

Why have mathematics skills eroded?

Several curriculum developments happened in the '60s. There were "New Mathematics," and "Individualized Instruction for Mathematics." Conceptually, individualized instruction, which was designed to go at your own pace, sounded very nice, but has proven to be unworkable as reported in research articles. To teach mathematics you have to use concrete materials; there has to be an interaction between something physical that the learner sees, touches, or smells, and discusses with the teacher. For example, fractions should be taught by folding paper or working with concrete objects, rocks, marbles, beans, etc. With "New Mathematics," young students were given a more axiomatic approach, such as, "give an example of the commutative property for addition."

What have you done to help teachers adapt to the changes in the mathematics curriculum?

Over the past several years, I coordinated the mathematics department and education department's efforts to develop meaningful content courses in mathematics and a useful methods course for elementary school teaching candidates. Our elementary school teaching candidates rate their mathematics education as one of their most positive learning experiences at CSU, Fresno. They find the information learned transferable to their classroom teaching situations. In addition, I have conducted several Extension Program courses on methodology for secondary school teachers. My published works have concentrated on problem solving in

geometry, problems and theorems for calculators, and ways to motivate students to learn mathematics. In the last two years, I have been the site coordinator for the University of California and the California State University system diagnostic testing project. As of June 1987, my office has processed more than 15,000 tests for high schools. The results provide students with a letter specifying their strengths and weaknesses. My most recent research paper was presented at the National Council of Teachers of Mathematics national conference in April 1987.

How do you approach mathematics to make it more interesting?

I try to find useful applications for the students. As a simple example, we explore the reasons that gas trucks are elliptically shaped. This easily leads to many ideas requiring calculus. To learn mathematics, you must experiment. If you have some triangles, you measure, you calculate, you make a chart, you organize your information, then you formulate your conclusions. What makes mathematics exciting is discovering mathematics, however trivial the discovery might be. A child who is taught $5 + 5 = 10$ and then figures out on his own that $5 + 6 = 11$, because $6 = 5 + 1$, is using reasoning to discover a mathematical truth, and that's the exciting part.

Have you ever worked with minorities?

Before coming to CSU, Fresno, I developed a mathematics program [K-8] for a school district that was more than 50 percent Hispanic. The program was based on concrete manipulative materials for each mathematical concept. This made the learning of concepts less dependent on the English language. Consequently, the average growth of the Hispanic children was greater than that of the Anglo children. While at CSU, Fresno, I had one of only three research grants in the U.S. to study the effects of calculators on learning mathematics. This study took place in a

predominantly Black high school. With specially designed lessons covering geometry, trigonometry, and some elementary calculus, the students averaged in the 7th percentile at the start of the semester and averaged in the 35th percentile at the end of the semester. The calculator is an exceptional tool in the hands of a competent teacher. I have written several problems for calculators and many of these have been published in books or leading mathematics journals.

What are your hobbies?

My wife, Dr. Charlotte Hiatt [associate professor in the Department of Information Systems and Decision Sciences], and I just finished a home in Cambria [on the Central Coast of California]. We did 90 percent of the work including tiling floors and putting in some wood floors. We enjoy going to the coast and walking along the beach. We also enjoy traveling in our camper. We have been to several countries and every state in the U.S. but three. I like most sports and try to play tennis now and then. My wife tries to force me to read non-mathematics books and magazines, but it is a real struggle. However, I just completed *The Prodigy* and have nearly finished two other novels. We love animals and have an 11-year-old cat. We have owned dogs and horses. Charlotte is trying to encourage me to get another dog. I use the excuse that with our new granddaughter, Rachel Marie, I will not have time for a dog. Dogs need a great deal of love and attention. In addition to a fine collection of Oriental rugs, I just purchased a 1937 Dodge coupe. I intend to make a street rod out of it and in the last year have read several car magazines in preparation for the project. When I retire, I would like to get more active in antique cars and street rods.