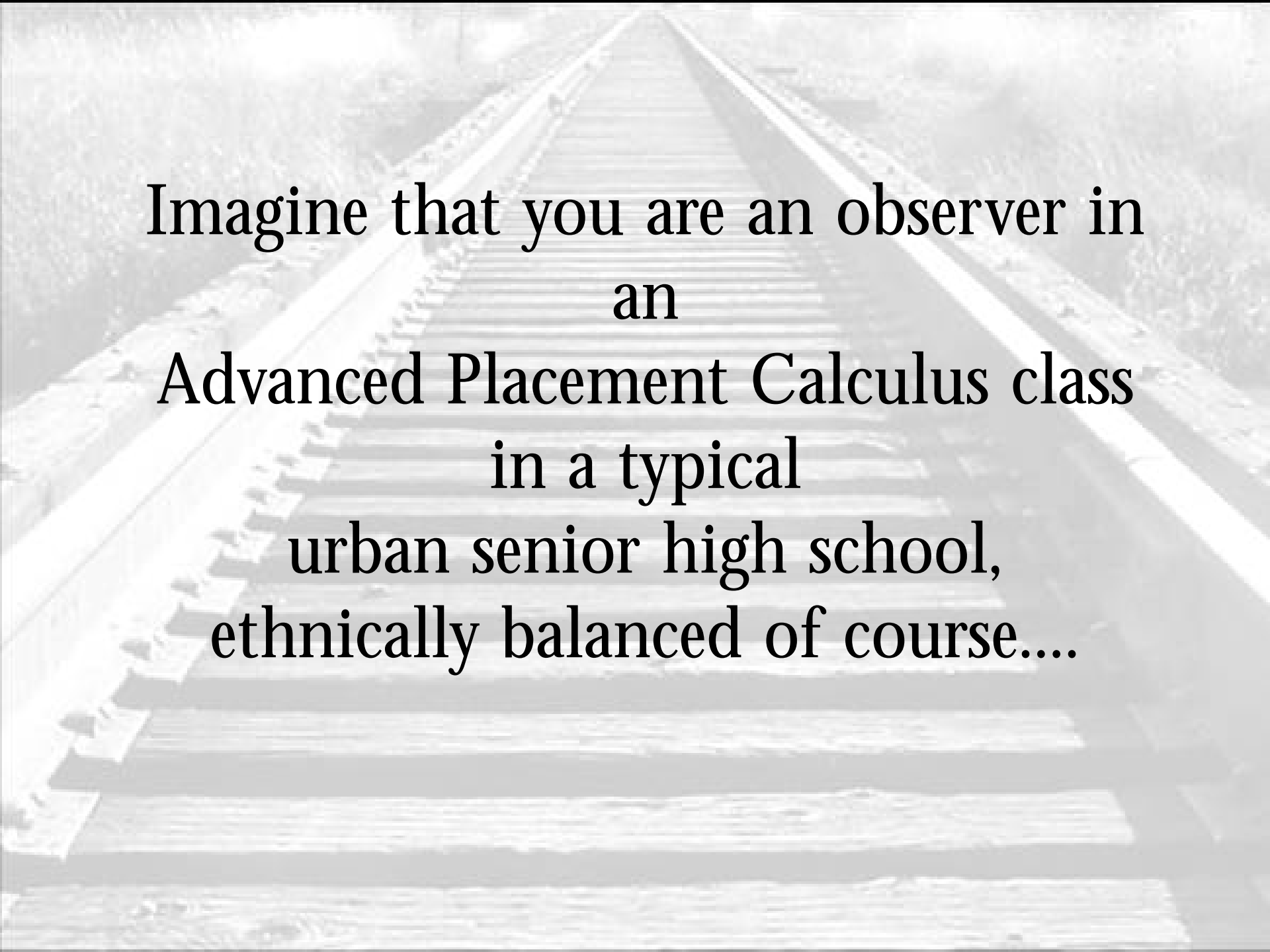




Let's Get All of Our Students in the  
Pre-AP and AP Mathematics  
Fast Track

Dr. Anne Papakonstantinou  
Director

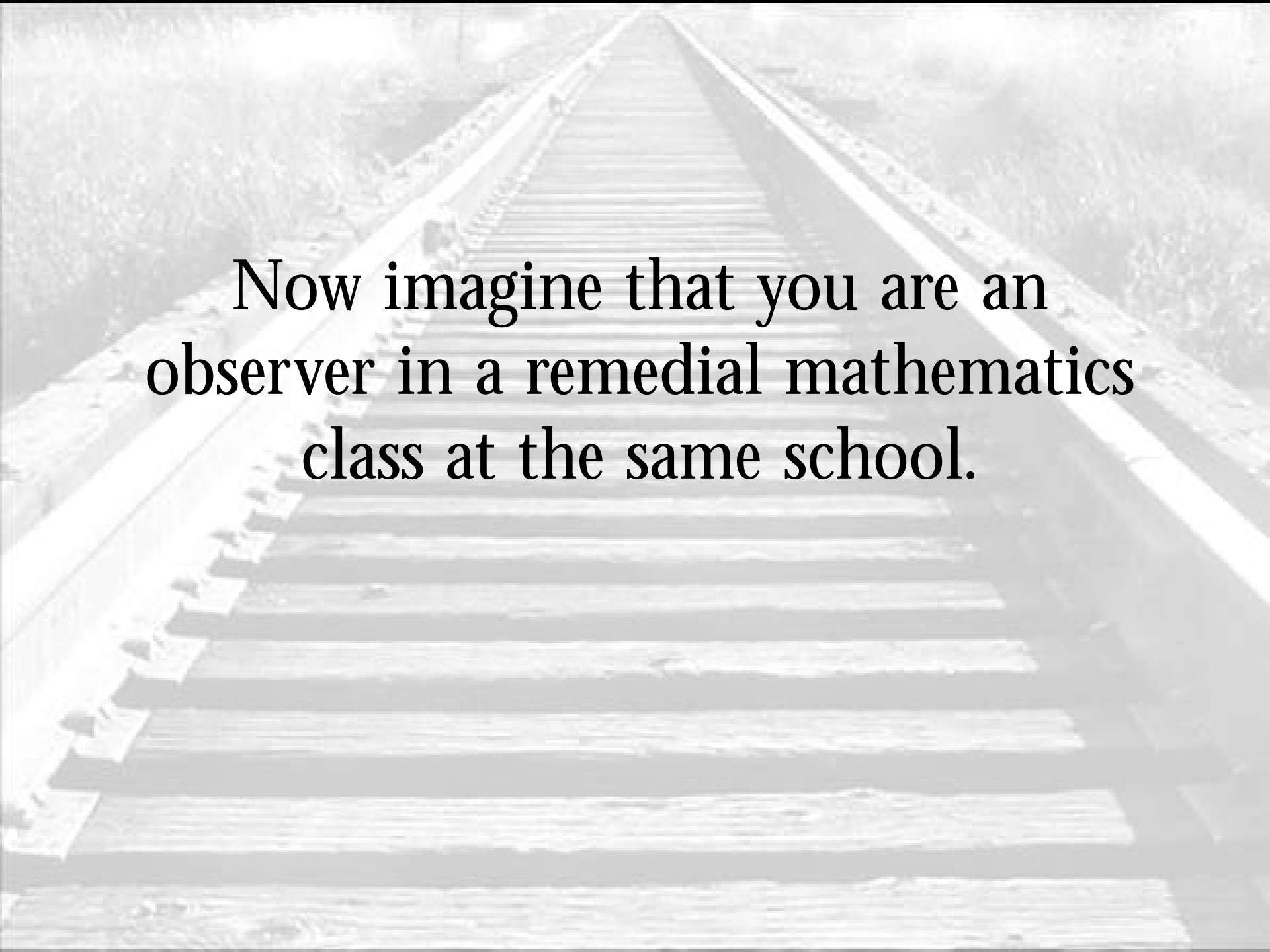
Rice University School Mathematics Project



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

A black and white photograph of a long, straight railway track stretching into the distance. The tracks are made of wooden sleepers and metal rails, converging towards a vanishing point in the center of the frame. The background is a hazy, overcast sky. Overlaid in the center of the image is the text "Who are the students in the class?" in a bold, black, serif font.

