

Examining the Role of Family in Women's Engagement and Success in Physics



George Mason University Research Team

Jessica Rosenberg, PI
Associate Professor of Physics & Astronomy

Ben Dreyfus, co-PI
Instructional Professor of Physics & Astronomy

Nancy Holincheck, co-PI
Assistant Professor of STEM Education

Laura M. Akesson
Graduate Research Assistant

Graduate Research Assistants:

Manáñez

Tehele

er

Wardere

Quiroga-Velasquez

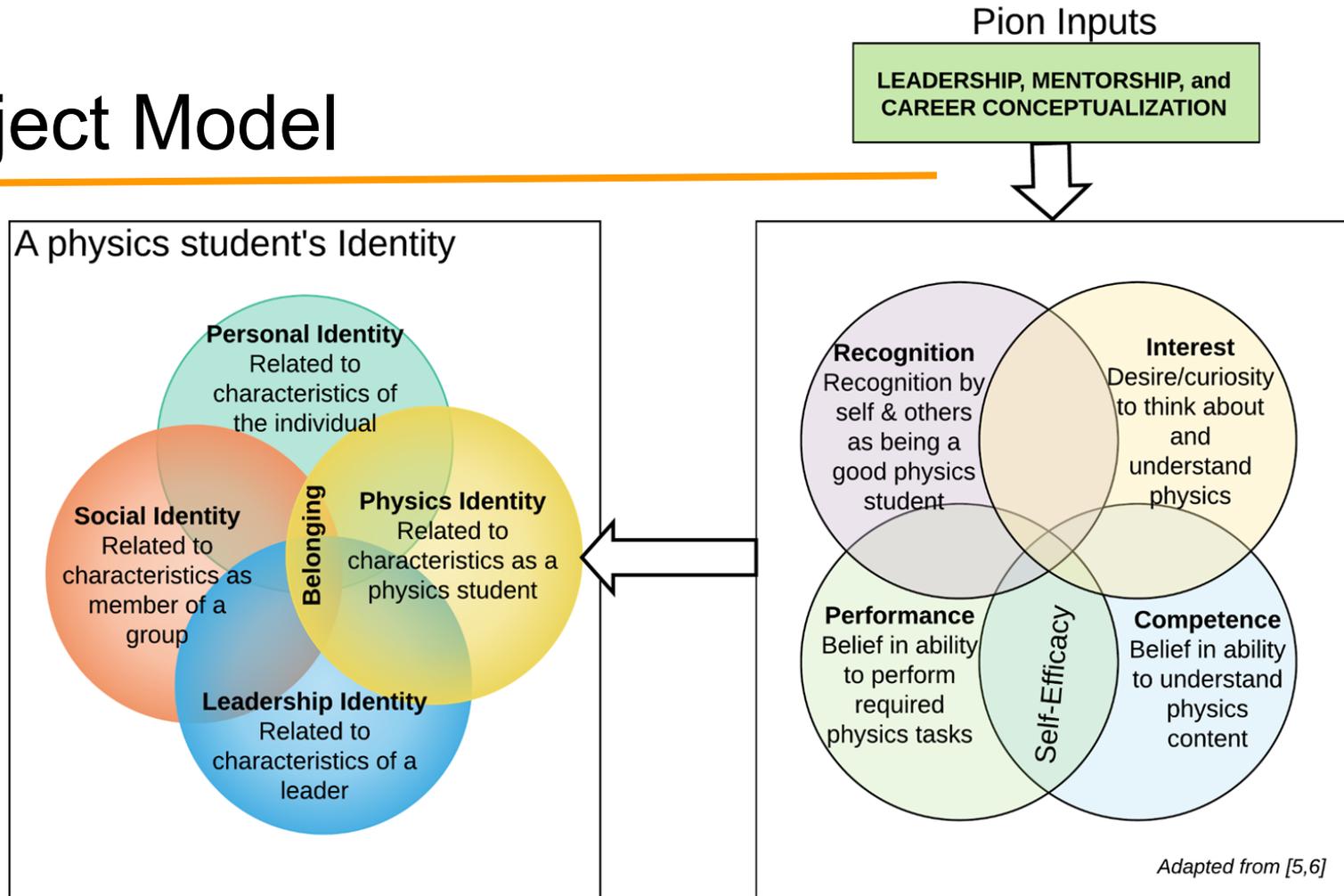
HI! I'm
new here!

