



Let's Get All of Our Students in the Mathematics Fast Track

Dr. Anne Papakonstantinou
Director

Rice University School Mathematics Project

Imagine that you are an observer in
an
Advanced Placement Calculus class
in a typical
urban senior high school,
ethnically balanced of course....

Who are the students in the class?

Now imagine that you are an
observer in a remedial mathematics
class at the same school.

Who are the students in this class?

- Why is there such a disparity in the student populations in the two classes?
- Why are mathematics classes some of the most segregated places in American society?

FACTS

- In the year 2000, 40% of the students in public schools were African American or Hispanic compared to 13% at the end of World War II.
- In the Houston Independent School District in 2005, 59% of students were Hispanic, 29% were African American, 9% were Anglo, and 3% were Asian and American Indian.

The study of mathematics in the United States has been dominated by white males.

FACTS

- U.S. Hispanics or African Americans earn only **4%** of the bachelors' degrees in mathematics and fewer than **2%** of the Ph. D. degrees.
- White males receive **3 out of 4** Ph. D. degrees awarded to U.S. citizens.

The National Science Board Reported:

- From 1990 to 2000, the percentage of foreign-born workers in the U. S. in science and engineering with Ph. D. degrees leaped from 24% to 38%.
- Since September 11, 2001, the number of temporary visas for jobs in science and technology dropped by 55% from 166,000 to 74,000.

The U. S. is not educating enough
of its own students to satisfy the
technology-hungry workforce.

There is low interest in scientific careers among the fastest growing demographic sector of the U. S. population – Hispanic-Americans.

FACTS

- American whites produce an average of 6.3 bachelor's degrees in science and engineering per 100 people between the ages of 18 and 24.
- Hispanics produce only 2.4.
- African Americans produce only 2.7.
- Asian and Pacific Islander Americans produce 14.7 degrees per 100 people in the same age group.

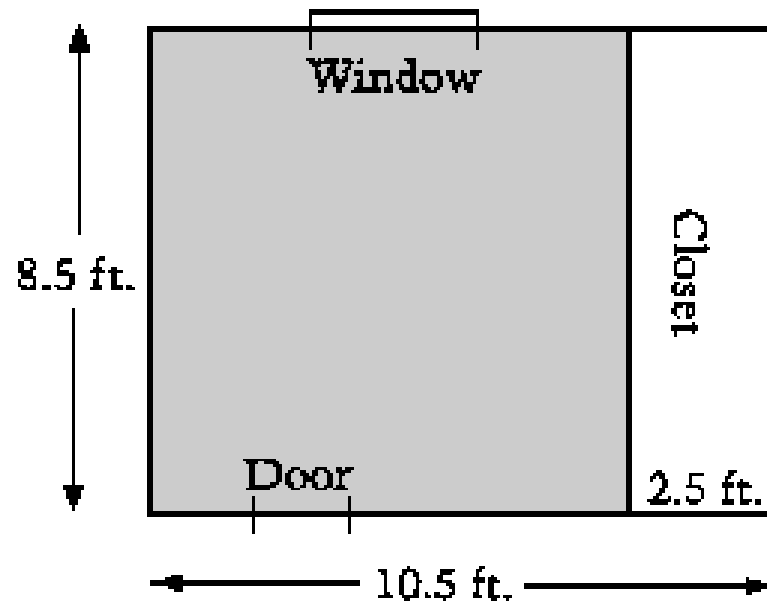
NAEP 2000 Math Assessment 12th Graders Scoring “Below Basic”

- 35% of all students
- 56% of Hispanic students
- 69% of African-American students
- 60% of low-income students
- 23% of students with college-educated parents

SOURCE: U.S. Department of Education, Institute of Education Sciences,
National Center for Education Statistics,
National Assessment of Educational Progress (NAEP), 2000

A Question Most “Below Basic” Students Answered Incorrectly

Chris wishes to carpet the rectangular room shown below. To the nearest square yard, how many square yards of carpet are needed to carpet the floor of the room if the closet floor will not be carpeted? (1 sq. yard = 9 sq. feet)



Mathematics moves society forward.

We must get more of our students, especially our underrepresented minorities, into the mathematics pipeline.

We must **sustain** our students,
especially our underrepresented
minorities, as they move through
the mathematics pipeline.

The mathematics pipeline has a huge dropout rate.

- From 9th grade through the Ph. D., the half-life of students is 1 year.
- Beginning with approximately 3.2 million students entering high school, we lose 50% each year until only a few hundred attain the Ph. D.

Losses from the mathematics pipeline come disproportionately from females, African Americans, Hispanics, and native Americans but at different stages.

Our fastest growing population - the
underrepresented minorities -
currently produces fewer than 2% of
our scientists, mathematicians, or
engineers.

"No first-world nation can maintain the health of its economy or society when such a large part of its population remains outside of all scientific and technological activity."

Professor Richard Tapia
Rice University

The World is Changing

- In everyday life, we are bombarded with "mathematical" information.
- In the workplace, we are regularly challenged to learn new skills.
- Our lives are being reshaped by changing technologies.

The NCTM Equity Principle:

Excellence in mathematics education requires equity – high expectations and strong support for all students.

Course taking is the **single**
most powerful factor under a
school's control that affects
student academic achievement.

We must demand the
highest level of
academic achievement
of all students.

Today, the goal is for all students to
take mathematics courses
each year
through the 12th grade.

The goal for all educators should be to ensure that every mathematics course is of the highest quality.

Too many minority students
do not receive
academic counseling encouraging
them to take AP courses.

Minority populations have traditional values that stress gender-differentiated roles for boys and girls.

Mathematics teachers and counselors **MUST** communicate the importance of studying mathematics to prepare for future careers, to increase possible earnings, and to function in society.

NCTM's Position on Closing the Achievement Gap

.... In order to close the achievement gap, all students need the opportunity to learn challenging mathematics from a well-qualified teacher who will make connections to the background, needs, and cultures of all learners.

Adopted April 2005

Suggestions for Mathematics Teachers

- Interact with all students not just with white males.
- Eliminate bias in the way that you interact with students.
- Discuss mathematics anxiety with your students and share your personal beliefs about it.
- Encourage women and minorities to seek interests that involve mathematics.
- **Do not** accept failure from minorities or females.

Mathematics in the Fast Track

- Pre-AP Algebra I in 8th grade
- Pre-AP Geometry in 9th grade
- Pre-AP Algebra II in 10th grade
- AP Pre-Calculus in 11th grade
- AP Calculus in 12th grade (AB or BC)
- AP Statistics concurrently with
Pre-AP Pre-Calculus or with AP Calculus, if
desired

Ways To Get Students in the Mathematics Fast Track

- Curriculum compacting
- Grade telescoping
- Summer school
- Concurrent enrollment in non-sequential mathematics courses
- Credit by examination

Words of Caution

- “Willing” an AP Calculus course at a school is not enough.
- Changing the names of existing pre-requisite courses to Pre-AP is not enough.
- High quality Pre-AP mathematics courses taught by knowledgeable teachers must be implemented.

The mathematics we teach must meet social and economic demands of the world, but we must take steps to ensure that **everyone** participates.



RICE

This presentation appears on the
Rice University
School Mathematics Project
web site
<http://rusmp.rice.edu>