

Effects of Informal and Formal Support Groups on Retaining Women and Minorities in U. S. Physics

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The Project SEED Initiative

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Research Questions

- How do social environments of science and engineering departments affect undergraduates' performance, interests, and participation in their fields?
- What factors encourage young minority females to stay in physics?

Outline of Talk

- National Landscape
- Theoretical Framework
- Methods
- Findings and Analysis
- Recommendations

Why Care about Retaining Women of Color in Physics?

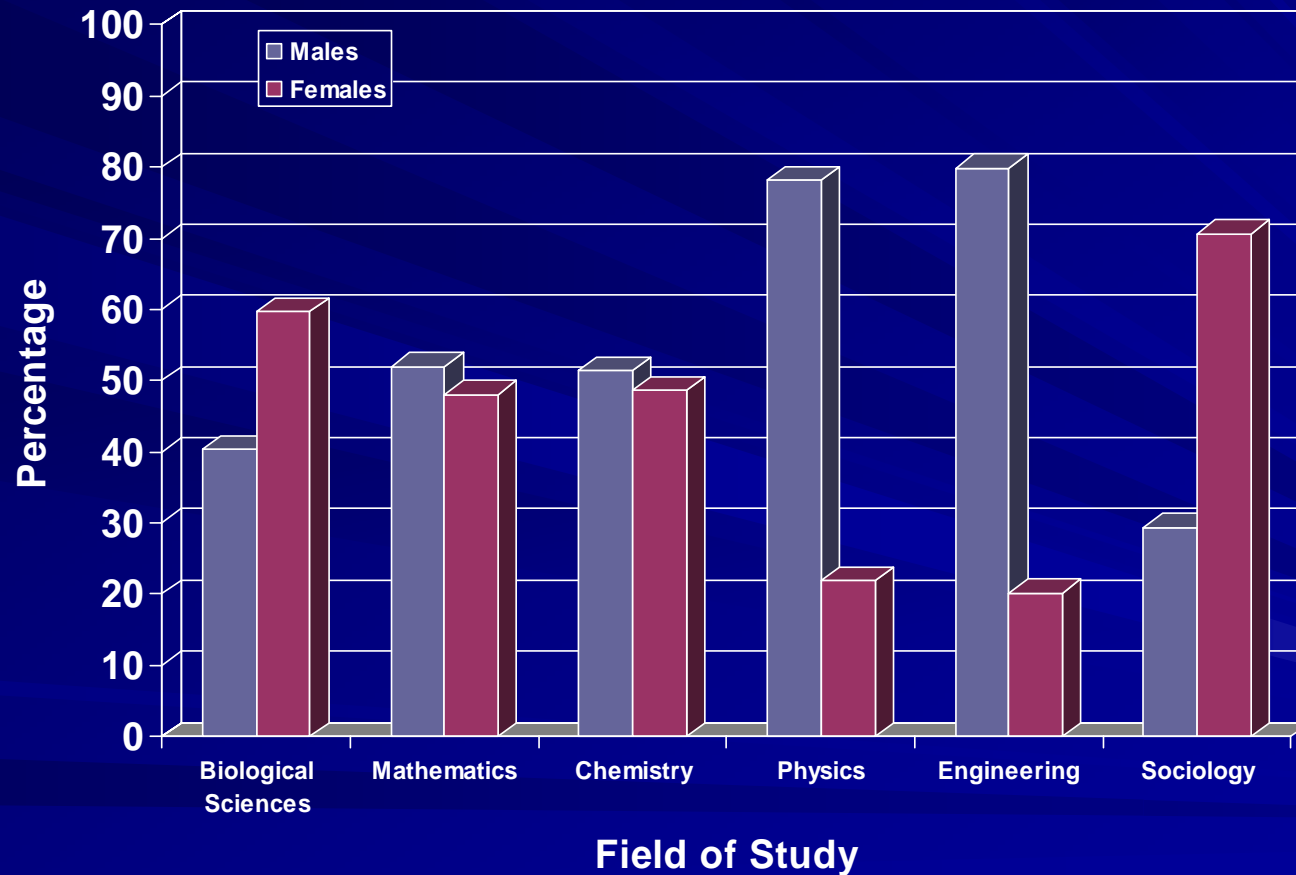


“By 2015, the [U.S.] undergraduate population will have grown by 2.6 million, with more than 2 million of those students being people of color. By 2010, more women than men will earn degrees at each stage of higher education... By contrast, the traditional STEM workforce is still nearly 82 percent white and 75 percent male. Clearly, there is a large demographic disparity between the scientific and technological workforce of the present, and the general college-educated population of the future.”