Pion Project:

Cultivating Physics Identity and Belonging for Women in Physics

This project examines the role of mentorship, leadership development, and understanding of career opportunities beyond academia in the development of physics identity and belonging of undergraduate women in physics

Project Model

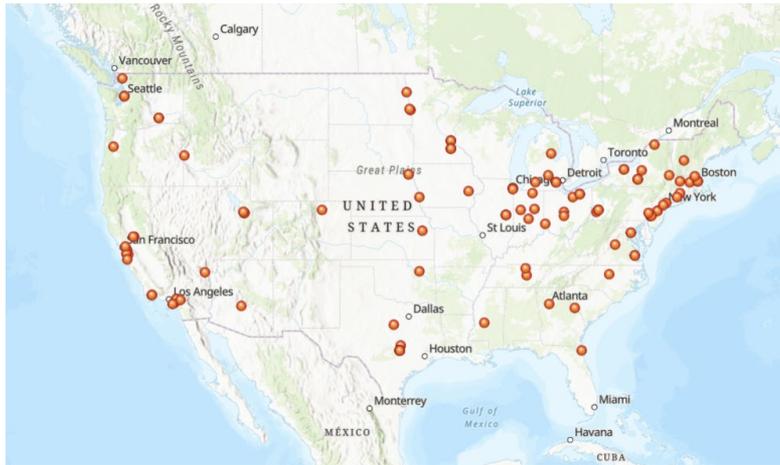


Data Sources

- Recruited survey participants from CUWiP attendees across US
 - 121 survey responses
- Conducting 1-hour Zoom interviews with survey respondents
 - 31 interviews completed to date

Data - Geographical

- 121 Surveys
 - Spring 2023



<https://arcg.is/1TibaO>

- 31 Interviews
 - Summer 2023: 16
 - Fall 2023: 15

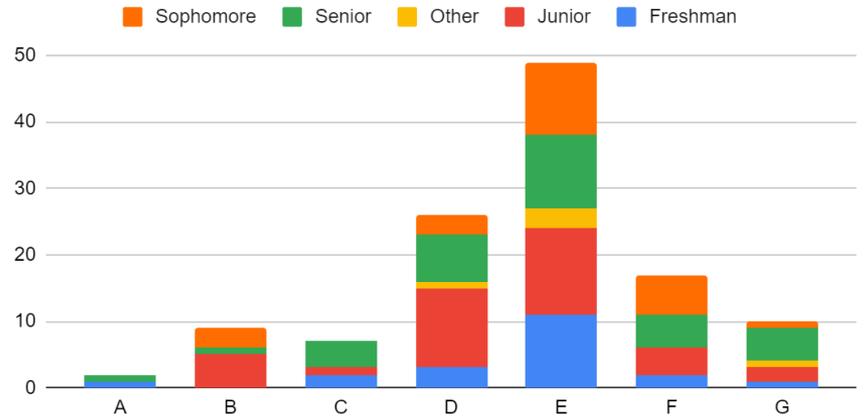
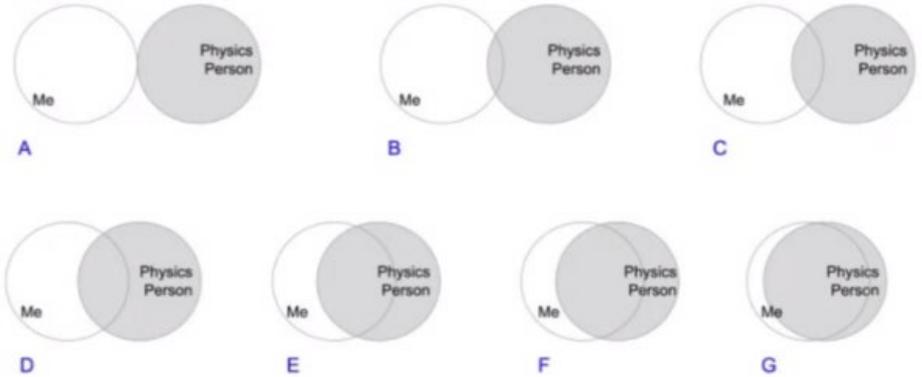
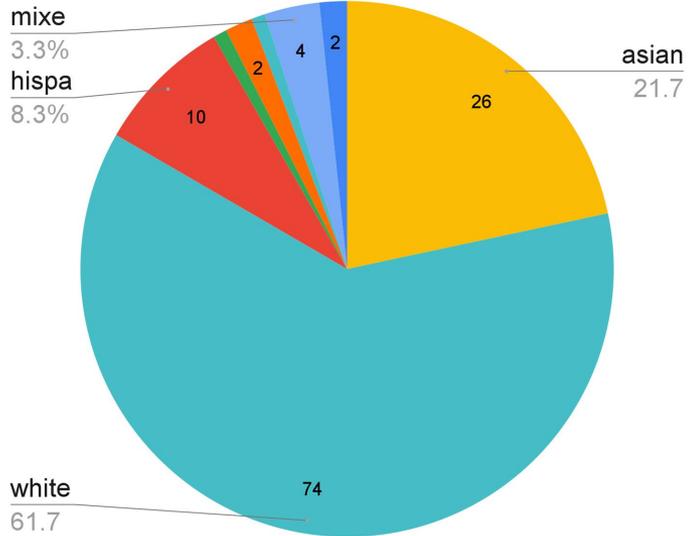


