

Reducing Stereotype Threat

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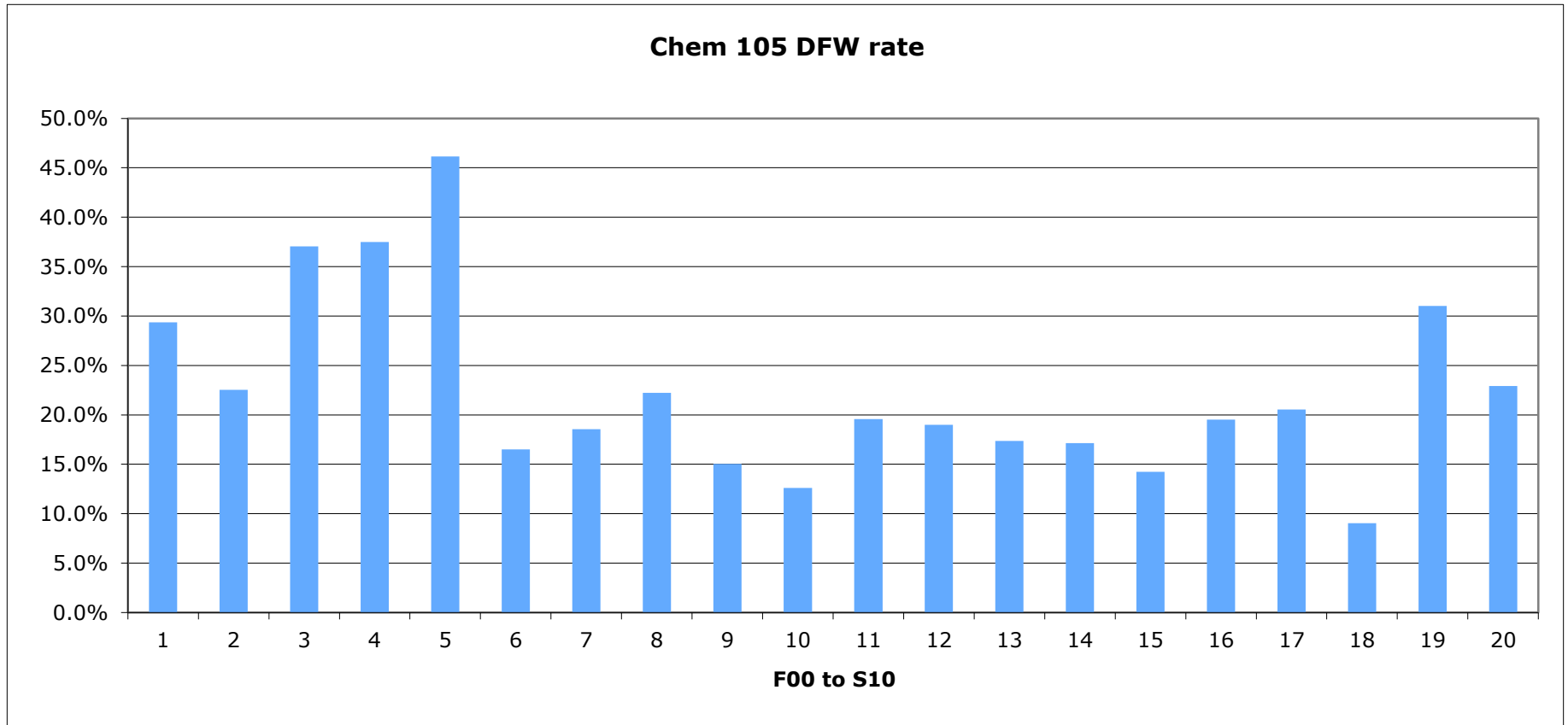
US Chemistry Graduates: Representation of Women

Year	Bachelor's	Master's	Doctorate
1984	35.3%	32.3%	19.9%
1989	39.7	37.3	28.1
1994	42.3	42.2	31.4
1999	45.2	43.0	30.5
2004	50.9	47.0	33.1
2009	49.9	46.5	38.9

