who have many questions that cannot be dealt with during class time, thereby helping students focus on pertinent questions during the tutorial sessions;
- giving written and verbal supplemental reviews of key terminology and processes as examination time approaches;
- seeking assistance from supportive professional colleagues when they feel overwhelmed by the teaching experience; and
- offering alternative times for testing so that students can obtain support from instructors one-on-one and reduce their own levels of anxiety; for example, students might take their tests individually before or after school.

The intent of this article is to give mathematics instructors an insightful view of negative behavior toward students. Instructors may be unaware that their behaviors are hurtful or negative. The authors understand that several factors can cause math anxiety in students and that instructor behavior is just one of those factors. In conclusion, the authors hope that instructors will provide an environment, through positive attitudes and sound pedagogy, that is conducive to students' success as mathematics learners. Books by Tobias (1993) and Zaslavsky (1994) list excellent additional strategies to alleviate math anxiety.

The authors would like to invite instructors at all levels to indicate effective ways to promote a supportive environment for students who struggle with mathematics. You can write to "Reader Reflections" at the *Mathematics Teacher,* or you can send e-mail to the authors at caroljackson@uta.edu or leffingwell@uta.edu.

REFERENCES

Stanford, Beverly Hardcastle. "Gender Equity in the Classroom." In *Common Bonds: Anti-bias Teaching in a Diverse Society,* edited by Deborah A. Byrnes and Gary Kiger, 79–94. Wheaton, Md.: Association for Childhood Education International, 1996.

Swetman, Daniel. "Fourth Grade Math: The Beginning of the End?" *Reading Improvement* 31 (fall 1994): 173–76.

Tankersley, Karen. "Teaching Math Their Way." *Educational Leadership* 50 (May 1993): 12–13.

Tobias, Sheila. *Overcoming Math Anxiety.* 2nd ed. New York: W. W. Norton & Co., 1993.

Zaslavsky, Claudia. *Fear of Math.* New Brunswick, N.J.: Rutgers University Press, 1994.