<https://arcg.is/1bLPWn1>

Survey Demographics

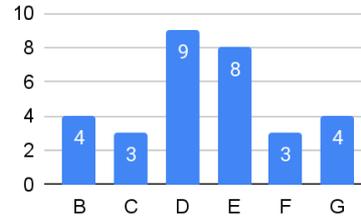
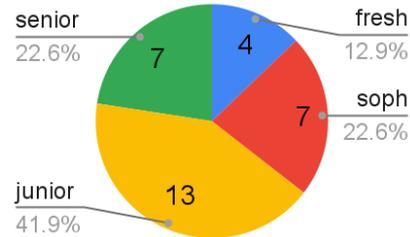
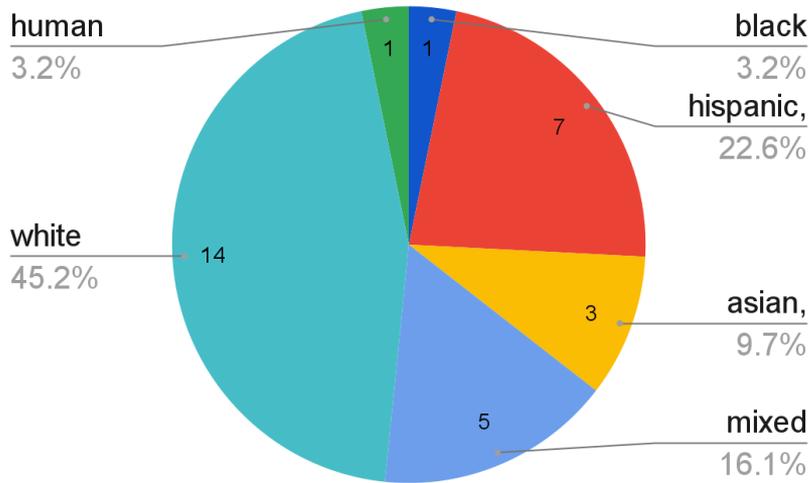
● (n=121)

Race/Ethnicity



Interviewee Demographics

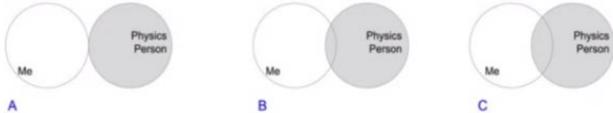
- (n=31)



Information offered, not asked for, in the interviews:

- 4 International
- 5 ESL
- 3 Community College Transfer
- 3 1st Generation
- 3 “returners”
 - 2 moms
- 5 LGBTQIA

Family in STEM - the num



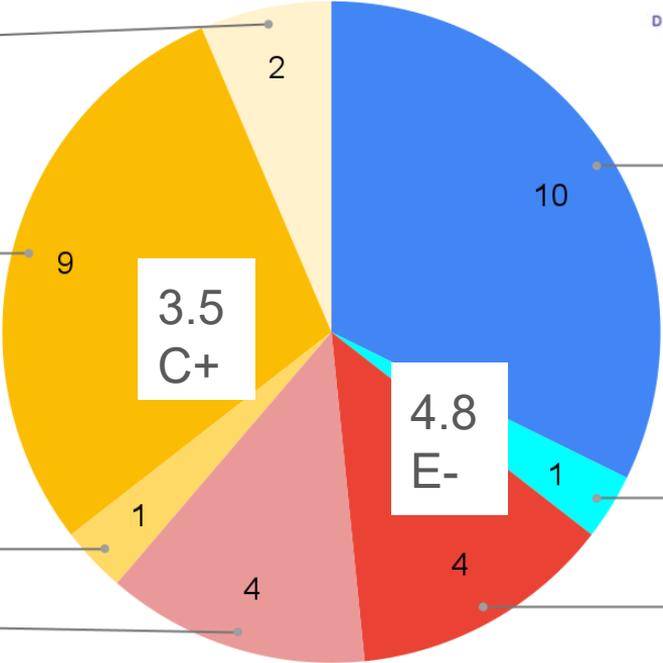
Remainder w Advanced Degree (explicit)