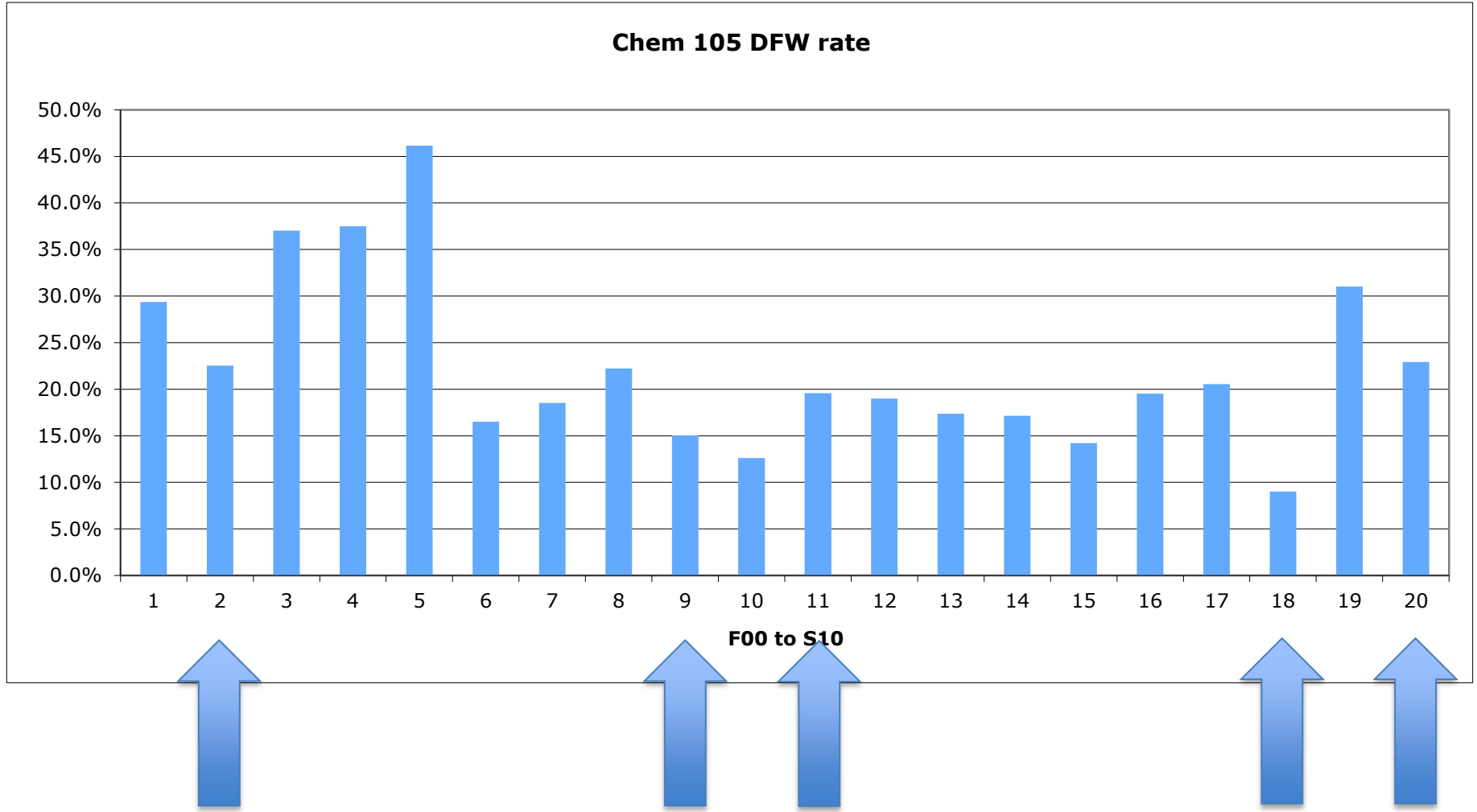
Share of degrees received by women 2008

Major	Bachelor's	Master's	Ph.D.
All	57%	64%	60%
Science/engineering	50	46	40
Biology	60	59	50
Physical sciences	41	36	27
Geosciences	41	45	36
Math & Stats	44	43	31
Engineering	19	23	21
Computer science	18	27	22