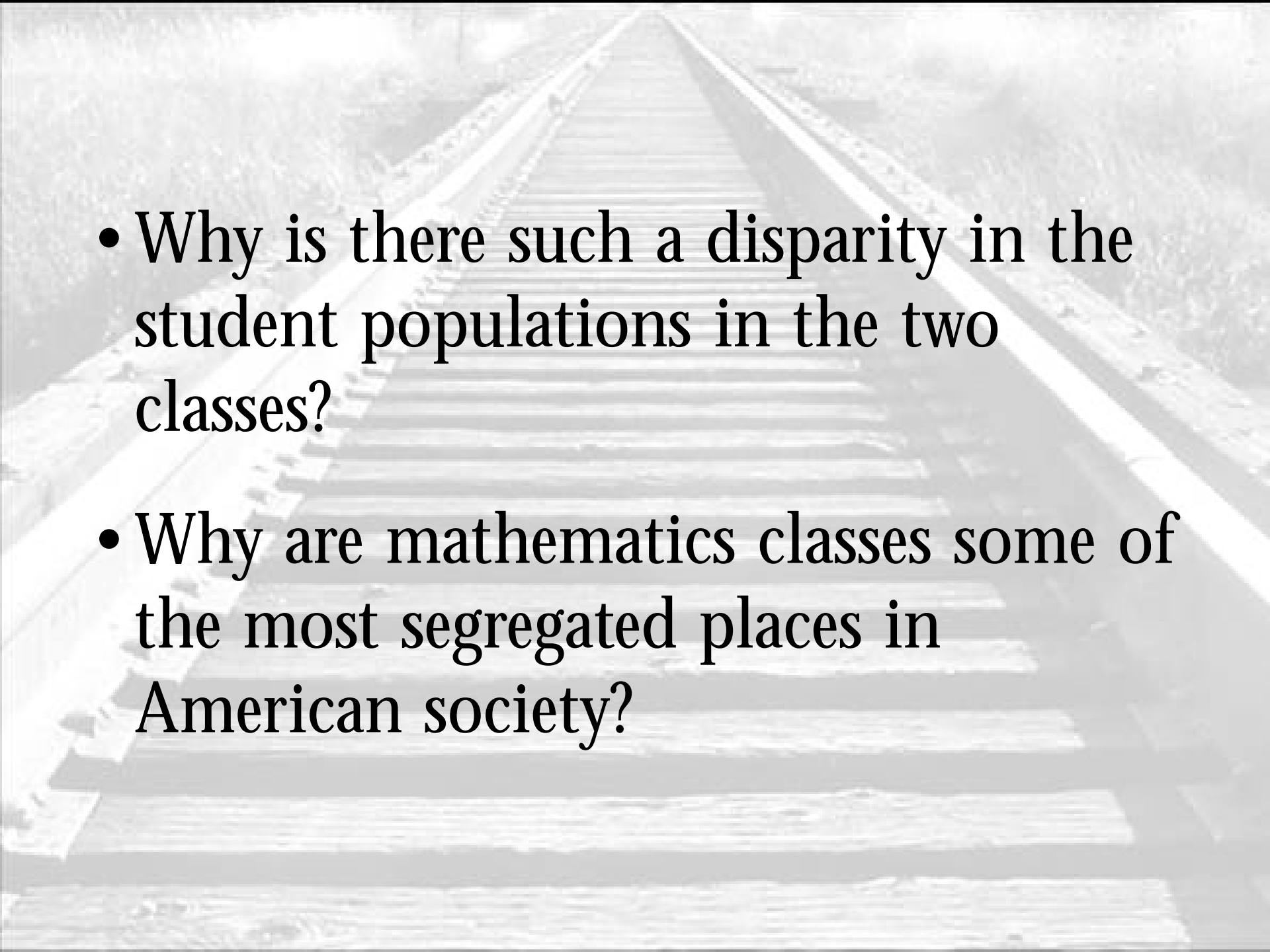
**Who are the students in the class?**



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

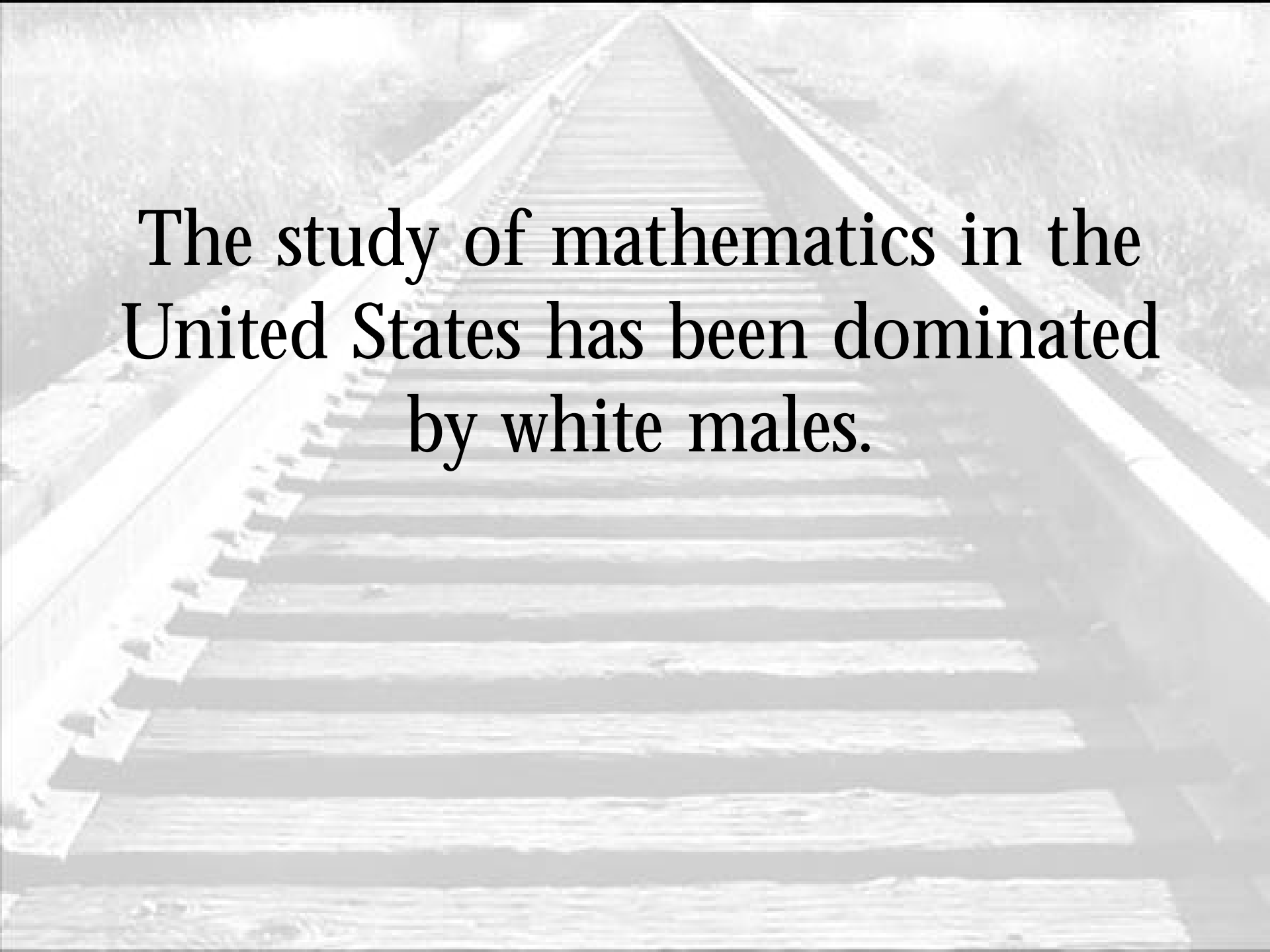
A black and white photograph of a long, straight railway track stretching into the distance. The tracks are made of wooden sleepers and metal rails, converging towards a vanishing point in the center of the frame. The background is a hazy, overcast sky. Overlaid on the center of the image is the text "Who are the students in this class?" in a bold, black, serif font.

**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 2004, 57% of students are Hispanic, 31% are African American, 9% are Anglo, and 3% are 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.

