Physics Education Research

Identifying Barriers to STEM in Underrepresented Groups

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Introduction

LACK OF DIVERSITY

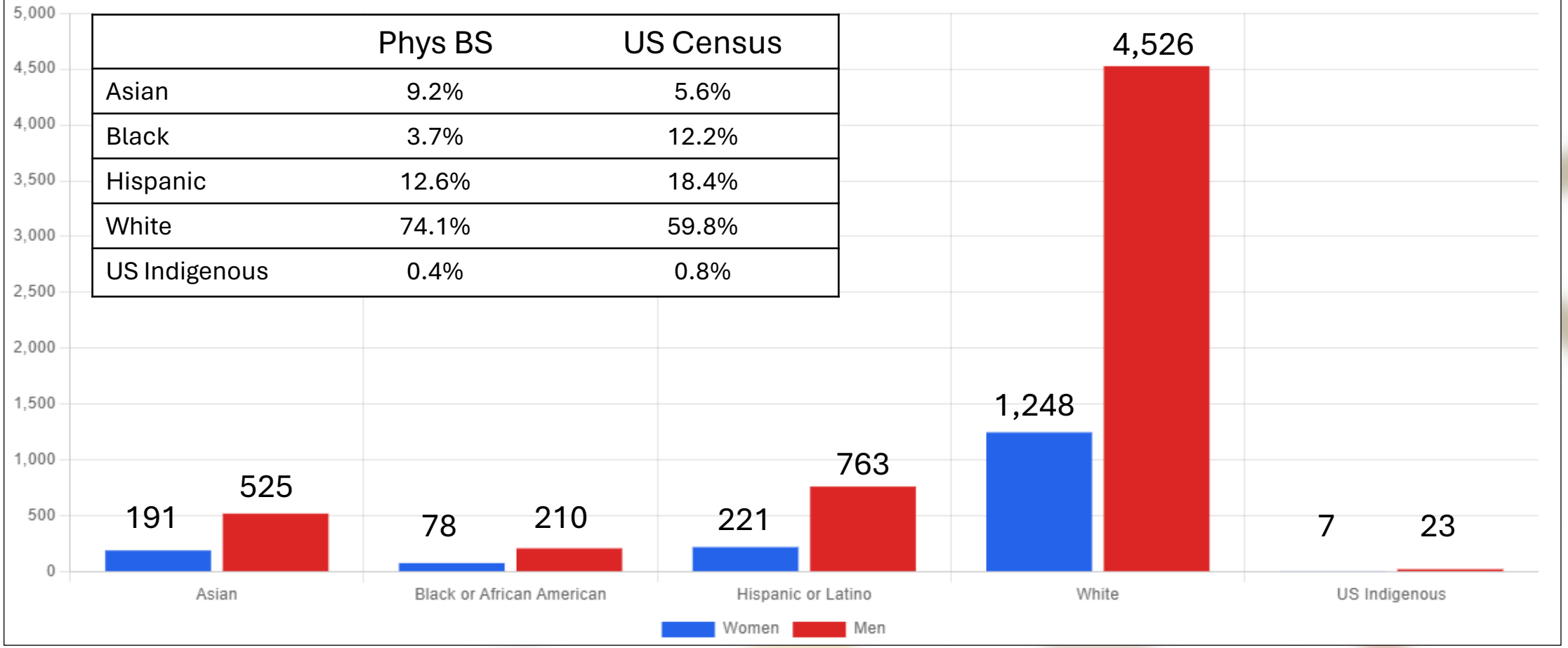
IDENTIFYING THE ISSUE

SOLUTIONS