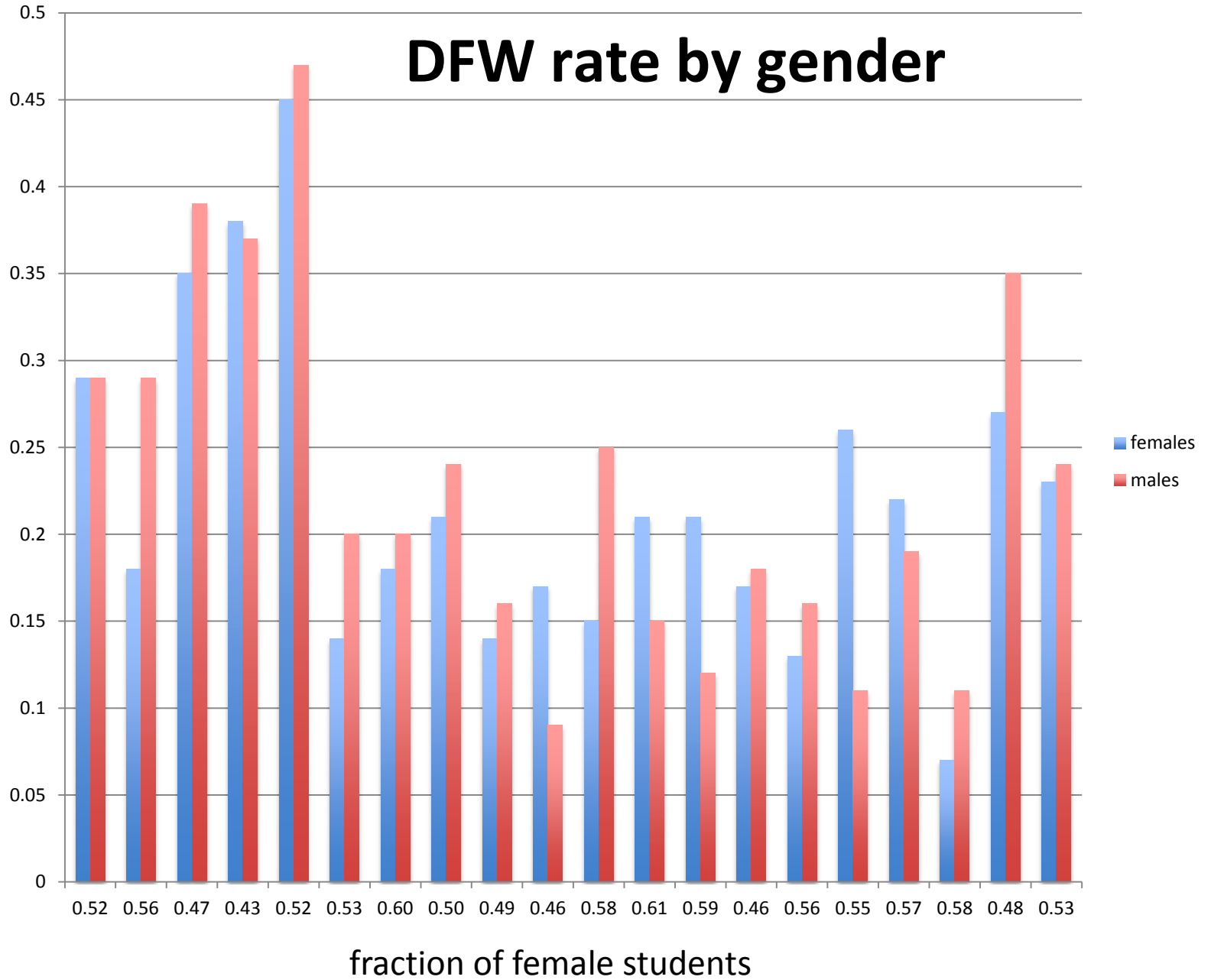
Where are we losing majors?