-- Shirley Anne Jackson, Ph.D.,
RPI President & Physicist,

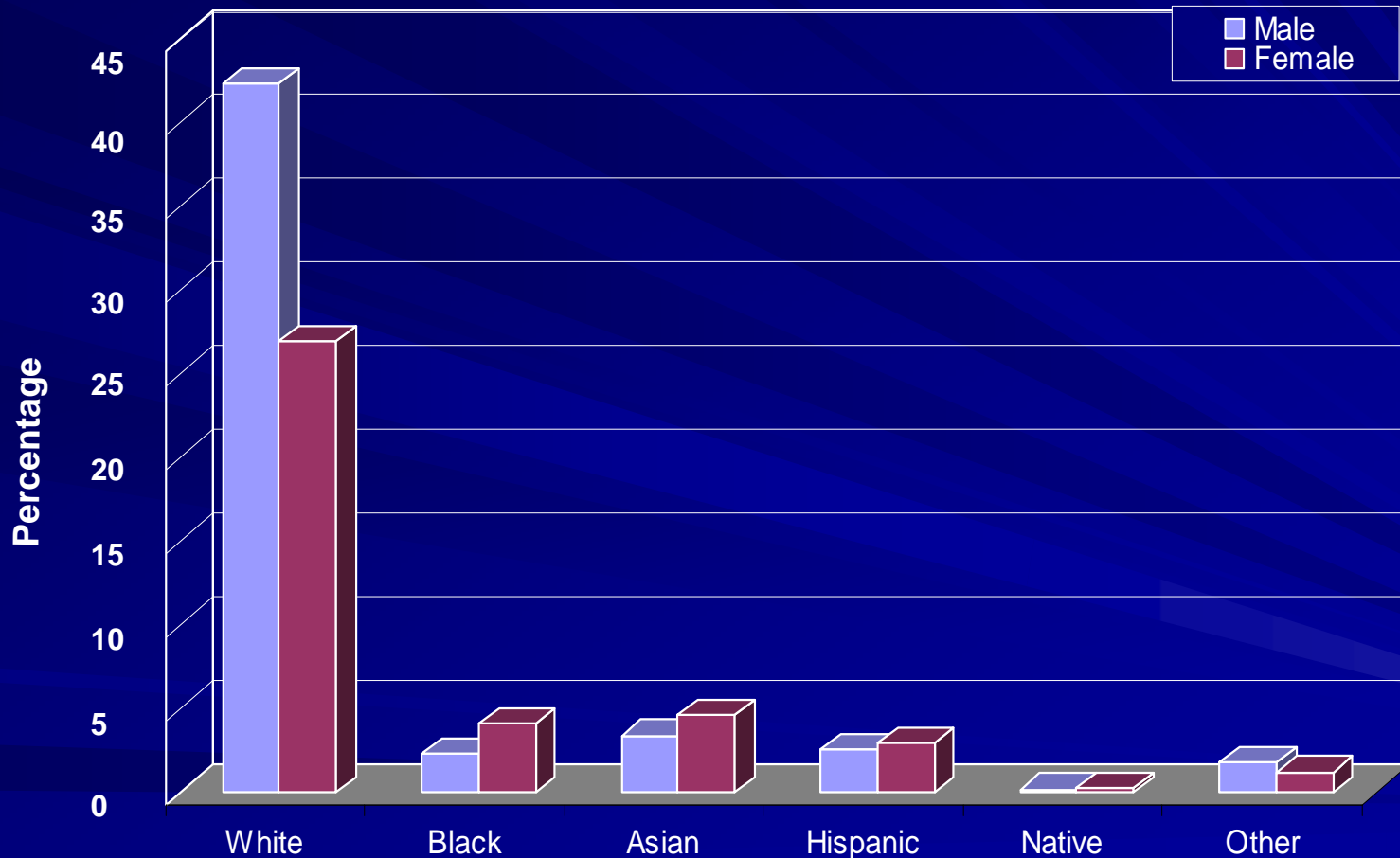
“Leadership to Sustain Our National Capacity for Innovation.” Address to the John F. Kennedy School of Government, Center for Public Leadership, Harvard University. Cambridge, MA.

