

Diversity & Talent



Factors of Success



Dr. Miriam J. Masullo
IBM T.J. Watson Research Center
National Action Council for Minorities in Engineering

Outline

- About NACME
- Minority Engineering
- Technology Issues
- "Math Is Power"
- What have we learned?
- What can we do?

About NACME: History

- At the end of the Civil Rights period the American engineering workforce was composed of:
 - 98% white males
 - 1% white females
 - 1% all other groups (minorities)
- At that time 60% of all CEO's in the US had engineering degrees
- Through most of this century engineering has been the force behind economic development and wealth creation

About NACME: History (cont.)

- Reginald Jones, CEO of GE led 25 of the nation's CEO's to establish NACME
- Frank Cary, CEO of IBM was one of the founders of NACME
- NACME was founded as a nonprofit organization 25 years ago in conjunction with the National Academy of Engineering and America's leading corporations
- NACME was charged with achieving matriculation and graduation parity among minority and nonminority engineering students

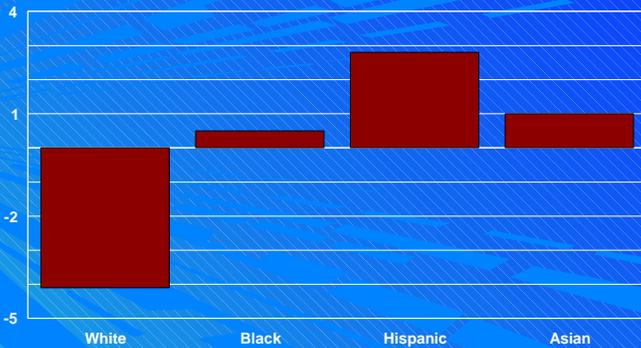
About NACME: Today

- To date - only - \$200M have been spent in the 25 year history of NACME
- The total number of minority graduates has reached a record high, while the nonminority graduation hit a 20 year low of 53,923 in 1999
- NACME has produced 10% of all minority engineering graduates since 1980, contributing more than 7,000 engineers to our workforce
 - Industrial 7.6%
 - Environmental 4.5%
 - Electrical 24.2%
 - Civil 7.6%
 - Computer 15.2%
 - Chemical 19.7%
 - Aerospace 3.0%
 - Mechanical 16.2%

About NACME: However...

- African Americans, Hispanic Americans and American Indians today represent 30% of the college age population, but only three percent of the engineering doctorates awarded annually
- Minorities are the fastest growing segment of the population
- The percentage of minority engineers continues to decline
- Only one out of three of (all) minorities who enrolls in engineering actually completes an engineering degree, compared to two out three of their nonminority peers

Why focus on minorities?



U.S. Census forecast. Demographic shift, 2000-2010

About NACME: While...

- NACME scholars consistently outperform their fellow engineering students academically and maintain a retention rate of 92%
- Our K-12 education system remains ineffective
- We increased national reliance on foreign talent
- Efforts must be directed at:
 - equity access to educational opportunity
 - nontraditional identification of talent
 - rather than at acquiring foreign talent

NACME

The National Action Council for Minorities in Engineering

- **Mission:** to increase access to careers in engineering and science-based disciplines
- **Methodology:** partner with companies, government agencies, schools and universities
- **Measure of success:** parity
- **NACME must now make IT an equalizer**

Minority Engineering

- **Workforce Representation**
 - 1/4 of the total workforce
 - 5.9% of the engineering workforce
 - 25% down the path to parity
- **Representation in Academia**
 - 30% of the student population
 - 3% of doctoral
 - 10% of undergraduate
 - 33% of the way to parity
- **Minority women are the most underrepresented group in America**
 - 1.7% of doctoral
 - 2.8% undergraduate

Barriers and Solutions

- | | |
|-------------------------------------|---------------------------------|
| ■ Lack of awareness at policy level | ■ Research and Public Policy |
| ■ Poor k-12 preparation | ■ Precollege programs; Vanguard |
| ■ Low teacher expectations | ■ Diversity awareness training |
| ■ Dearth of materials | ■ Publications |
| ■ Financial aid | ■ Scholarships |

\$200m Investment yielded publication reach of 100m+, development of 40+ precollege programs, more than 7,000 engineering graduates

End-to-End Mentoring

- | | |
|---|--|
| <ul style="list-style-type: none"> ■ Precollege <ul style="list-style-type: none"> - systemic reform - paradigm shift - demonstration models - national advocacy - NACME's Vanguard | <ul style="list-style-type: none"> ■ University <ul style="list-style-type: none"> - comprehensive scholarship programs - institutional reform - leadership development - career development - NACME's CSP |
| <ul style="list-style-type: none"> ■ Workplace <ul style="list-style-type: none"> - alumni development - volunteer corps - recognition awards - NACME's CSP | |