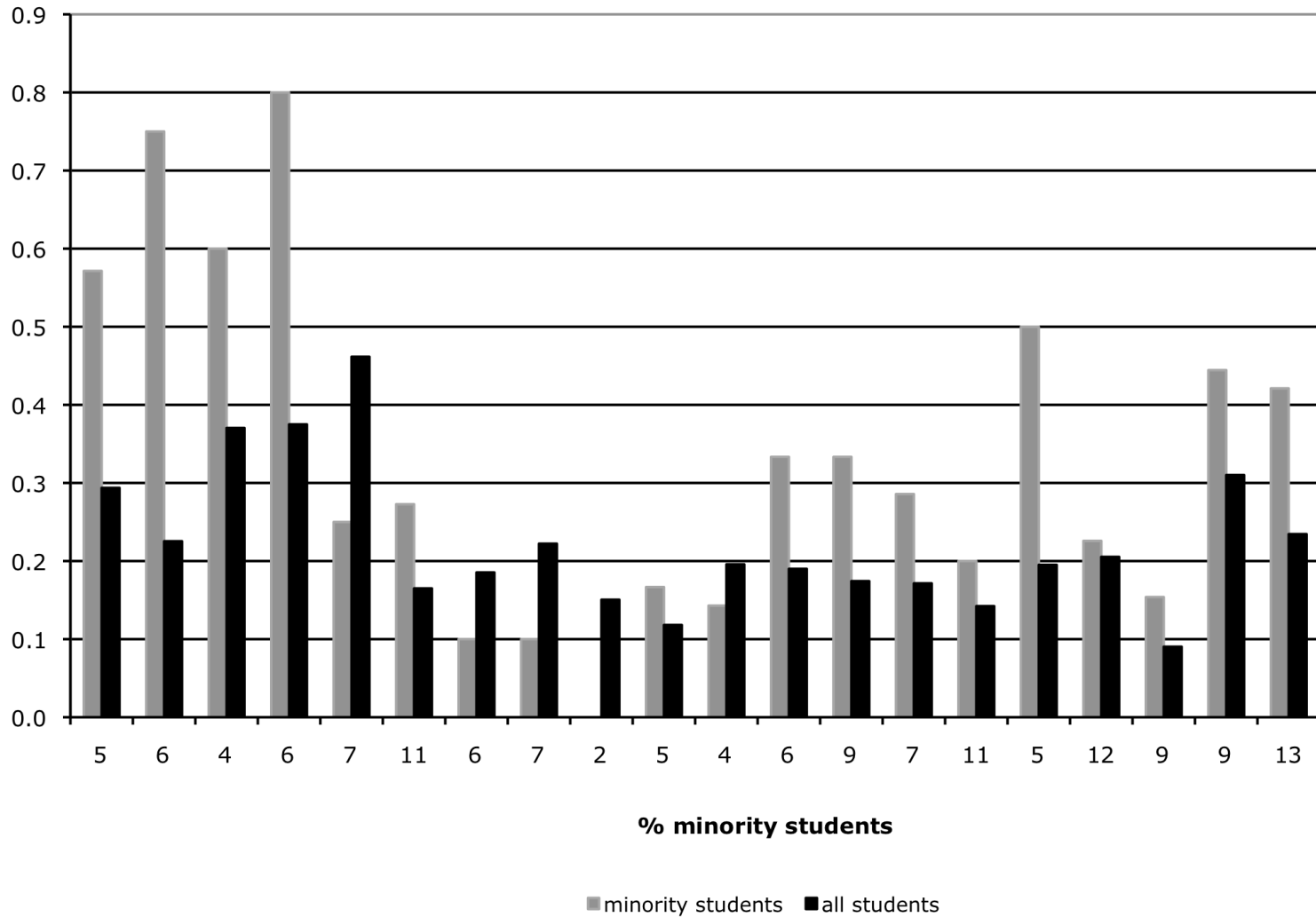
Instructional methods can make a difference