Advanced Degree
6.5%

remainder
29.0%

0P + ext
3.2%

2P + ext
12.9%



1 Parent
32.3%

1P + ext
3.2%

2 Parents
12.9%

Family in STEM - inconsistencies

*“...they told me multiple times they, that they **didn't want me to study physics** because as you know, I mean...not a lot of job flexibility or...at least I guess if you follow the traditional path and like stay in academia...That's gonna take very long years. And they instead wanted me to become either a doctor or an engineer actually.” (-Jennifer (D), doctor father, pharmacist mother. Turkish.)*

*“...my dad is so hard religious that there was a lot of patriarchal aspects of my family...I wanna study math. And he said to me, I. Oh, **you don't**, the only jobs that a mathematician can get is a middle school math teacher. And I was like, well, there's also high school math, but yeah, I see what you're saying. So I was kind of swayed away from that.” (-Suzanne (E), college STEM professor father)*

“..family wise, my parents have been very like, supportive and, and that's very excited about the research I'm doing. This is such a good opportunity.” (-Mary (E), no family in STEM)

STEM capital and STEM habitus

Bourdieu's theory of social reproduction (Archer et. al)

capital:

the legitimate, valuable, and exchangeable resources in a society that can generate forms of social advantage within specific fields

family habitus:

the ways in which families (and their values, resources, sense of "self"/identity, and practices) may relate to children's (science) aspirations.

STEM capital and STEM habitus

capital:

“...my family is very academic and they've always encouraged me to do well in stem. So I've always liked math and science, but because my grandpa was a physics professor, I think I got really into physics more than anything else...So my dad was a mechanical engineer and then he got a master's degree in quality engineering. So, He used to tell me a lot about ...[his] job where he would go to different factories...how a lot of different things are made... And my mom was a microbiologist, so she used to talk a lot about her studies and I thought science was really cool.”

-Ruby (E), freshman

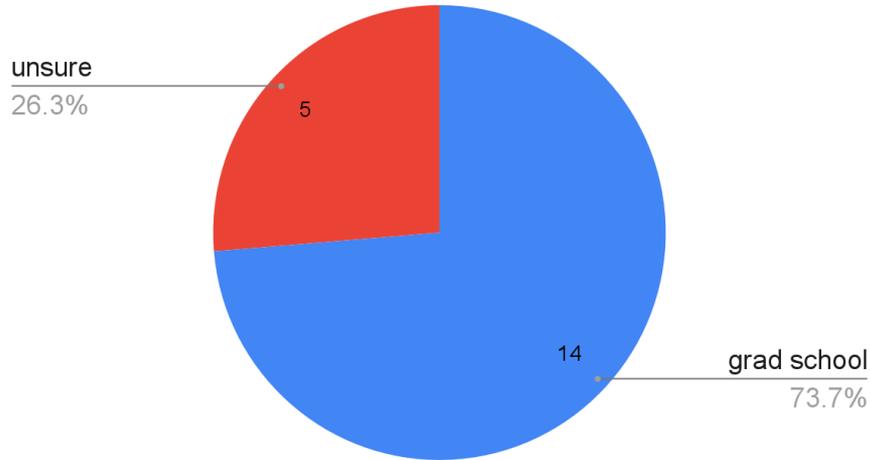
family habitus:

“The reason why I started majoring in this in the 1st place was I always knew that I was into stem growing up. My parents were really good about kind of keeping this in those sort of. Environments from libraries to museums to different things like that. Super huge on, like, informal learning I am 1st gen and I don't know a whole lot.” - Shannon (D), “blue collar” father, immigrant mother, no family in STEM