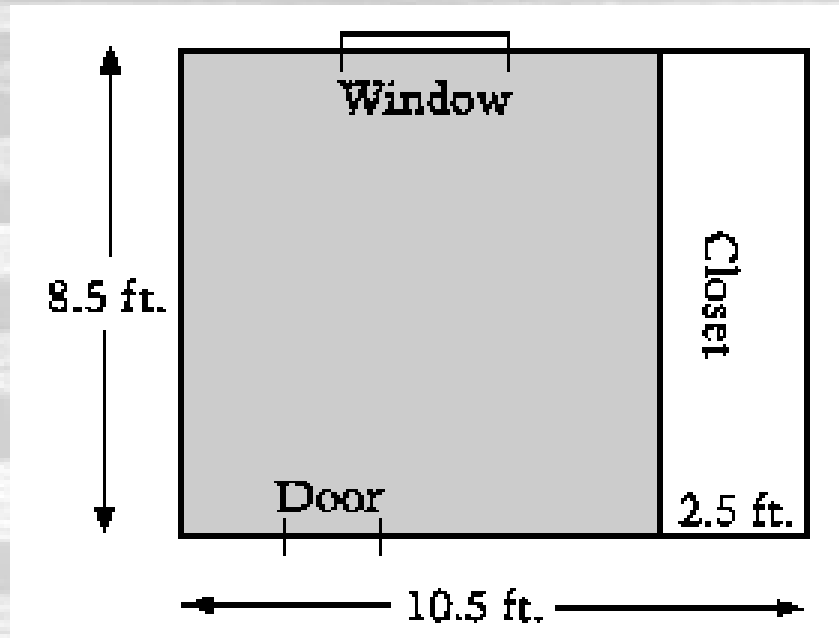
# **NAEP 2000 Math Assessment 12th Graders Scoring “Below Basic”**

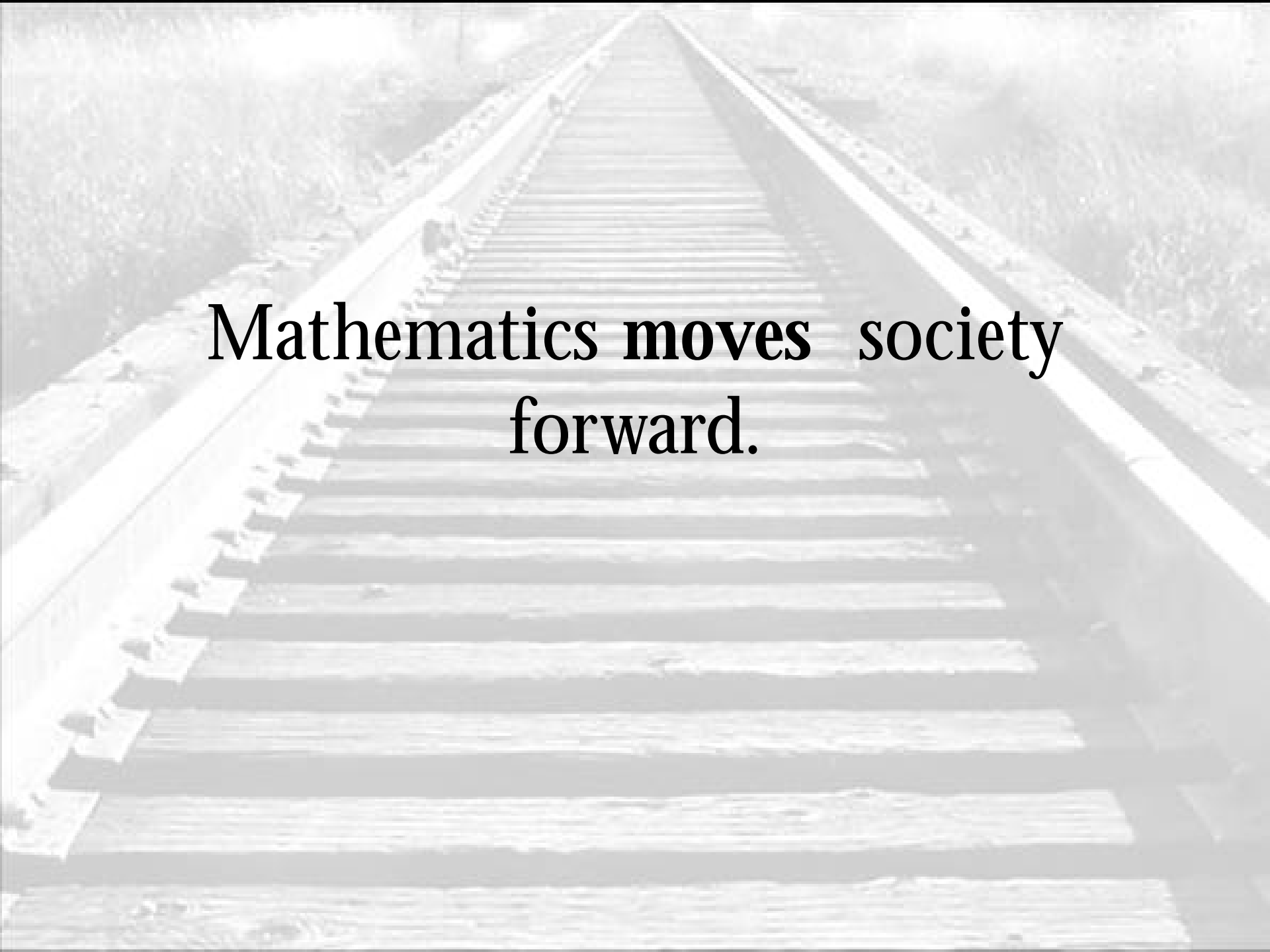
- 35 percent of all students
- 56 percent of Hispanic students
- 69 percent of African-American students
- 60 percent of low-income students
- 23 percent of students with college-educated parents

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

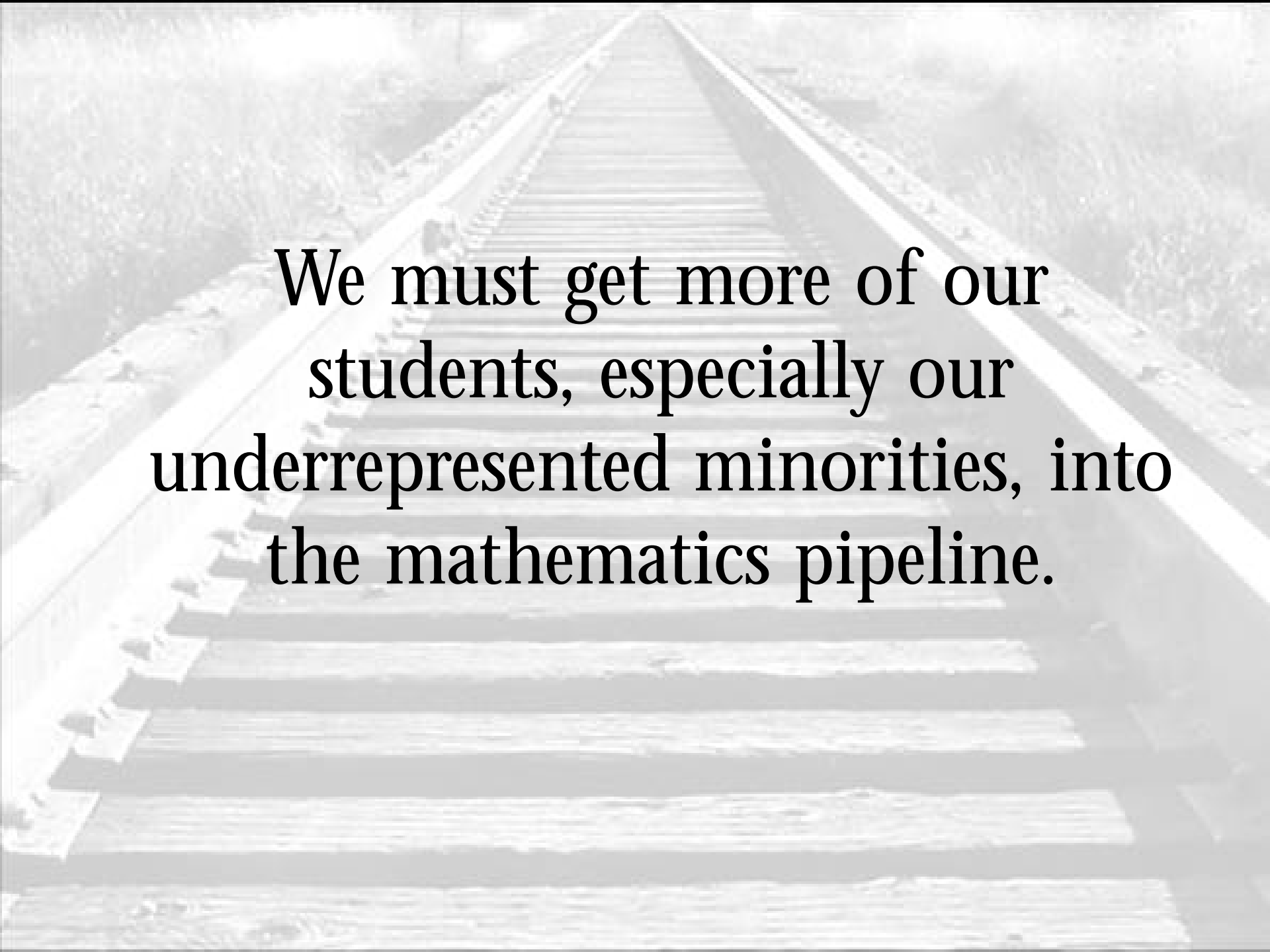
Chris wishes to carpet the rectangular room shown below. To the nearest square yard, how many square yards of carpet are needed to carpet the floor of the room if the closet floor will not be carpeted? (1 sq. yard = 9 sq. feet)