DFW rate by gender



Chem 105 DFW rates



DFW rates are higher for students of color

In both academe and the workforce, those fields look the least like America, with much smaller proportions of women, African Americans, Native Americans, and Latinos. Although the overall student population has become more diverse, at the undergraduate level members of these minority groups are underrepresented among all STEM majors, with women underrepresented in many STEM fields. At the graduate level, there is an additional problem: a declining percentage of U.S. citizens. In many departments of physics, computer science, and engineering, it is difficult to find a graduate student who is a U.S. citizen. Across the STEM fields, the situation for faculty members is even more dire.

Daryl E. Chubin and Shirley M. Malcom, “Making a Case for Diversity in STEM Fields” *MentorNet News*

WHY DO THEY LEAVE?

Seymour & Hewitt, *Talking About Leaving*
1994 study at seven different institutions

We find no support for the hypothesis that switchers and non-switchers can be sufficiently distinguished, in terms of high school preparation, performance scores, or effort expended, in order to explain why one group leaves and the other group stays.

We have found a high level of agreement across our whole student sample about the issues which lead to defection by switchers, and dissatisfaction among non-switchers ... we hypothesize that a far greater contribution to SME attrition is made by problems which arise from the structure of the educational experience, and the culture of the discipline (as objectified in the attitudes and practices of SME faculty) than by problems of personal inadequacy, aptitude for other disciplines, or the appeal of other majors.

Concerns expressed by students

#1 Poor teaching

Faculty seen as unapproachable

Grading designed to fail a fraction of students

Grading encourages competition, not collaboration

Difficult threshold concepts block progress;

 downward spiral in confidence, attendance

TA's have too much responsibility for teaching

Over-packed curricula lengthen time, cost of degree

 (just weeding out students?)

Rewards of SME careers not worth effort and cost

Students switched from SME major because:

1. Loss of interest in science
2. Other majors offer better education, more interesting
3. Poor teaching by SME faculty
4. Curriculum overloaded, pace overwhelming
5. Career options/rewards not worth effort
6. Rejection of SME careers/lifestyles
7. More appealing non-SME career option
8. Inadequate advising or help with problems
9. Discouraged by low grades in early years
10. Financial problems

Why are women and minority students more likely to switch than white male students?

Stereotype Threat

- Concept developed by psychologist Claude Steele and colleagues
- People who are members of a group about which negative stereotypes exist fear confirming it with poor performance
- Greater effect on more conscientious students

examples of stereotypes

- Girls can't do math
- Asian-Americans are math and science whizzes
- *Mythbusters*: women are better multitaskers
- *White Men Can't Jump*
- older people have poor memories

inducing stereotype threat

5-7 year old Asian American girls were given math tests with different pre-test activities

- color picture of girl with doll

or

- color landscape or picture of Asian children eating rice with chopsticks

Physical Effects of Stereotype Threat

In an exam situation scientists can measure changes

- working memory reduced
- coordination decreased (reversed writing)
- higher blood pressure
- reduced blood flow to math regions of brain, increased to social & emotional processing

What can be done to overcome stereotype threat?

- exam introductions in experiments had effects
 - on this standardized test women do as well as men
 - this is a test of problem solving strategies, not intellectual ability

Get students together

- Observation: Dedicated minority students struggle alone in calculus, keep trying harder
- Group problem-solving: take care of arithmetic and algebra errors, focus on new concepts
- Mixed-race discussion groups: all students have to adjust to college
- Upperclass models report on early frustrations until they found useful resources for success

Discussing Diversity

- Colorblindness not comforting to isolated students of color
 - instead demonstrate value placed on diversity
- Majority students may feel uncomfortable when discussing sensitive race-related issues
 - tell that discussion is learning opportunity
 - what didn't work: saying would not be judged, differences in perspective are valued