Bachelor's Degrees Awarded by Field and Gender (2001)



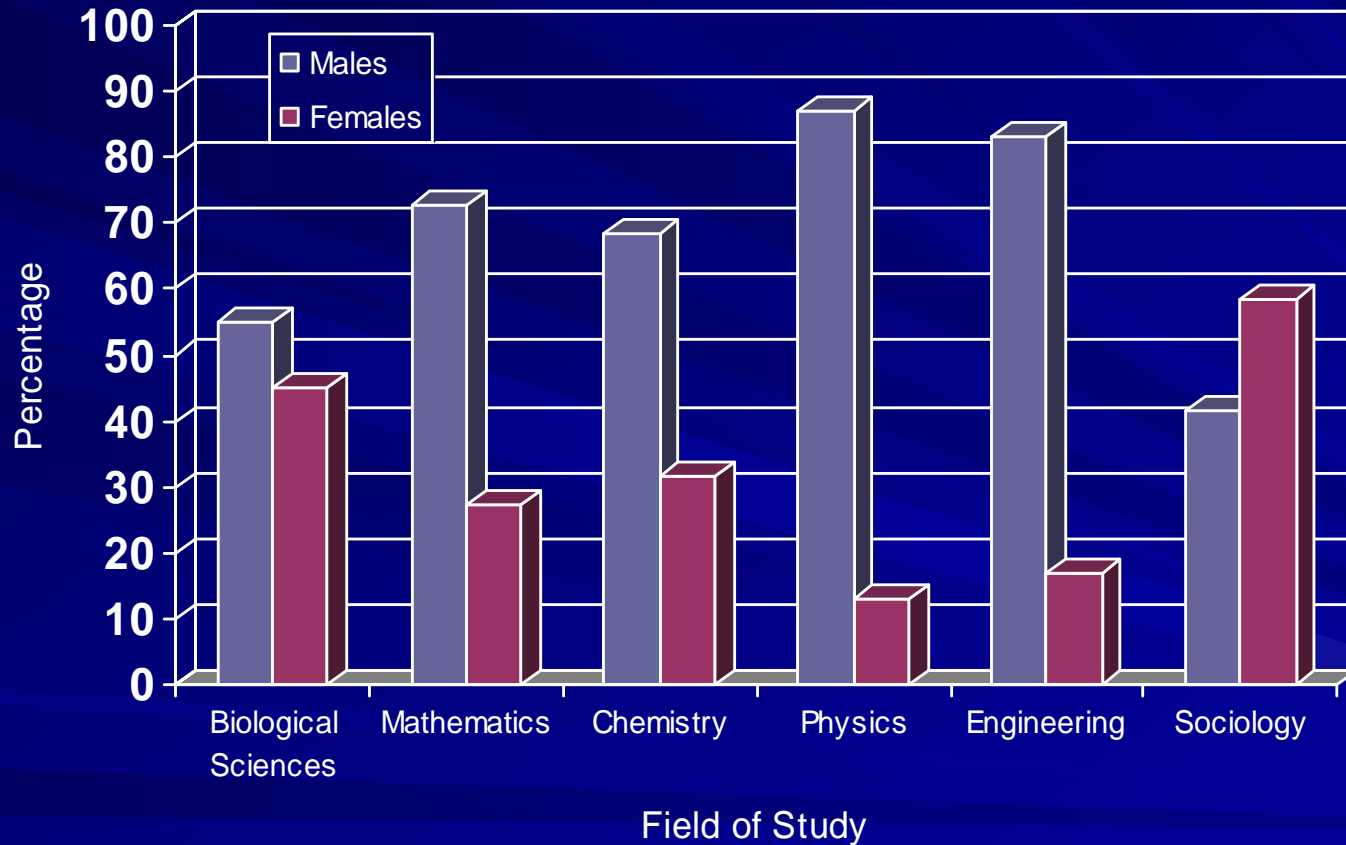
NSF (2004). *Women, minorities, and persons with disabilities in science and engineering: 2004*. NSF 04-317.