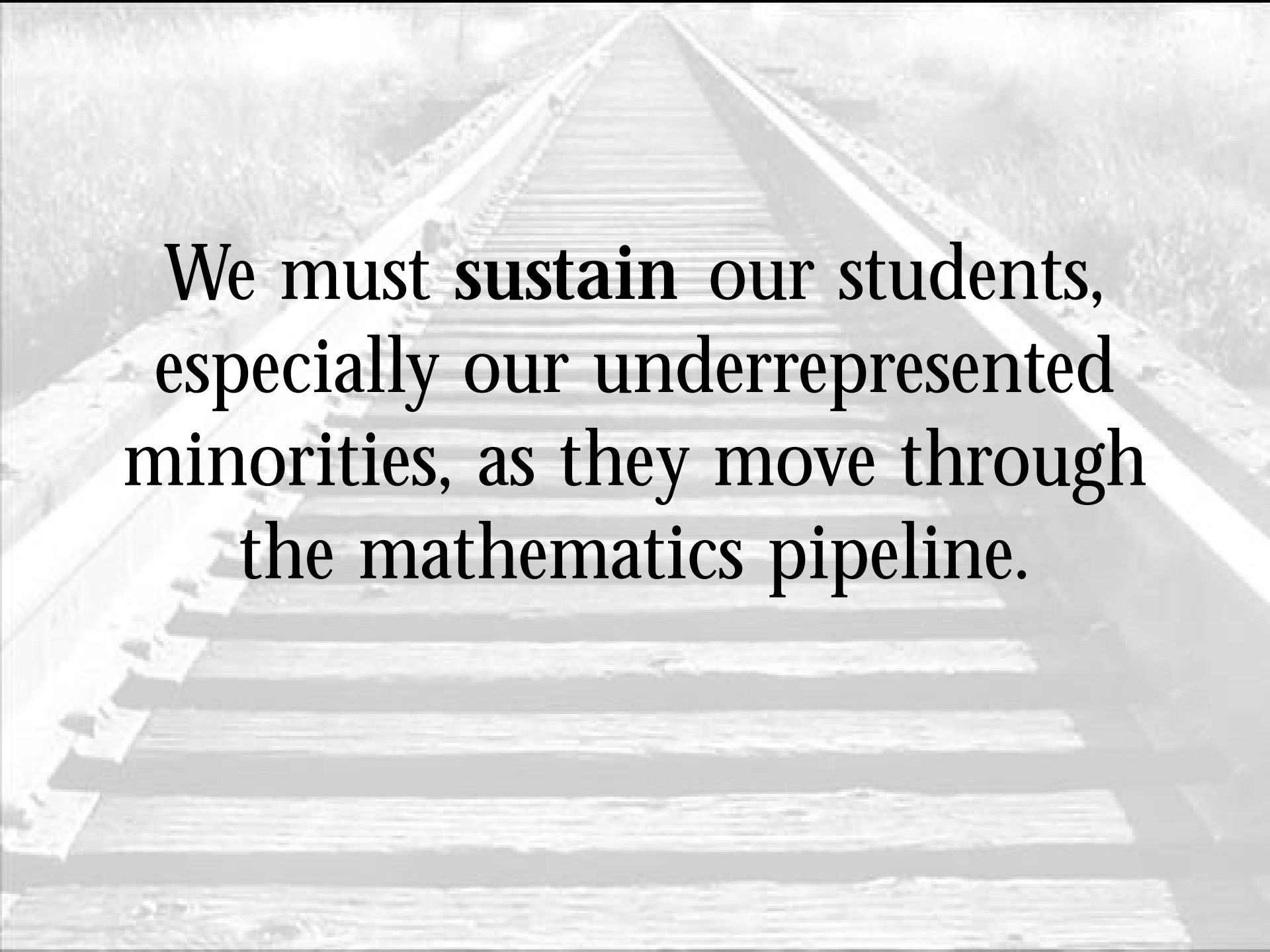


**Mathematics moves society  
forward.**





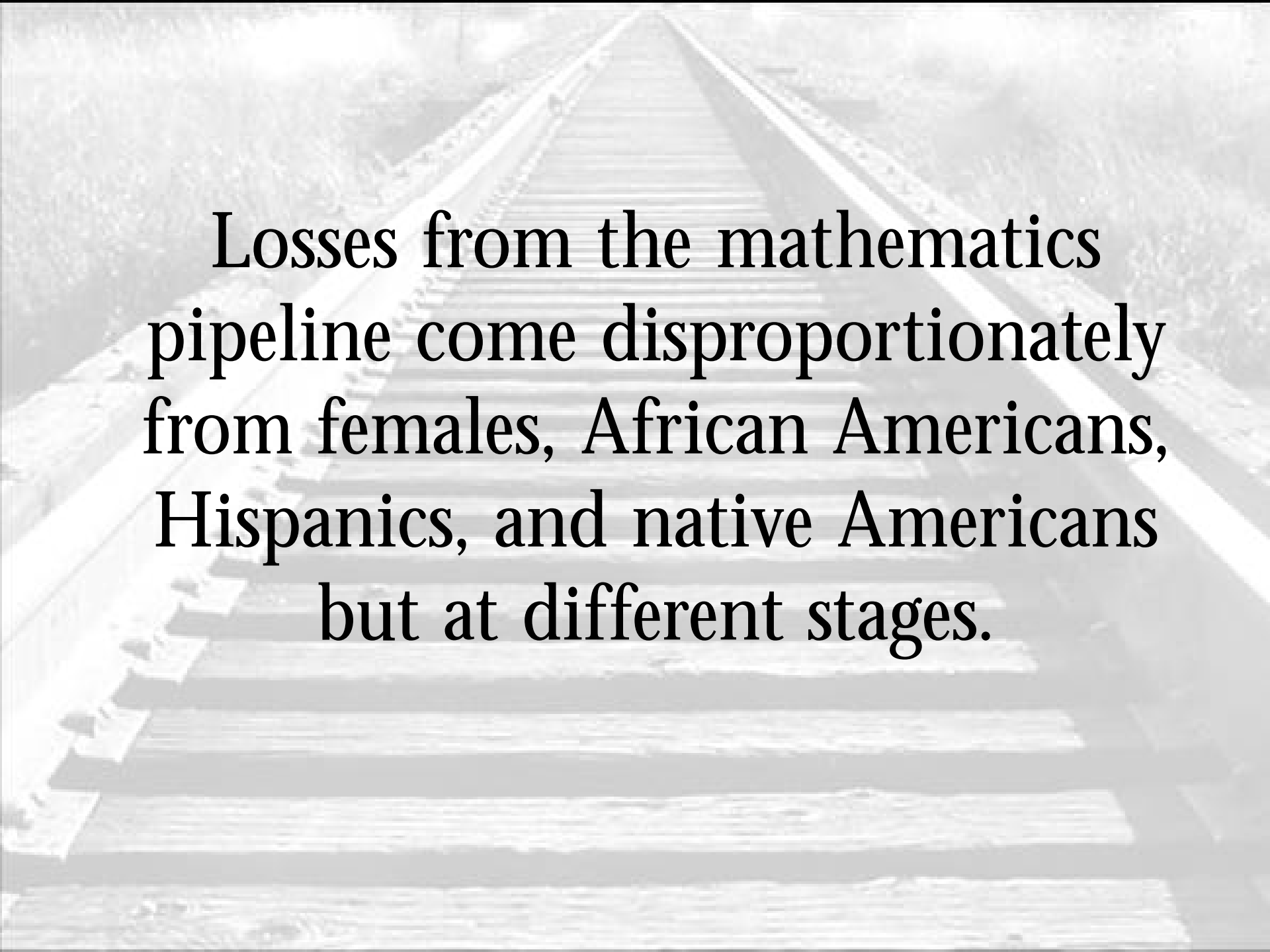
We must get more of our students, especially our underrepresented minorities, into the mathematics pipeline.