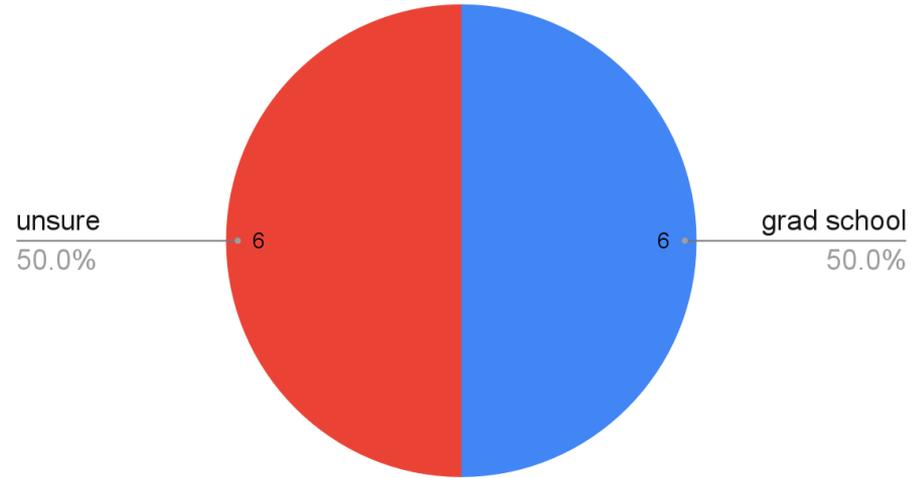
“My family is a huge, huge thing for me... it's, they're all nerds. We're all nerds...my uncle...my brother ...My grandpa did Electronics. My grandma did architecture, huge geometry nerd. It's like, it's everywhere, everywhere.” -Ivy (F), ESL, immigrant, STEM family

STEM capital and STEM habitus

Future Plans (Parents in STEM)



Future Plans (neither parent in STEM)



“...parental attitudes to science were found to be more closely related to children's science aspirations than general parental involvement.” Archer et. al.

“Finding Family STEM capital and habitus”

“So she is a huge **advocate for me** and I also have dyslexia and ADHD, which do impact my ability to perform well in school. And she is extremely understanding. If I tell her I can't get this done by this date, she says, not a problem. She doesn't question it. She knows if I say I need an extension, I need accommodations, I need help. She doesn't hesitate. And it's also nice. She doesn't ask questions, which is a weird thing to say, but **I don't feel like I ever have to justify myself to her**. It's a little debilitating to have to go to someone and say, I need an extension. I'm disabled.” -Nancy (B), Grad school plans

“I feel like this, this sense of like working together, that they **accept me** to the physics community, especially when it's like a person, mentors are usually like at least one step further...I worked with postdocs and professors. And when they **value my ideas** and accept me to their physics community and like, tell me that what I do is great or interesting or like just like **give me support on my way**. I really feel like I'm a physicist too, ...because they were working with me on equals and appreciating my contributions. That I think is, was important.” -Olivia (D), Grad school plans

STEM capital and STEM habitus

- Program for rural middle school girls and parents: “It may seem that adults view sustaining or enhancing girls’ STEM interests as important yet perceive that as the responsibilities of others.” (Hite, et. al)

Archer et. al.

- RE: habitus: “stronger and with clearer messages in Latino and Asian families as compared to White and African American families.”
- Social class plays a key role
 - Science as irrelevant (working class)
 - Affluence correlates to more positive view of science
- Counterpoint: rebellion! (agency differences by class, race, gender)

References

Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2015). "Science capital": A conceptual, methodological, and empirical argument for extending Bourdieusian notions of capital beyond the arts. *Journal of Research in Science Teaching*, 52(7), 922–948.

<https://doi.org/10.1002/tea.21227>

Archer, Louise, et al. "Science Aspirations, Capital, and Family Habitus." *American Educational Research Journal*, vol. 49, no. 5, Oct. 2012, pp. 881–908, iel.org/sites/default/files/Science%20Capital_%20Archer%20et%20al%20-2012_A8.pdf, <https://doi.org/10.3102/0002831211433290>.

Carlone, H. B., & Johnson, A. (2007). Understanding the science experiences of successful women of color: Science identity as an analytic lens. *Journal of Research in Science Teaching*, 44(8), 1187–1218. <https://doi.org/10.1002/tea.20237>

Hazari, Z., Sonnert, G., Sadler, P. M., & Shanahan, M. C. (2010). Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice: A gender study. *Journal of Research in Science Teaching*. <https://doi.org/10.1002/tea.20363>

Hite, Rebecca L., and Jessica L. Spott. "Improving Parents' and Teachers' Perceptions of Girls' STEM Activities and Interests before and after an Informal STEM Intervention." *The Journal of STEM Outreach*, vol. 5, no. 1, 5 Jan. 2022, <https://doi.org/10.15695/jstem/v5i1.01>. Accessed 23 Feb. 2022.