LACK OF DIVERSITY

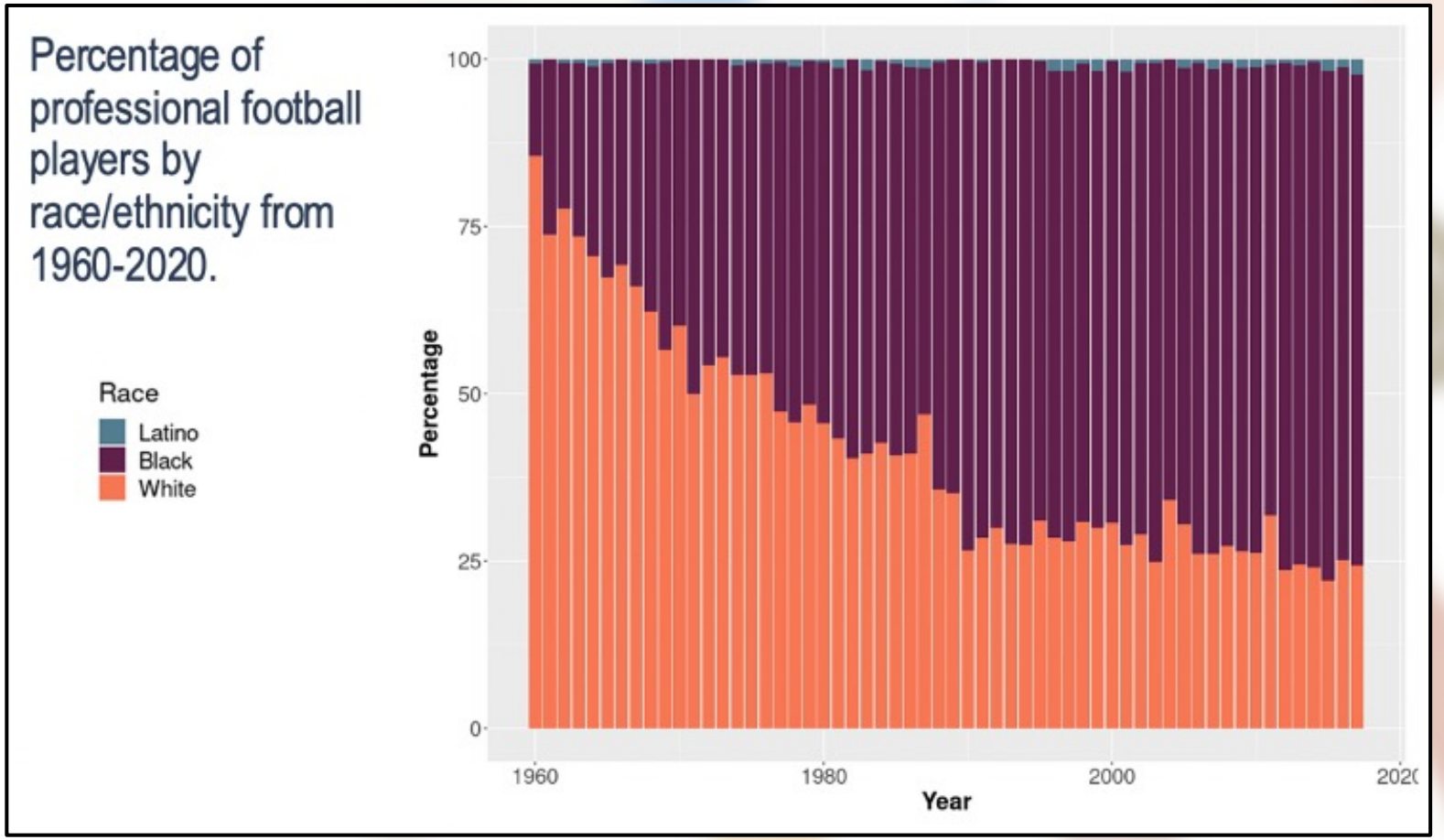
Physics bachelor's degrees by gender and race/ethnicity (2017-2021)

	Phys BS	US Census
Asian	9.2%	5.6%
Black	3.7%	12.2%
Hispanic	12.6%	18.4%
White	74.1%	59.8%
US Indigenous	0.4%	0.8%



