



INNOVATION ABSTRACTS

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SCARED STIFF: THE FEAR OF ALGEBRA

Hardly a semester goes by without a number of my students expressing immense anxiety about having to take algebra, which is required for all full-time students attending this college. This phobia unnecessarily stresses them, jeopardizes their true learning, and delays their graduation, as I've occasionally witnessed. That is, they might take every required course but algebra, or enroll and then withdraw (in some cases, several times) for fear of getting a poor grade, before they finally muster up enough courage to take it, stick it out, and pass it. Some students take the entire course, are not satisfied with the grade, and take it again.

I could never understand this fear. Of course, in the case of nontraditional students who had been out of school for several years, any insecurity about taking algebra might be more easily explained. As for the traditional students, perhaps they had goofed off in high school and were now regretting it. But, I suspected there was more to it than that. Why, after all, don't they appear to have such apprehension, for these same reasons, about history, geography, English, psychology—or even my subject area, biology? Could it be that a fear of math, in general, precedes the college years? If so, why?

Algebra and other math courses, as well as physics and chemistry, are very important, if not essential to the study of biology. So, I felt justified in investigating the matter further by means of a survey. I created a questionnaire and asked students to respond anonymously about the math or science courses they most feared, why they feared them, and how they think the situation could be improved. Approximately 400 community college (CC) students and 700 high school (HS) seniors from 11 regional high schools completed the questionnaire. Nearly all had taken algebra, biology, and chemistry. Close to one-third of the HS seniors and one-half of the CC students had taken physics. Only the HS students were asked about geometry and calculus. Most of

them had taken geometry, but only a quarter had taken calculus and/or precalculus. [Since a distinction between these two subjects had not been made in the questionnaire, they are hereafter referred to jointly as (pre-?)calculus.]

Hoping to get the faculty involved, too, I sent each instructor a three-question survey, to be completed anonymously, asking if and why they believed our students feared algebra above all other courses and what they thought could be done about it. Those who responded made some excellent observations. In addition, a longtime friend and former (now retired) math teacher at this college sent me an extensive elaboration on the issue.

The student survey responses revealed that one-half of the CC students feared or disliked algebra, even though only a quarter of them had previous trouble with it. About a quarter of the HS seniors had had trouble in algebra, but few of them said they feared taking it in college. Rather, it was (pre-?)calculus for which they expressed fear. Nearly one-half of those who had taken it, and one-half who had not, said they would be afraid to take it in college.

Chemistry also evokes fear, according to the survey. In the CC group, almost one-third who had taken it and one-fifth who hadn't said they disliked or feared it; and in the HS group, one-fifth who had taken it and one-third who hadn't felt the same way. The numbers were similar in the HS group, with respect to physics. Almost one-half of the CC students who had taken physics and a quarter who hadn't said they disliked or feared it. So, it appears that the only math and science courses that do not seem to create much anxiety in the two groups are geometry, among the high school students, and biology, among them all. The nontraditional students, as a separate group, and the CC students, in general, made similar responses.

In the subjective part of the questionnaire, one student remarked, "I feel inferior to algebra." I found this to be an interesting, especially telling comment—and typical of most students' answers as to why they have trouble in the course. Is it the prevailing sentiment



about math in our country that only the very superior, accelerated mind, not the average one, can understand it? As one faculty member put it, the fear of math is "...hard to reverse here, because it's almost cultural." I suspect, however, that this phenomenon is peculiar to the U.S., because students elsewhere—such as in Sweden, England, Japan, Germany, Jordan, India, Czech Republic, to name a few—do quite *well* in math, as most of us are aware.

In a society where everything is ready-made and one can get results to problems at the touch of a telephone or the click of a "mouse," the value of taking time to work things out on one's own is becoming passé. Perhaps it is likely that math (as well as chemistry) is disliked or feared partly because of the time-consuming work and concentration required to learn and master the concepts, and students are not willing and/or able to devote the required time and effort to it. In short, many students may lack a personal history of self-motivation and discipline. They may panic at the idea of having to apply themselves, especially in a course that appears to hold no obvious relevance to everyday life or problems. The student immediately says, "I just can't do it."

Ultimately, it was the overwhelming trend among the students to attribute their fear of math to their own shortcomings—"I can't do it... I'm not good at it ... I don't understand it ... It's too hard and complicated." However, when they were asked for ideas as to how math could be improved, **the teacher's attitude and instructional approaches were the focal points** of their suggestions.

"Go slower ... *take more time* on each topic...don't move on until everyone understands ... *explain more in depth...*" (42%)

"Give more one-on-one help in class or after school." (20%)

"Do more hands-on and group work." (15%)

"Make it more fun and interesting." (10%)

"Relate more to *real-life* situations." (7%)

"Give more examples." (6%)

It is clear that the most important element in math instruction, according to students, is **time**. Any good mathematician will admit that doing math problems takes time and that understanding math concepts takes time (and patience)—not merely for the learner, but also for the instructor. In math, it is unlikely that a student can understand a new concept without having mastered the previous, or prerequisite, one. Are HS and CC math teachers allowing enough time for the study of math concepts? Or, are they rushing from one to the next—before students have fully grasped them—because they

are required to cover a certain amount of material in a given timeframe? For CC students, many of whom begin the course with a confidence problem, this pace can be very frustrating. Thus, the rather common practice among them to withdraw from an algebra course in "midstream" and take it later, or finish it with a poor grade and then repeat the course altogether, continues.

Adopting "mastery learning" in math might be a possible answer for this problem. In this approach, students move along at their own learning pace until all major concepts/objectives of the course are understood and achieved. Reducing the amount of material being covered and giving more in-depth instruction on the most important concepts might reduce students' anxiety further.

Finally, how teachers perceive math and their students' ability to do it are very important factors affecting how students feel about it. Many respondents in both groups commented that during the first days of classes, some teachers make a point of saying that they don't expect everyone to be able to understand math or pass with a successful grade; that for students to get an "A" will be improbable, or at best difficult; or other similar comments. Instead of challenging students, as might be the sincere intention, this approach perpetuates the idea that math is simply too difficult for the average person—an image that math does not deserve.

Repetition of key concepts, using a variety of approaches, especially in math, is of utmost importance during the first few weeks of class. Once students grasp one concept, learning the next one becomes easier. Students' fear decreases, and their interest in learning increases. Most important, they begin to realize that math can be mastered. With time and patience, *all people can learn*.

John G. Shiber, *Professor, Biological Science*

For further information and a copy of the complete survey results, contact the author at Kentucky Community & Technical College System, Prestonsburg Community College, 110 Bert T. Combs Drive, Prestonsburg, KY 41563. e-mail: john.shiber@kctcs.net