Bachelor's Degrees Awarded in Physical Sciences (2001)



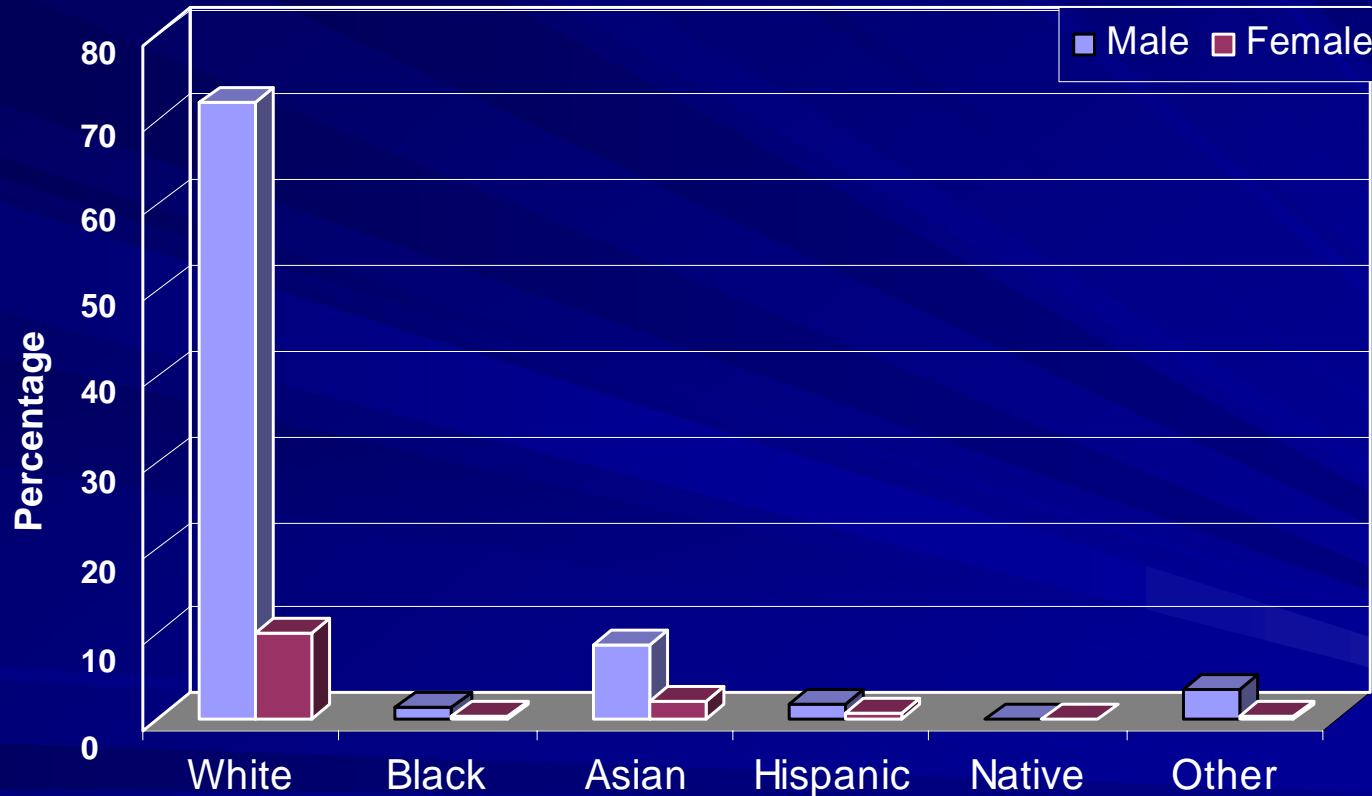
NSF (2004). *Women, minorities, and persons with disabilities in science and engineering: 2004*. NSF 04-317.

Ph.D. Degrees Awarded by Selected Field and Gender (2001)



NSF (2004). *Women, minorities, and persons with disabilities in science and engineering: 2004*. NSF 04-317.

Ph.D. Degrees Awarded in Physics (2001)



NSF (2004). *Women, minorities, and persons with disabilities in science and engineering: 2004*. NSF 04-317.

“Minority women especially represent a great, untapped resource that could be drawn on to increase the size of the scientific workforce in the U.S.”

R. Ivie & K. N. Ray. (2005). *Women in Physics and Astronomy*. AIP Publication Number R-430.02. College Park, MD: American Institute of Physics.

Theoretical Framework

- Social Capital – *networks of people (e.g., genealogy of advisors)*
- Cultural Capital – *tacit knowledge about behavior, dress, speech, etc.*

Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). New York: Greenwood Press.

- Alternative Capital – *capital accrued by alternative means*
 - Sense of Community & Opportunities to Normalize Experiences
 - Counter-Spaces
 - Role Models, Resources, & Challenging Stereotypes

Davis, K. S. (2001). "Peripheral and subversive": Women making connections and challenging the boundaries of the science community. *Science Education*, 85 (4), 368-409.