Reference: https://www.aps.org/learning-center/statistics/diversity

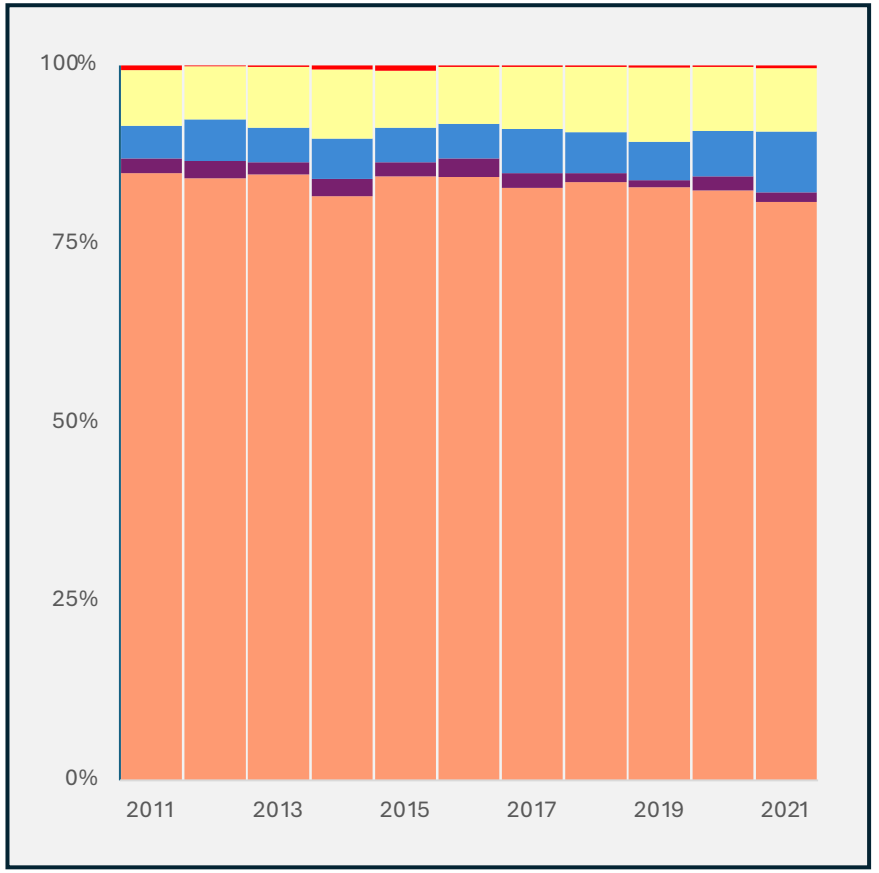
LACK OF DIVERSITY



Reference: https://footballplayershealth.harvard.edu/about/news/examining-race-trends-in-the-nfl-diversity-but-not-inclusion/

LACK OF DIVERSITY

Percentage of PhD Degrees earned in Physics & selected Engineering Fields by race/ethnicity from 2011-2021



Reference: https://ww2.aip.org/statistics/physics-engineering-degrees-earned#

Introduction

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IDENTIFYING THE ISSUE

SOLUTIONS

My Research

METHOD

RESULTS

DISCUSSION

Semi-structured Interviews

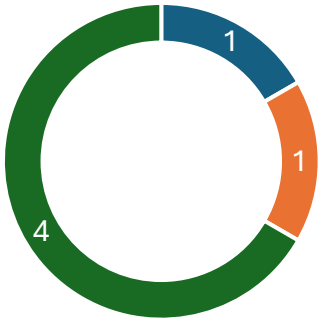
Students		
Name:	Age:	Gender:
Ethnicity:	Major:	Socioeconomic status:
Hometown:	Homestate:	
Elementary Attended:		
Middle School Attended:		
High School Attended:		
Who raised you?		
What school/education values stick out to you as a child that were instilled by your parent(s)/guardian?	How did your parent(s)/guardian support you in your education?	Did your parent(s)/guardian play a role in how you chose your major?
What school education values stick out to you as a child that were instilled by your friends and community?	How did your friends/community support or created obstacles in your educational path? (i.e., stigmas, stereotypes, etc)	If you encountered obstacles in choosing a Physics major, described what these obstacles looked and how you overcame them or overcoming them?
What were the demographics of your elementary school?	What science do you remember being taught?	What did the interactions with your teacher teaching science look like?
What were the demographics of your middle school?	What science(s) did you learn? Was physics offered?	If physics was offered, did you take it? If not, why?
What were the demographics of your high school?	What science(s) did you learn? Was physics offered?	Did you have any counselors/mentors with helping you determining your major?