End-to-End Mentoring

- 1996: President's Medal for Excellence in Science, Mathematics and Engineering Mentoring
 - 1998: US Department of Labor's EPIC Award for Exemplary Public Interest Contribution
- ▶ Partnerships
 - ▶ Research
 - ▶ Public Policy Initiatives
 - ▶ Information Dissemination

Technology Issues

- Computer Proficiency Digital Divide: the technologies that we are using are not intuitive
- Knowledge Workers: knowledge needs to be updated to keep up with changing technologies
- Racial Gulfs: a Commerce Department study conducted last summer concluded that income alone does not explain disparities in computer use
- e-education Revolution: corporate universities and the extreme competitiveness of the job market threaten to make training a substitute for education

Standard Solutions

- Ensure that every student is computer literate by 8th grade
 - What is the definition of "literate" in "somebody's" 8th grade?
 - What happens after 8th grade?
- Internet access for all schools and libraries
 - The majority of Internet users are severely computer illiterate
- Technology training for teachers
 - Teachers who are online feel disconnected
 - Only 20% of new teachers feel prepared to include technology into classroom instruction
 - Teaching is not a technology-based (IT) job
- Inclusion of computers in school curriculum
 - What will the impact be on academic performance?
 - Persistent lack of assessment data on the effectiveness of use of technology threatens to reduce inclusion in curriculum

Standard Solutions (cont.)

- Focus on the creation of computer centers in less fortunate communities (but instead we have...)
 - EduCommerce?
 - HDTV & ITV (same stuff in pure digital perfection?)
- Focus on potential rather than achievement
 - Foster appropriate data collection of learning styles and cognitive behaviors that highly correlate with success
 - Build suitable warehouses for alternative assessment based on identified key data
 - Harness this key data to identify talent using special tools

Albert Einstein said that the problem with the world is that all the people who created the problems are the same ones who are trying to fix them.



The power to contribute to society...

NACME issue of the IBM Journal of Research and Development

Call 1-800-97NACME

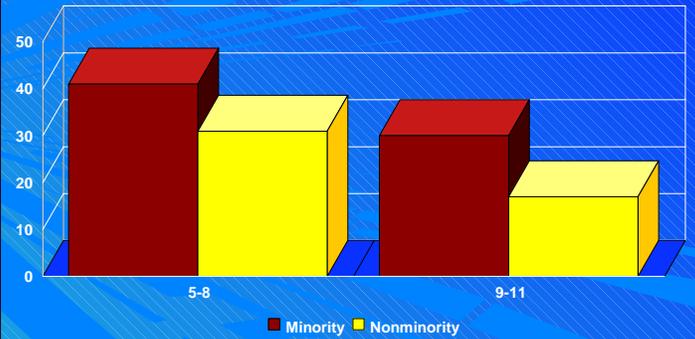
Why "Math is Power"

- Completing Algebra II doubles chances of earning college degree
- By 2005, almost half of all workers will be employed in IT-driven industries
- Fastest growing occupations require math literacy
- Ten occupations with highest earnings are math and science-based
- Mathematics is the underpinning of physics, chemistry, engineering and computer science

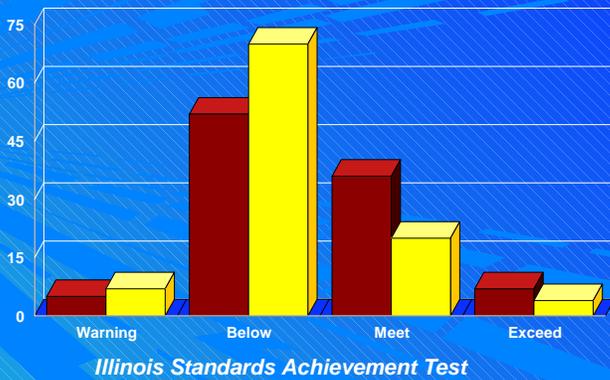
Performance of American Students in Mathematics

- Only 12 percent of American students complete high school having taken four years of mathematics and science
- Only six percent of minorities (an increasing portion of the population) complete four years of math and science
- American students ranked 28th out of 41 countries in mathematics (TIMSS)
- 25% decline among US students in engineering

"Math is my favorite subject"