Methods & Analysis

- Type of Study: Qualitative: Interviews & ethnography
- Initial Site: Large, diverse university with academically-oriented formal support programs
- Participant Pool: Thirty-six physics-related majors (10 WOC)
- Length of Study: Nine years +

Sense of Community & Normalizing Experiences

- Informal and formal groups offer students a place to feel at “home.”
- They can also help to normalize women of color’s experiences by putting into context interactions and feelings.

Fox, M. F. (1998) “Women in Science and Engineering: Theory, Practice, and Policy in Programs.” *Signs* 24:201-23.

Whitten, B., Foster S. R., and Duncombe, M. L. (2003) “What Works for Women in Undergraduate Physics?” *Physics Today* 56(9):46-51.

(<http://www.physicstoday.org/vol-56/iss-9/p46.html>).

Sense of Community

Almost all of my friends that I work with are through [the formal support programs]. And we definitely help each other and we hang out socially and we make sure of day-to-day things like you're keeping up on your homework and things like that. It's really nice to have a support network like that.

– Chicana senior

Normalizing Experiences

I didn't really hang out with a lot of women in physics... until I got to upper division and I found that actually helps, because I don't feel like I'm on the defensive... They can relate to these kinds of experiences. And it's just so much more comfortable, that they relate 'cause sometimes I think that it's not real, that I'm making it up, it's in my head, and that it's my insecurities. So it's very reassuring to know that someone else feels that way.

– Chicana junior

Counter-Spaces

Formal and informal peer support groups provide “counter-spaces” that provide a sense of belonging and safe places to learn. Counter-spaces counteract or neutralize their negative encounters with peers or faculty in the department.

Solórzano, D., Ceja, M., and Yosso, T. (2000) “Critical Race Theory, Racial Microaggressions, and Campus Racial Climate: The Experiences of African American College Students.” *Journal of Negro Education* 69:60-73.

Counter-Spaces

I find the people whom I work closely with all the time [are in] one of two categories: a White woman or an Hispanic male or an African American male... I guess it's important for me to not feel like I'm dealing or battling or getting angry. Wondering and questioning... if this person thinks that I'm a slacker because of what I am.

–Chicana junior

Role Models, Resources, & Challenging Stereotypes

Female- and ethnic-oriented support groups and programs foster collaborative working relationships that reaffirm students' academic and social identities and provide rare exposure to minority and female scientist role models.

Treisman, P. U. (1983). Improving the performance of minority students in college-level mathematics. *Innovation Abstracts*, 5, 17.

Role Models

I had the chance to talk to so many students that were in similar positions to me, in terms of wanting to go into science and having the same experiences, same difficulties in school with classes... It was pretty much one of the deciding factors that made me realize I definitely want to do research. I wanna have the same experiences that these kids are having, how good they feel about what they've accomplished.

– Filipina sophomore

Challenging Stereotypes

There're like hundreds of stereotypes being knocked down in there [in the program] everyday. Like there's this group of Asian guys, and you would think that they're very smart and so organized and ... those guys are the least organized guys there are!... And then you see this group of Latino guys over there and they're really working hard, and they know what they're doing.

– Latina first-year undergraduate

Resources

My grade in physics is what kept me in the University. And I would not have been able to get that grade had I not gone through the program, for sure... I mean, I've had a really great support team. The instructors, program directors, teaching assistants, all of them, have always been really rooting for me. And I think support is probably the single most important thing that you need to get through this place... is someone to say, 'We believe in you' ... It really makes you rise to the occasion.

– African American junior

The 2005 U.S. Delegation 2nd IUPAP International Conference on Women in Physics



Recommendations for U.S. Physics Departments

- Seek greater representation of women and minorities at all levels: undergraduate, graduate, postdoctoral, and faculty
- Host events where students—especially women and students of color—may meet and socialize with one another and with faculty; designate physical space
- Implement local and national policies and programs to recruit and retain women and students of color in physics

Acknowledgments

- The Harvard Graduate School of Education Postdoctoral Fund
- American Education Research Association
- NSF – UC Berkeley Program in the Social Studies of Science and Technology
- Yevgeniya V. Zastavker, Ph.D.
- Charleen D. Laughlin

- The First Symposium of the Project SEED Initiative:
Promoting Educational Equity and Diversity in Science,
Technology, Engineering, and Mathematics
http://www.civilrightsproject.harvard.edu/convenings/convenings_2006.php

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