Teachers		
Name:		
Position:		
Grade/Subject you teach:		
How many years in field:		
School District:		
School Name:		
Educational Background:		
How do you determine for the school year what you will be teaching for math and science?	Do you have leeway in what you teach in these subjects?	Are there restrictions, and if so, what are they?
Do you notice any differences in the effectiveness of delivery amongst different demographics groups in your class?	Do you change teaching methods/strategies to accommodate those differences?	What resources do you have to supplement your teaching?
***If teaching ≤10 yrs**	Can you give me your observations from past to present with changes in how STEM is presented in the schools?	

Principals		
Name:	School Name:	
Position:	Educational Background:	
Grade/Subject you taught:		
How many years in field:		
School District:		
How is the curriculum determined for your school?	Who has the final say on what is taught in the classrooms?	Does your school offer STEM-based classes? If so, are they offered at all or certain grade levels?
If STEM not offered, why and what are barriers preventing such classes from being offered?	What resources do you have for promoting STEM education, or math/science teachers? Where does that money come from?	Can you give me your observations from past to present with changes in how STEM is presented in the schools?

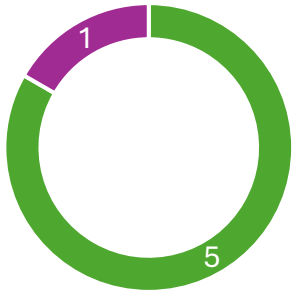
Sample Size

Undergraduate Physics Major



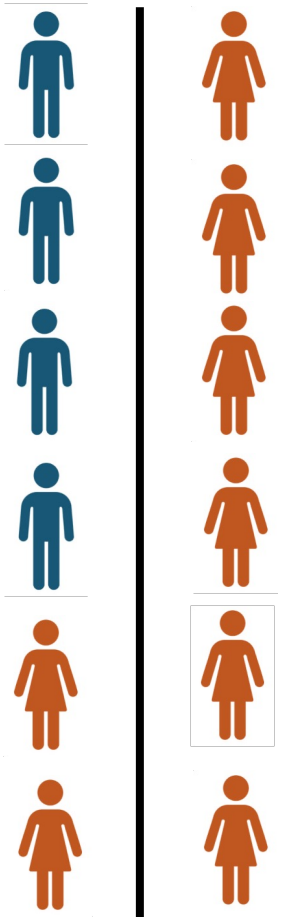
White Hispanic African American

Upbringing

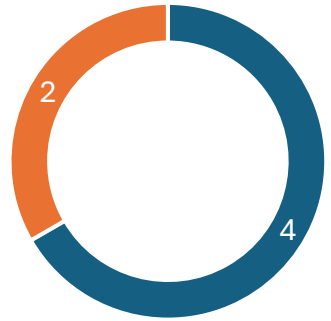


Both Parents Grandmother

Gender

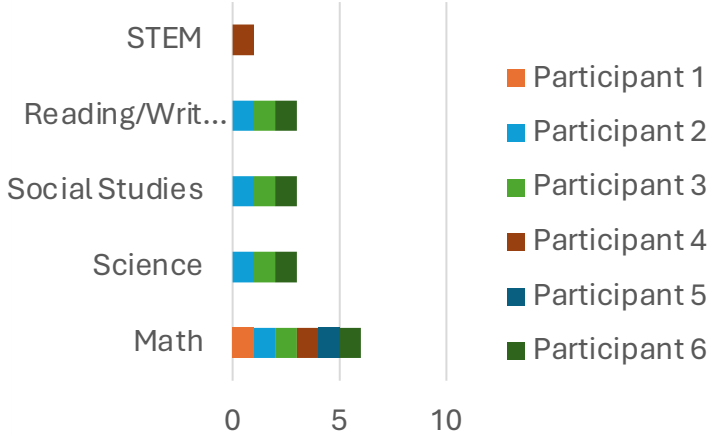


K-12 Educators

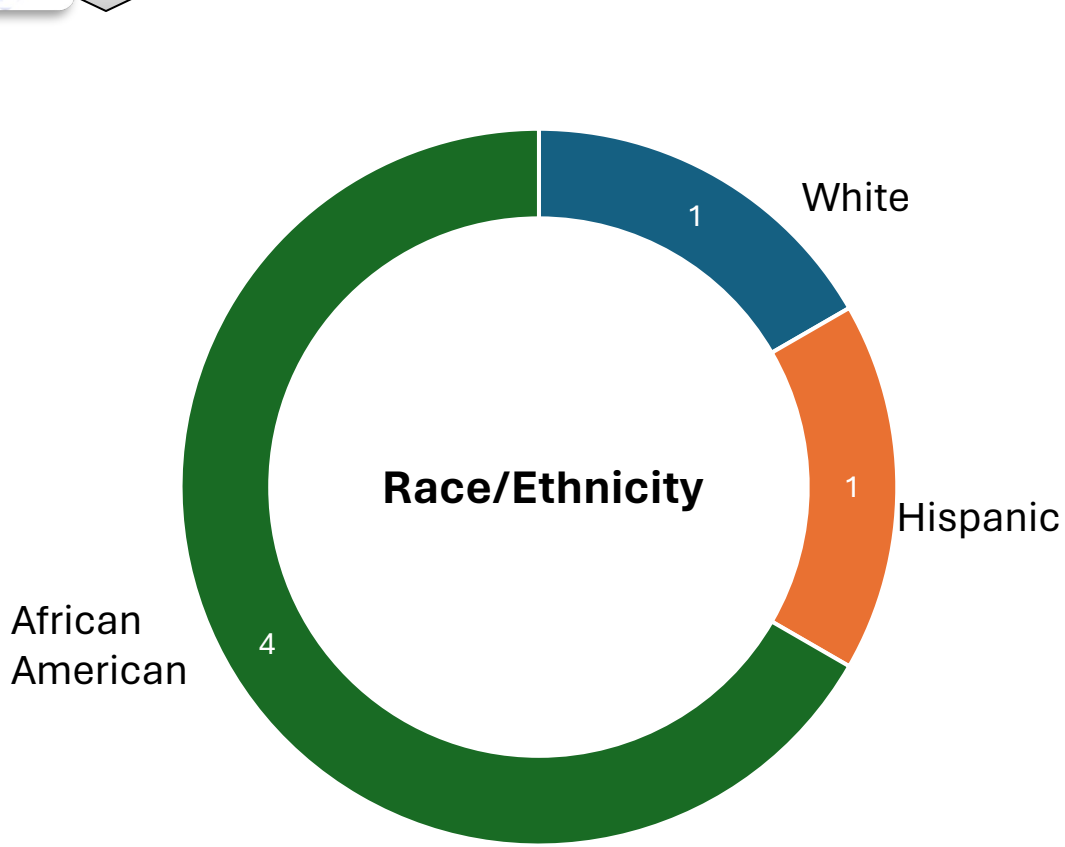


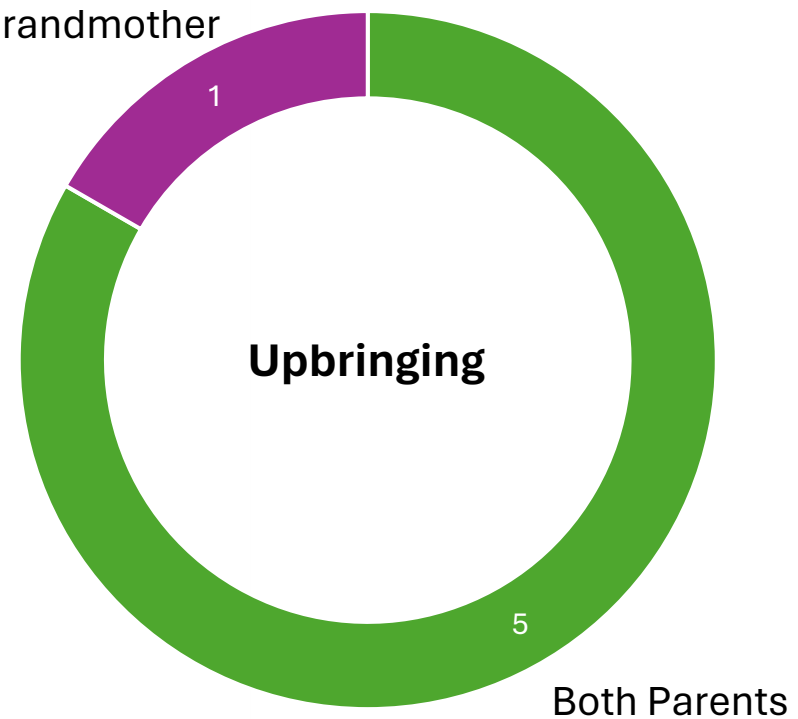
Elementary Middle School

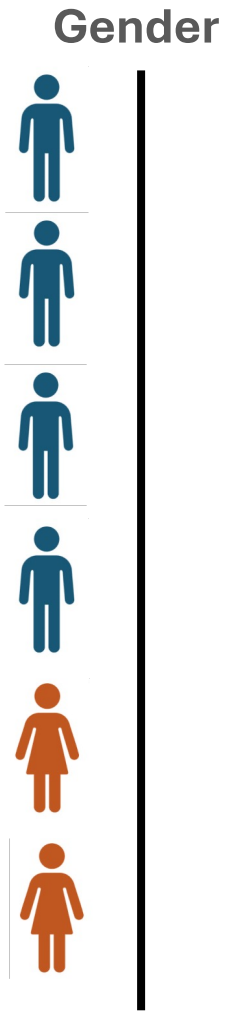
Teaching Topics



Undergraduate Physics Major