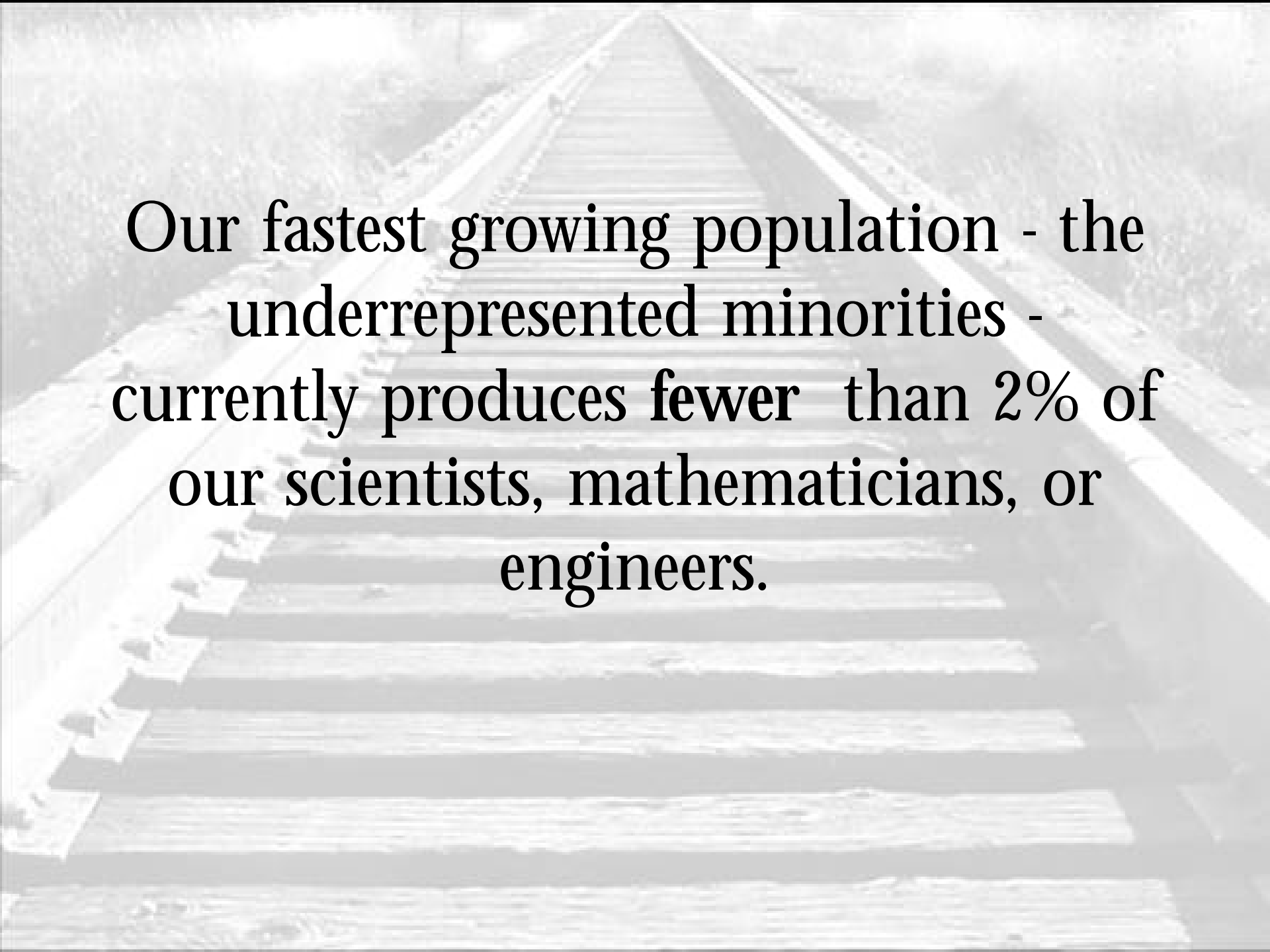
We must **sustain** our students,  
especially our underrepresented  
minorities, as they move through  
the mathematics pipeline.

# The mathematics pipeline has a huge dropout rate.

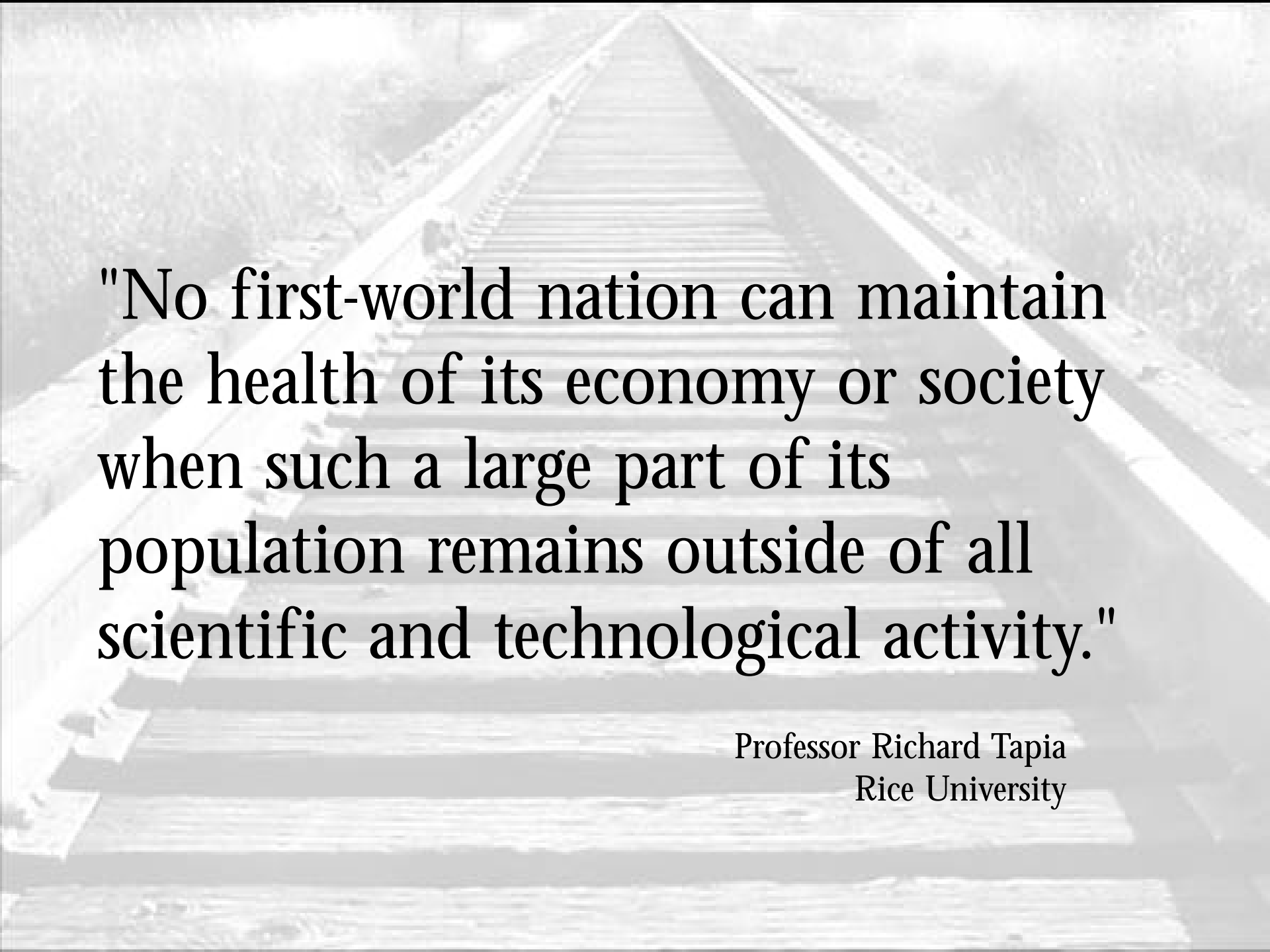
- From 9<sup>th</sup> grade through the Ph. D., the half-life of students is 1 year.
- Beginning with approximately 3.2 million students entering high school, we lose 50% each year until only a few hundred attain the Ph. D.



