

Math

By Bill Hobby

Most Americans seem to think that mathematics is a monster to be feared and hated.

About 70 percent of the graduate students in engineering and 54 percent of the graduate students in mathematics are foreigners.

If the number of American students is small, the number of Hispanic and Afro-Americans is infinitesimal. In 1991, when about 1,000 PH.D's in math were awarded, two went to Afro-Americans and one to a Mexican-American.

Thus, it has become a new scientific frontier to prepare American students, particularly Hispanics and Afro-Americans, to face the math monster.

Fortunately, two of the most successful practitioners of this art are at Texas universities. Philip Uri Treisman, a professor of mathematics at the University of Texas at Austin, was recently awarded a \$285,000 MacArthur Fellowship for improving math education for minority and low-income students.

Richard Tapia, of the Department of Computational and Applied Mathematics at Rice University, has been so successful in recruiting minority students that Rice has lead the nation in the number of mathematics graduate degrees granted to minority students. About one-third of the graduate students admitted last year to his program are Hispanic or Afro-American.

Their motivations and techniques differ. They share a high degree of creativity and commitment. Treisman came to his work from a sense of outrage that mathematics, "which to us mathematicians is our art form and our life" was the tool used to screen people out of careers in such fields as medicine, business and architecture.

"It should be a vehicle to increase opportunity--a pump, not a filter," he said.

Treisman, then at the University of California at Berkeley, started out by analyzing the differences between undergraduate students who did well in math--Chinese--and those who did not--Afro-American and Hispanic. He discovered that the Chinese students did not have, as most Americans suspect, a math gene.

And he discovered that minority students were not lacking in the factors often credited for failure--preparation, motivation and family support. The difference was that the Chinese students worked in groups, finding mistakes and constructing solutions, and they were more willing to seek help from teaching assistants.

Using that information, Treisman created the Emerging Scholars program which now exists at UT-Austin and about 100 university math departments. At UT, the program invites 24 students each year to join. Three-quarters are Afro-American or Hispanic, the rest white or Asian. Half are women. The program successfully combats the dropout syndrome which is typical for all students who enter science or engineering. After three years of study, 86 percent of the emerging scholars are still in these majors compared to 45 percent of other students.

About 90 percent of the minority Emerging Scholars earn A's or B's in calculus, compared to fewer than one-third of other minority students.

In a large university where individual students can be overwhelmed, the Emerging Scholars are courted and supported. They have close and frequent contact with faculty and organized study groups.

Some of them go on to graduate work at Rice, where Richard Tapia is also looking for those who are overlooked.

A second-generation Mexican American from California, Tapia is acutely concerned with minority failures.

"We as a nation are producing unemployed people," he said. "They have no jobs because they have no education, because they don't buy into education. Every job requires some knowledge of computers. You either get a degree or you work at McDonald's."

So Tapia has developed programs to invite Hispanic and Afro-American youngsters into the math mainstream.

One--the Computational and Mathematical Sciences Awareness Program--educates teachers from schools with large minority populations on the latest techniques in mathematics and computer sciences.

Another--Spend a Summer With A Scientist--brings a minority high school student to Rice each year to work on a research project.

A third--the High School Summer Work Project--brings students not likely to go to college to Rice to work as support staff. So far, 100 percent of the summer workers have opted for a college education.

Tapia, who last year became the first Mexican-American elected to the prestigious National Academy of Engineers, recruits his minority graduate students from those who might not make an Ivy League roster.

"We talk to them, encourage them, nurture them toward success," he said. "We let them take a longer time if necessary, strengthen their backgrounds. It may take six or seven years."

But they persist. Most mathematic graduate departments have a 60 percent retention rate, he said. His department retains 90 percent.

For Tapia, his success is a key ingredient in national survival.

"The success of this nation was built on science and technology. We're in danger of losing our first world status because we don't learn science and math. It's a national crisis," he said.

It is also important for the future of the profession, Treisman said.

"In the past the individuals who worked on these, what were then seen as quasi-professional issues, did so as personal work, almost as hobbies: "You play golf, I work with the Black kids," Treisman said in a lecture at the University of California at San Bernardino.

"The scale of the problem now is such that many mathematicians will need to engage in activities that are necessary for the future life of the profession."

Those of us who love math are grateful to Treisman and Tapia. Those of us who love this country should be even more appreciative.

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