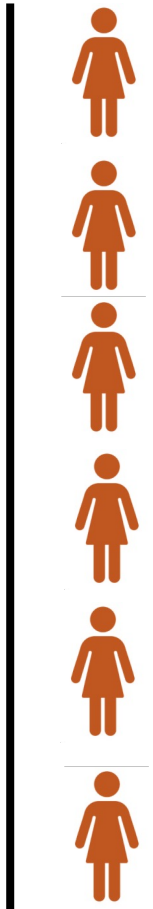


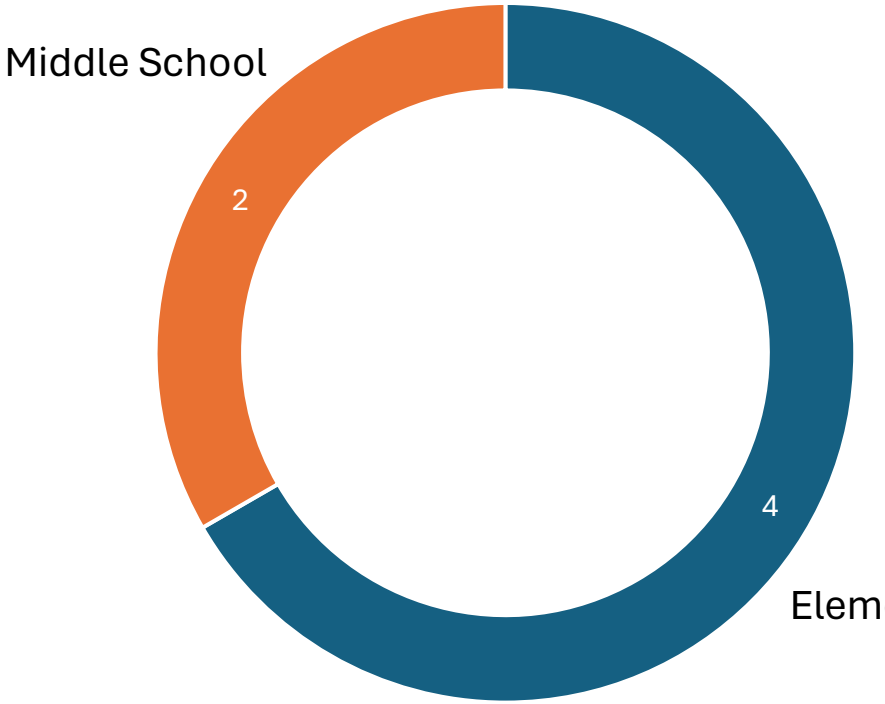


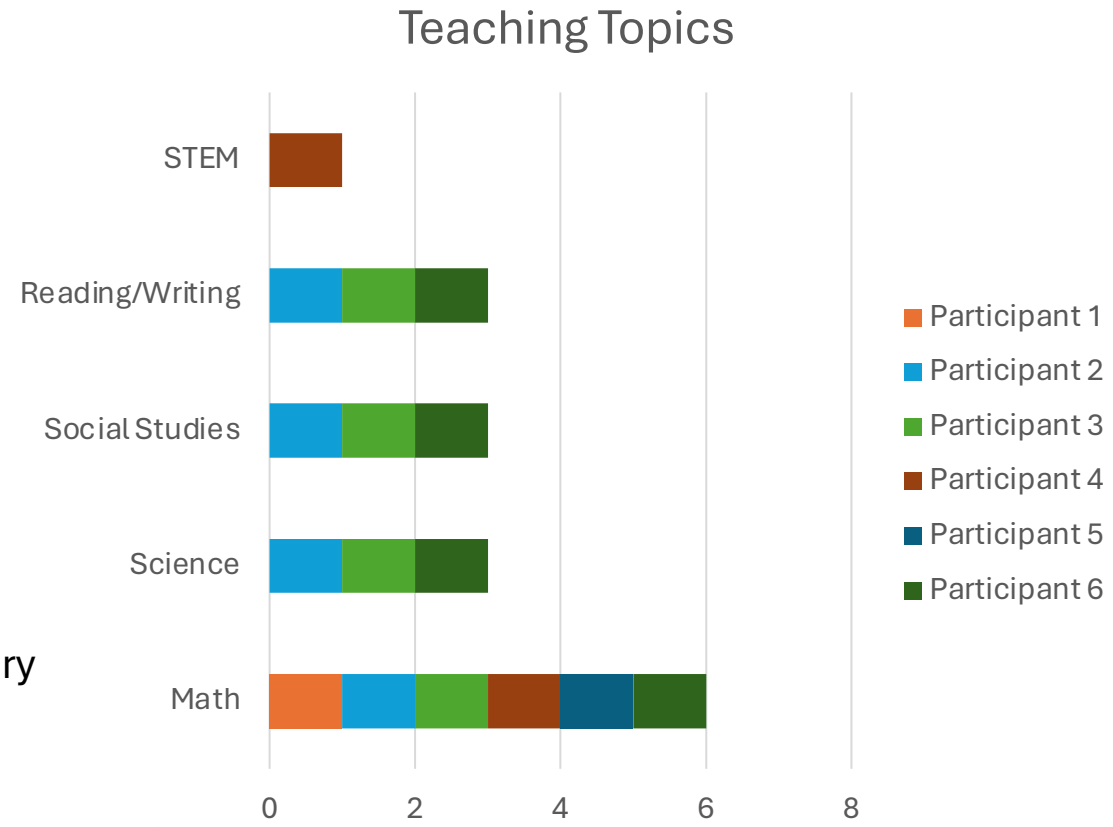


K-8 Educators

Gender

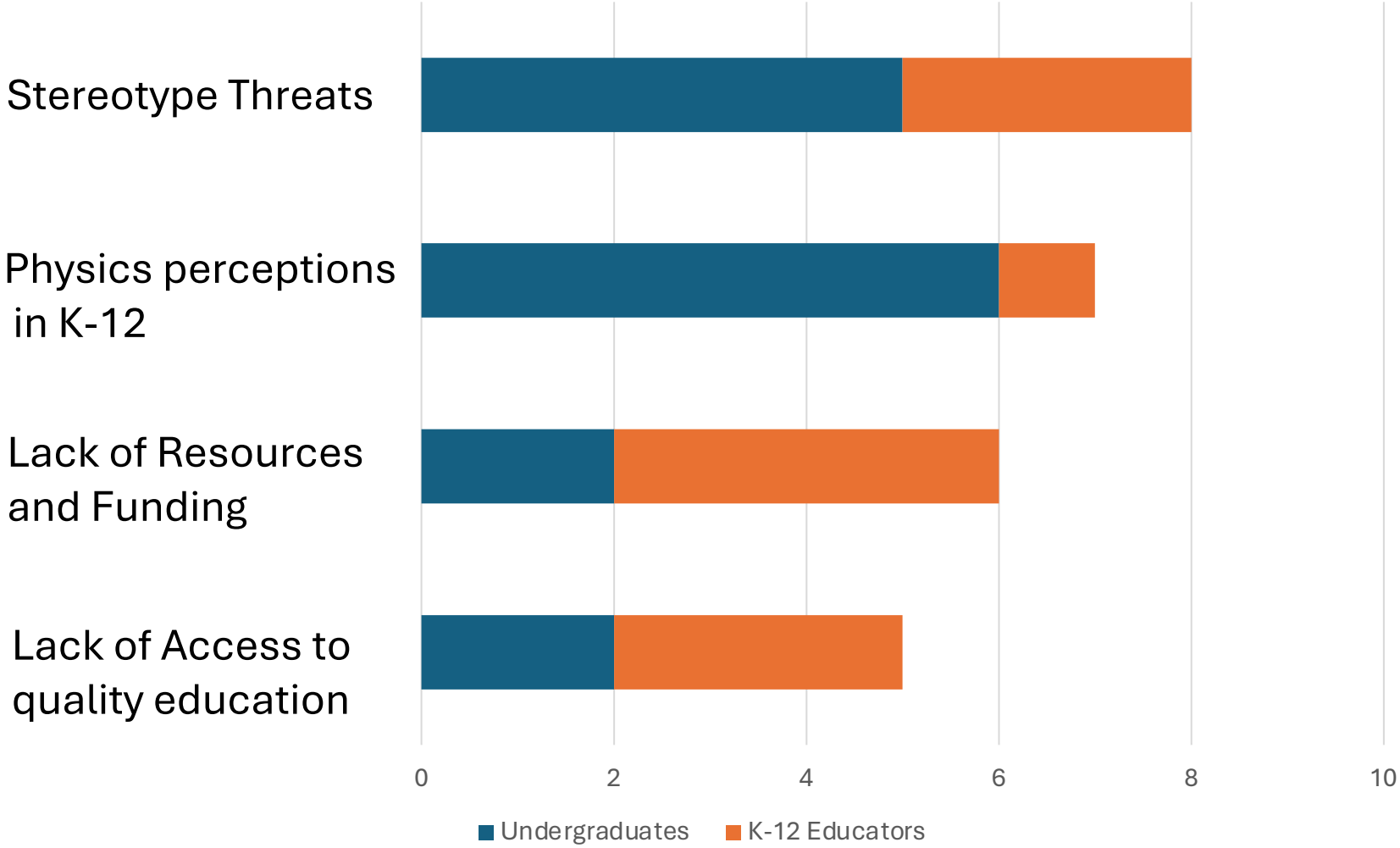






RESULTS

Identified Barriers



district they block so many websites…[that] gives me access to fun competitions for kids..

DISCUSSION

Critical Race Theory

Highlighted **CRT** tenets: **colorblindness**, interest convergence, and **whiteness property**

A Caucasian educator participant indicated that teaching methods may not be changed to accommodate demographic groups and that ways of learning have no bearing on race.

Analyze the systemic inequities within educational institutions that hinder the participation of underrepresented groups in physics and other STEM disciplines

Solutions

early exposure, better **training and development** for teachers, visible yet **diverse role models**

Study Limitations

Time constraints, sample size too small and not diverse enough

Conclusion

More extensives research needs to be conducted on this issue

Benefits from diversity

Solutions

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For more details visit my PERC poster

Conclusion

- BENEFITS TO DIVERSITY
- MORE EXTENSIVE RESEARCH
- SOLUTIONS