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

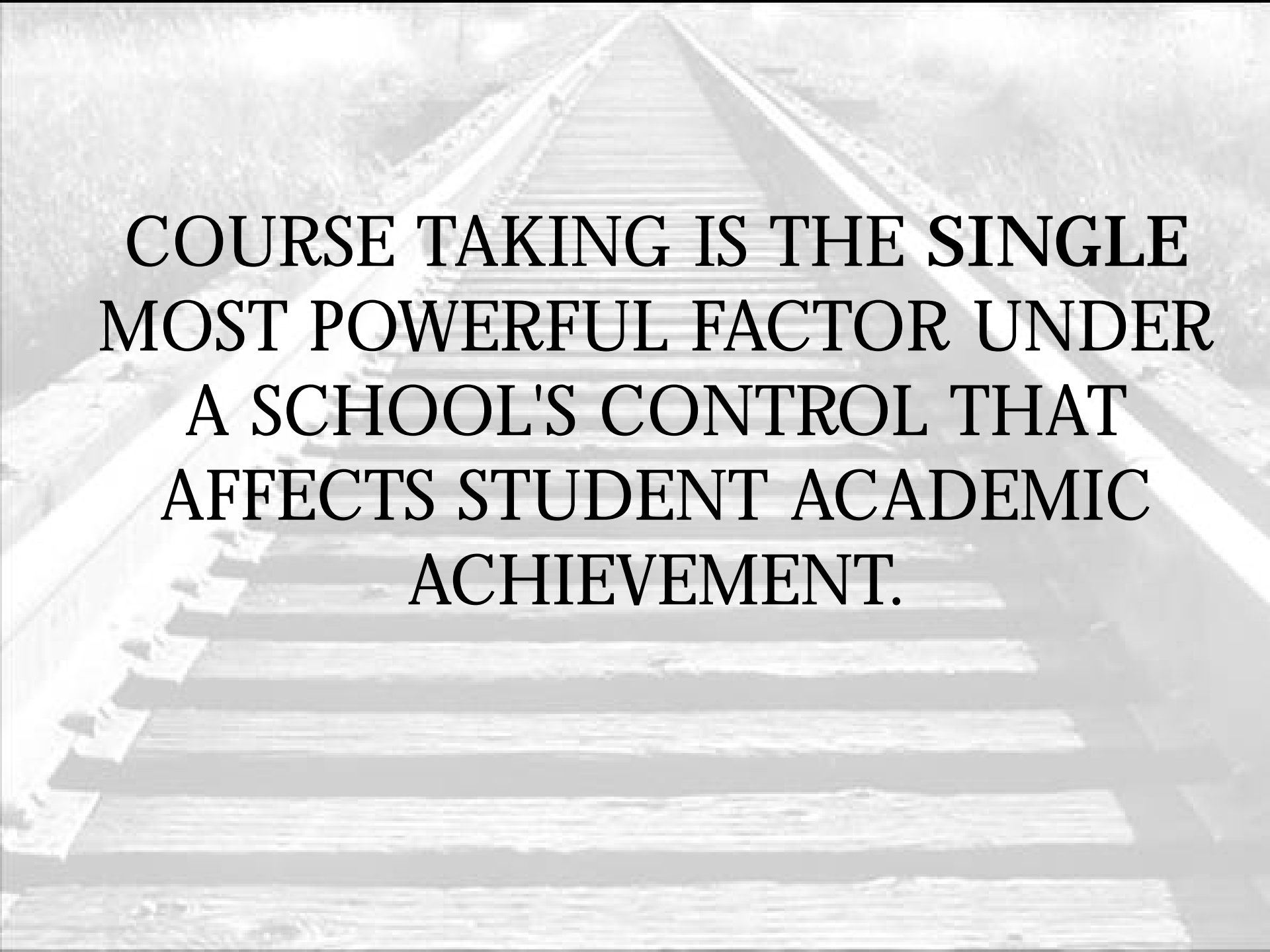
# The World is Changing

- 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.**

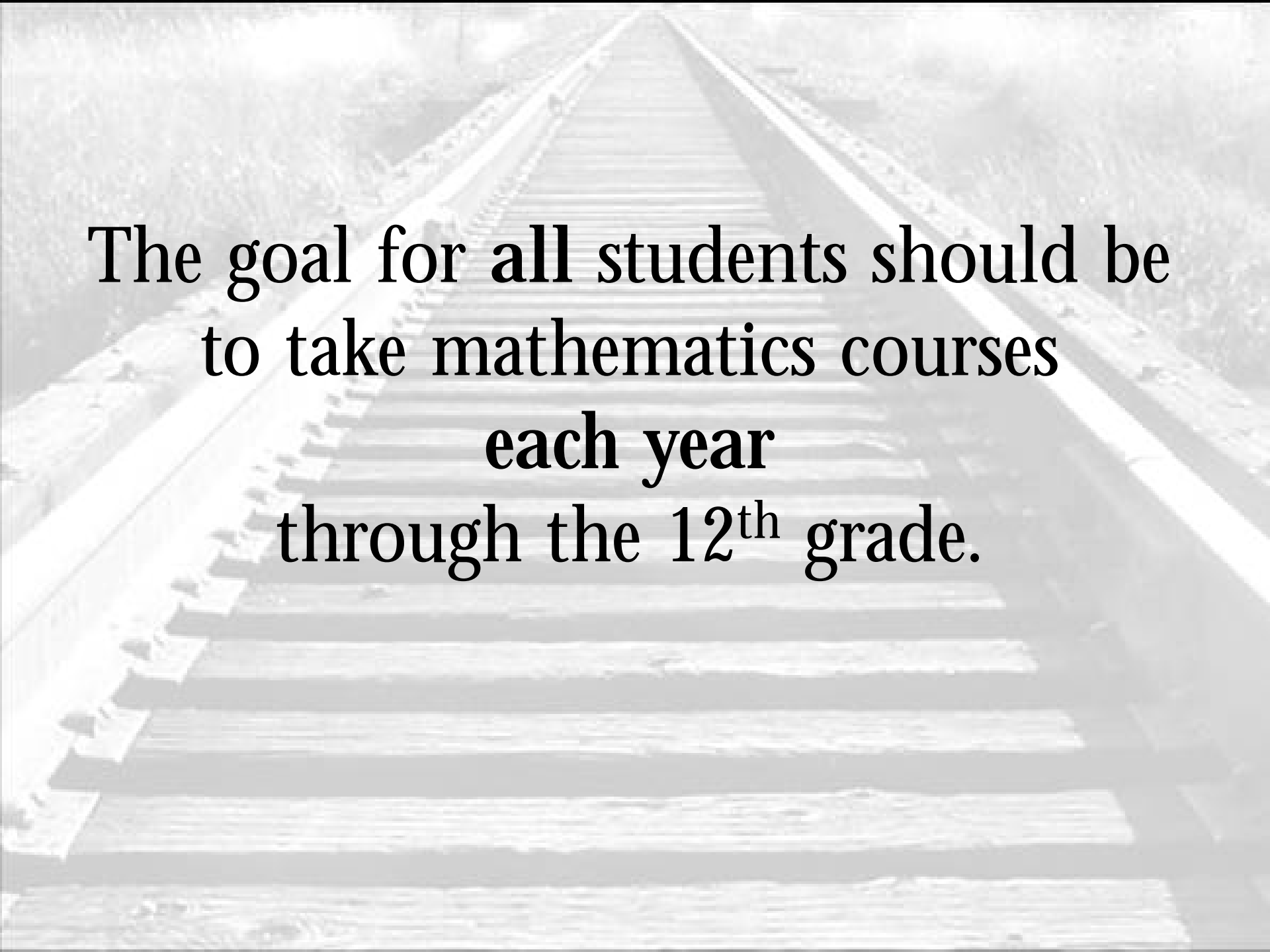




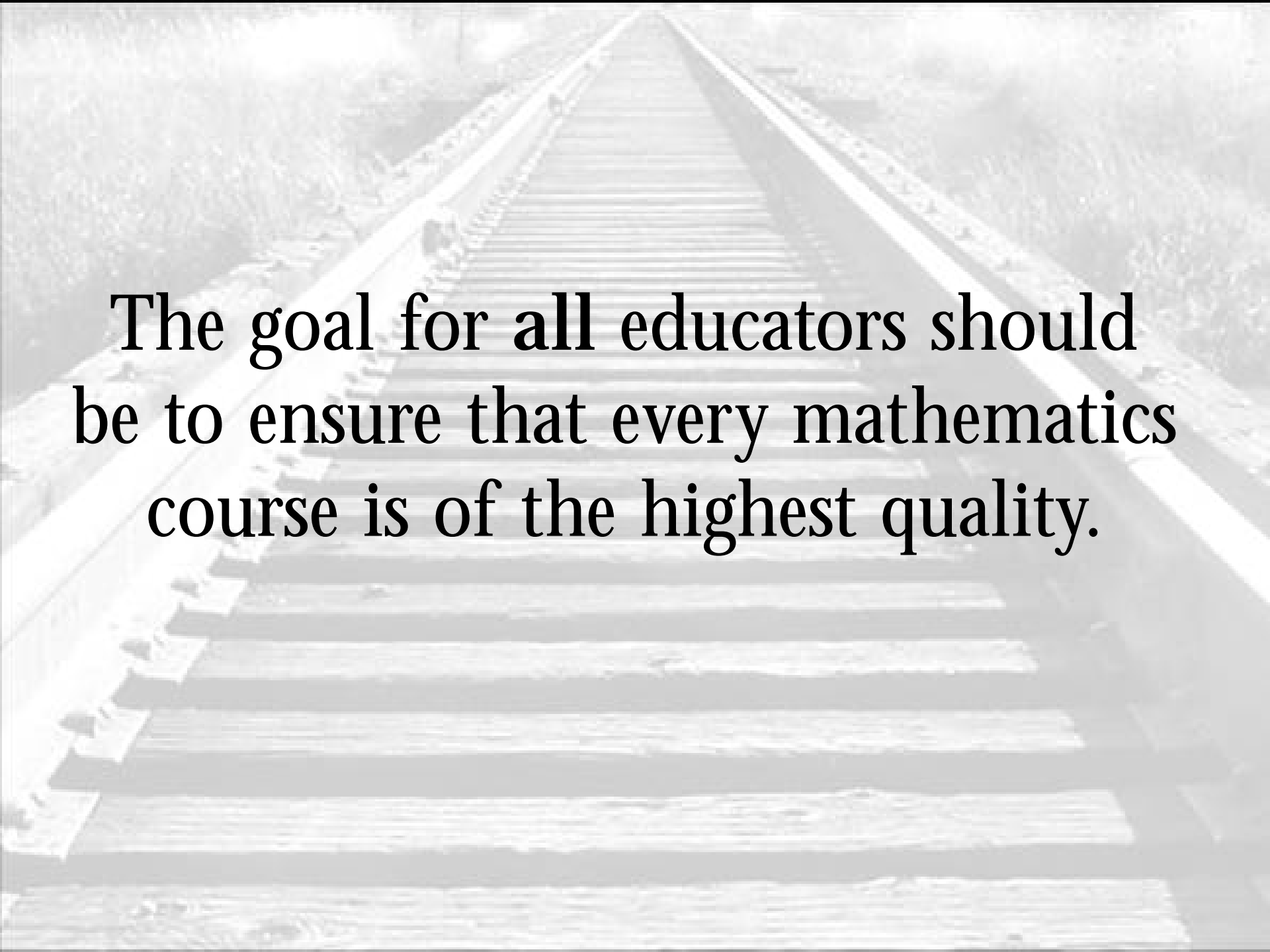
**COURSE TAKING IS THE SINGLE  
MOST POWERFUL FACTOR UNDER  
A SCHOOL'S CONTROL THAT  
AFFECTS STUDENT ACADEMIC  
ACHIEVEMENT.**