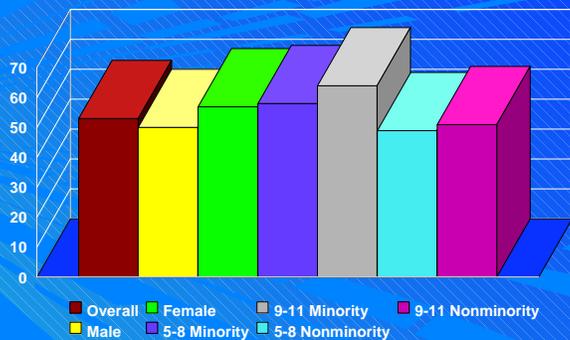
Math performance of eighth graders



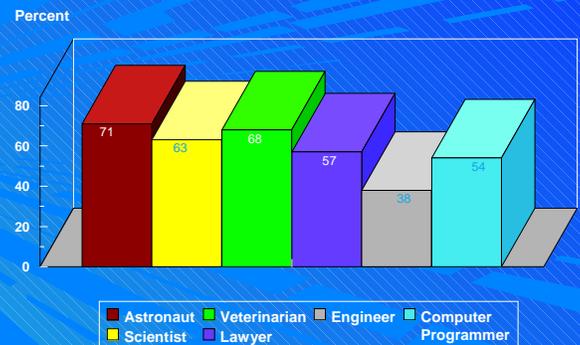
Math performance of tenth graders



"I Will Only Take Math as Long as I Have To"

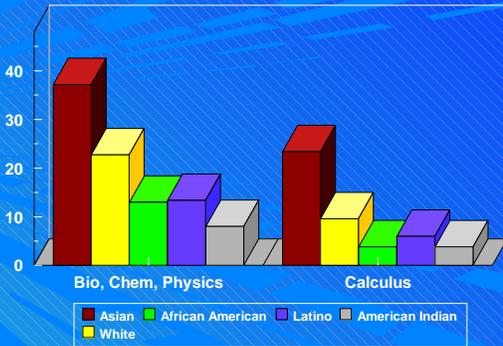


Career Interests Students Planning to Drop Math

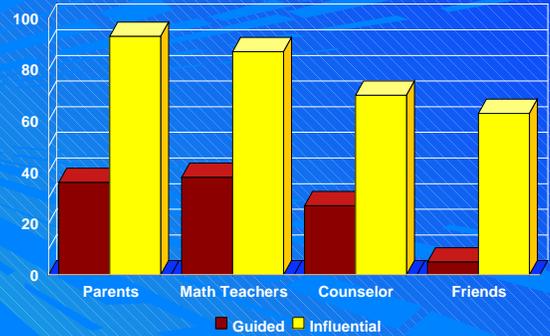


HS Course Completion

Percent of High School Graduates



Who guided course decisions?

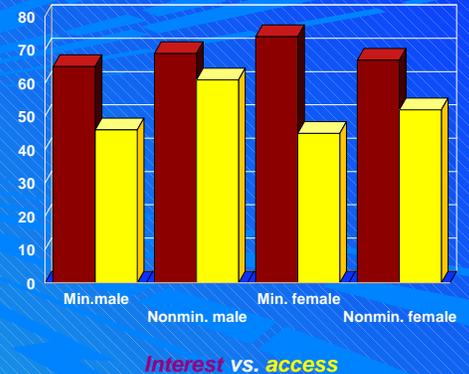


Summative Evaluation Harris Interactive, Topline Results

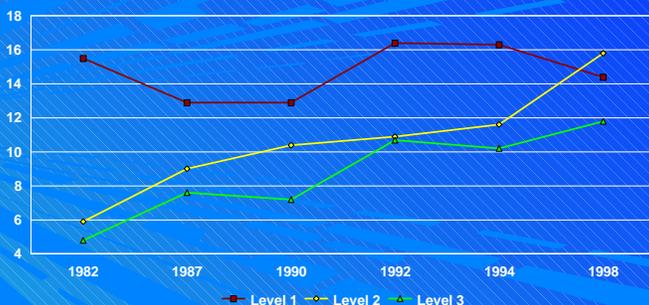
- More than 50 percent of students recognize phrase "Math Is Power"
- Positive correlations between campaign awareness, attitudes and choices
- Good News: Upward shift in younger minority students' attitudes towards math
- Bad News: Upward shift in number of older minority students planning to drop math
- Increased need: Larger numbers of students are interested in AP math and science, lack access or are uninformed about options

Math Is Power: Phase II

- Once students know what courses they need to take, they need to demand access to those courses



High School Math Course-Taking 1982-1998



Source: National Center for Education Statistics, U.S. Department of Education

What can we learn from all this...

- Basic research in education technology is needed
 - It cannot be based on solving the problems of today, but on foreseeing the future - including the future of technology - and how it could impact education
 - It cannot be dependent on funding proposals, but on direct appropriations for specific goals
 - It cannot be driven by what can be sold or what can be done, but by what is needed
- There's a need for a doctoral program in educational technology leadership
- What can you do?