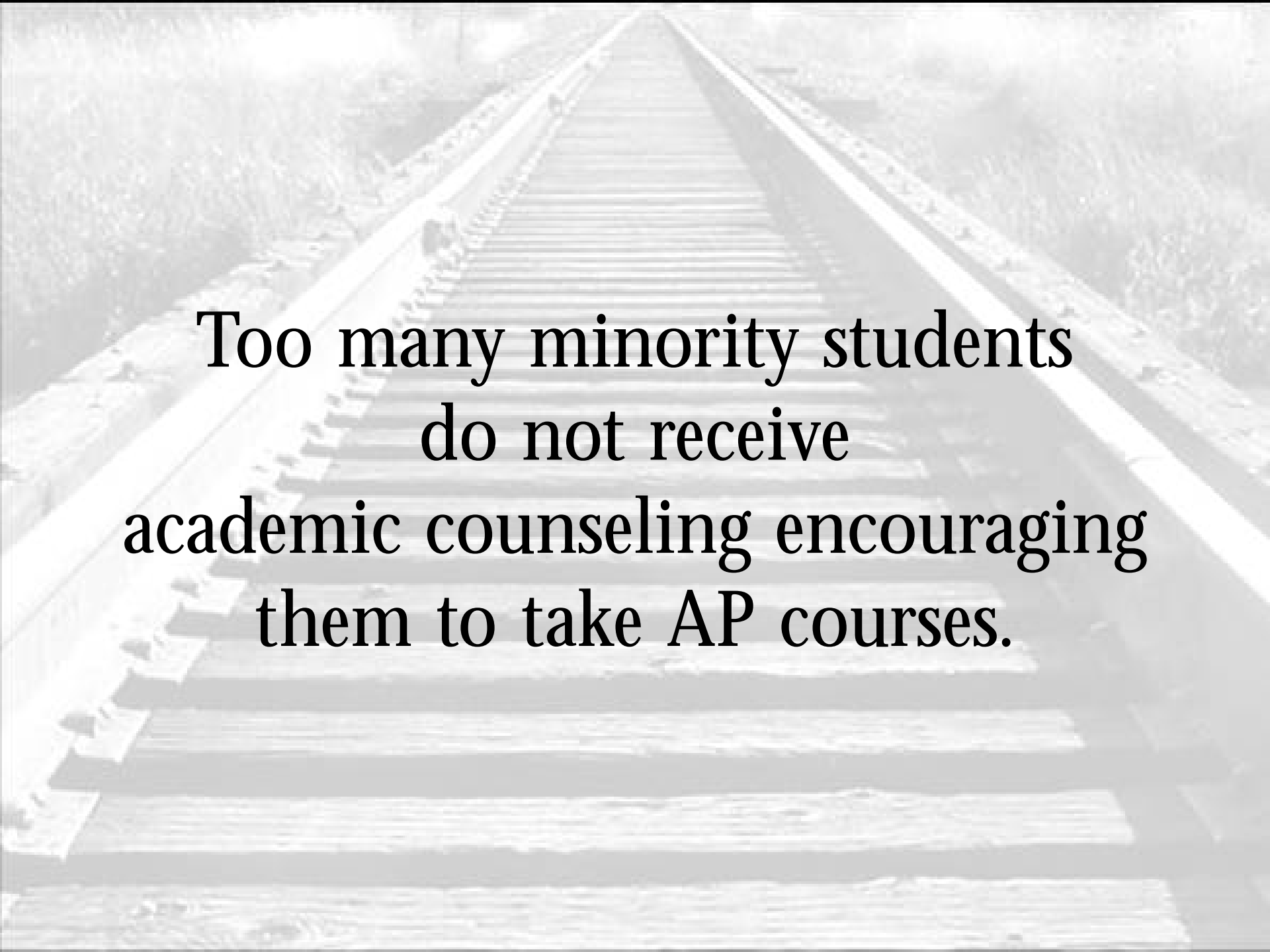
We must demand the  
highest level of  
academic achievement  
of all students.



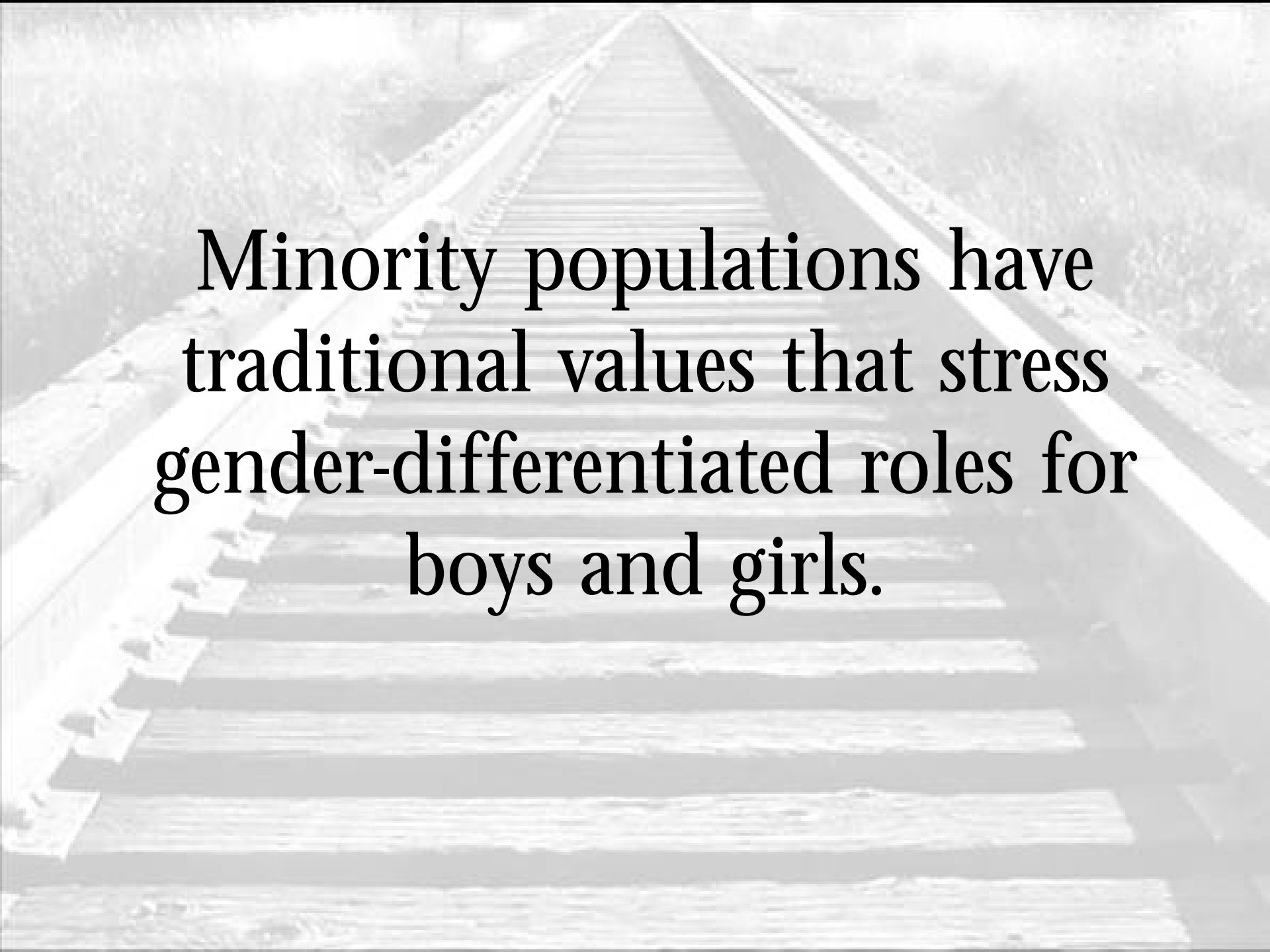
The goal for all students should be  
to take mathematics courses  
**each year**  
through the 12<sup>th</sup> grade.



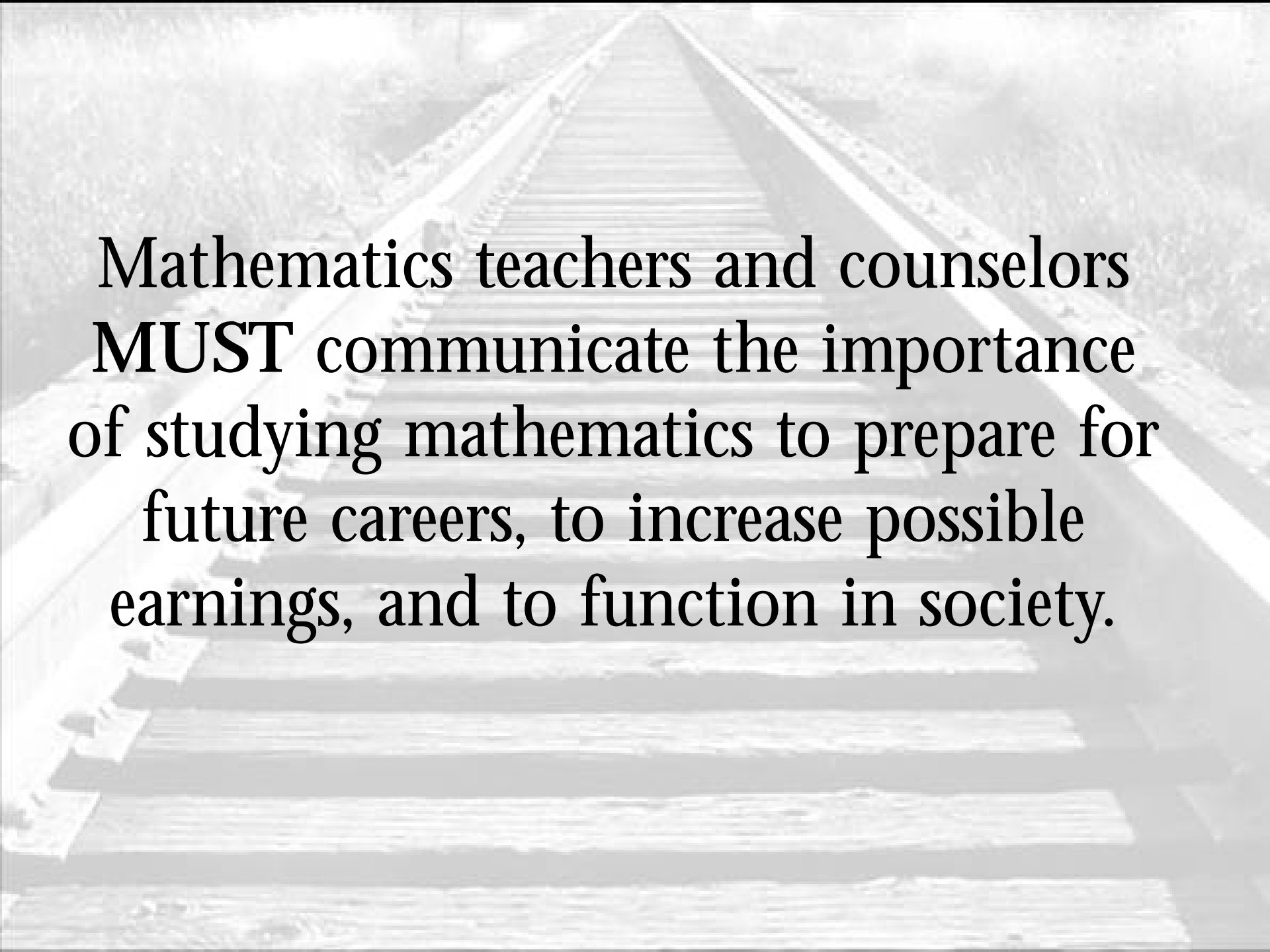
The goal for all educators should be to ensure that every mathematics course is of the highest quality.



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

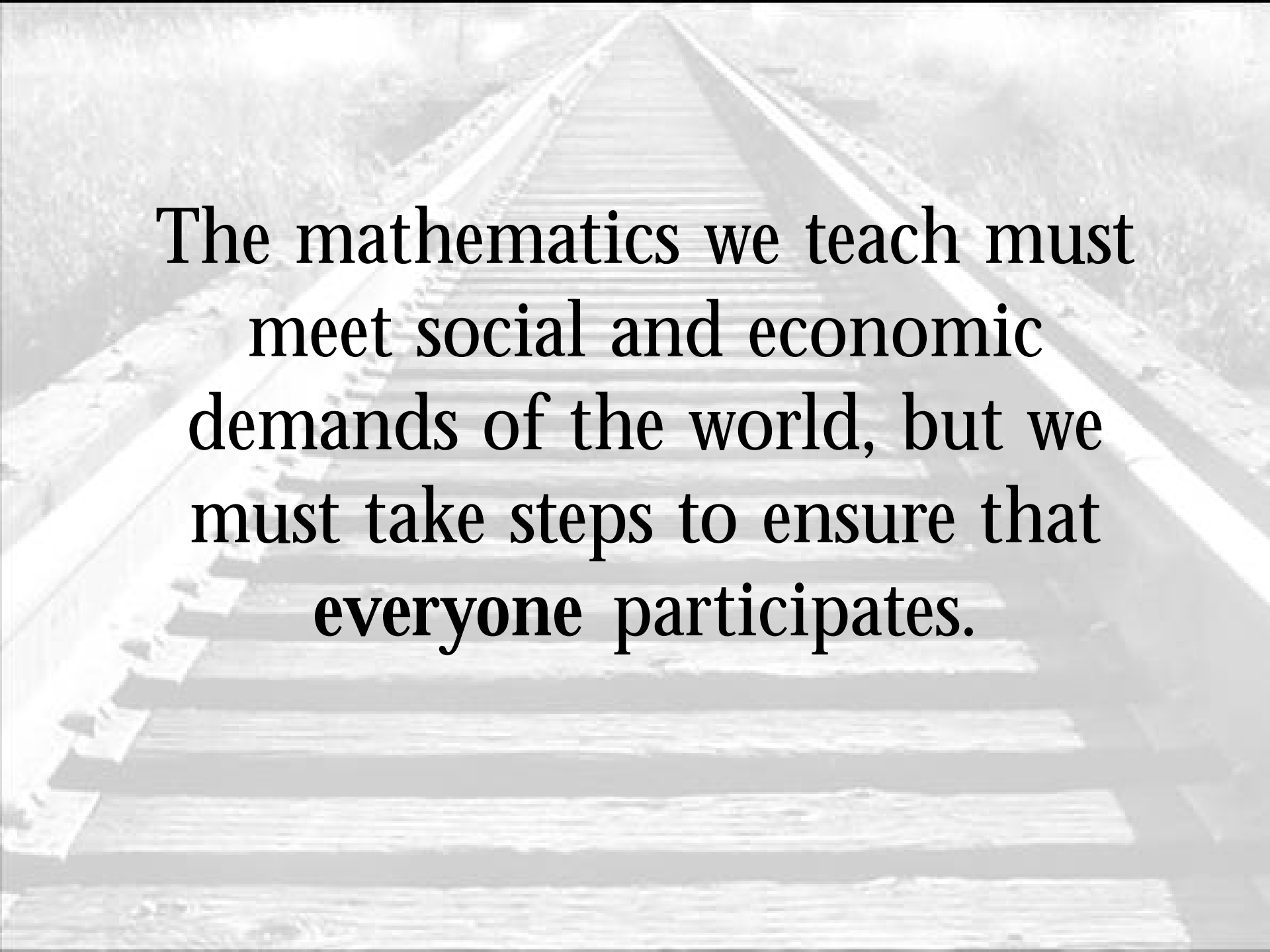
- Pre-AP Algebra I in 8<sup>th</sup> grade
- Pre-AP Geometry in 9<sup>th</sup> grade
- Pre-AP Algebra II in 10<sup>th</sup> grade
- AP Pre-Calculus in 11<sup>th</sup> grade
- AP Calculus in 12<sup>th</sup> grade (AB or BC)
- AP Statistics concurrently with  
Pre-AP Pre-Calculus or with AP Calculus, if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



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