



WORLD BANK GROUP

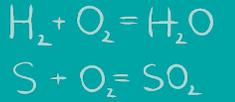
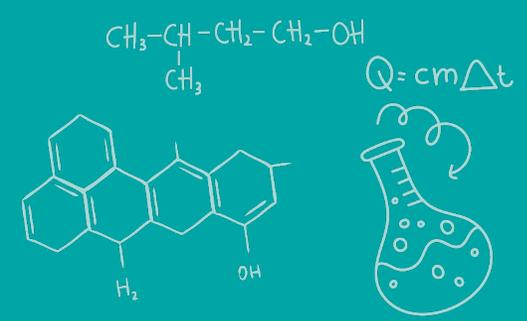
THE EQUALITY EQUATION

Advancing the Participation of Women and Girls in STEM

Alicia Hammond, Eliana Rubiano Matulevich, Kathleen Beegle and Sai Krishna Kumaraswamy

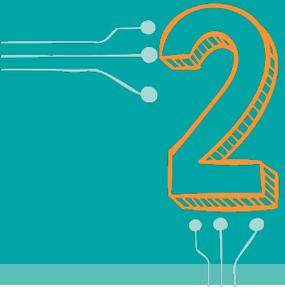
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BACKGROUND

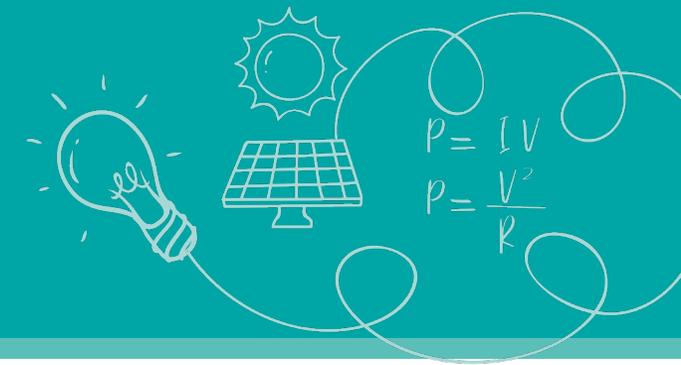


- A comprehensive literature review focused on women and girls in STEM education and careers.
- The objective was to identify the drivers, evidence-based solutions and to highlight gaps in the research.
- Reviewed 300+ studies (most since 2009), mostly quantitative research, some qualitative research to fill gaps.
- We tried to prioritize studies outside US and European contexts, but that revealed a large gap in the evidence base.





GENDER GAPS IN STEM EDUCATION AND CAREERS



Muted gender gaps on the path to postsecondary

- Globally, girls and boys enroll and complete primary school at about the same rates. Gaps persist in specific countries/regions: to the disadvantage of girls (Sub-Saharan Africa), to the disadvantage of boys (Latin America).
- Enrollment and completion rates are lower at the secondary level. And there are differences across countries by income level.
- Girls often perform as well as or better than boys in science and mathematics.

Girls do as well or better than boys in science and math tests

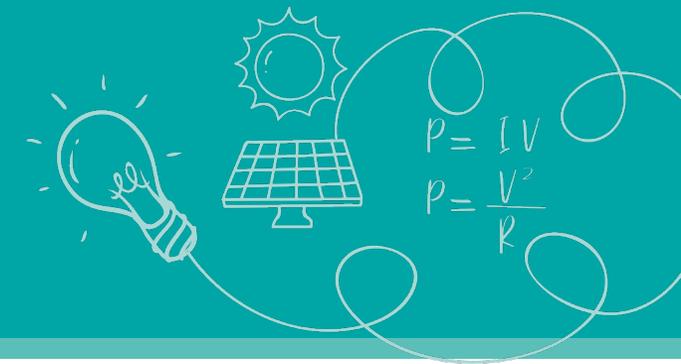
Indicator	Science		Mathematics	
	PISA	TIMSS secondary	PISA	TIMSS secondary
No statistical difference	39	19	33	25
Boys do better	6 (11 pts)	5 (11 pts)	32 (10 pts)	6 (9 pts)
Girls do better	34 (13 pts)	13 (29 pts)	14 (11 pts)	6 (17 pts)
Number of economies	79	37	79	37
Overall average score, points	458	506	459	481

Source: PISA 2018 and TIMSS 2015 data.

Note: Statistical differences are assessed at 5 percent. Average point differences are indicated in parentheses.



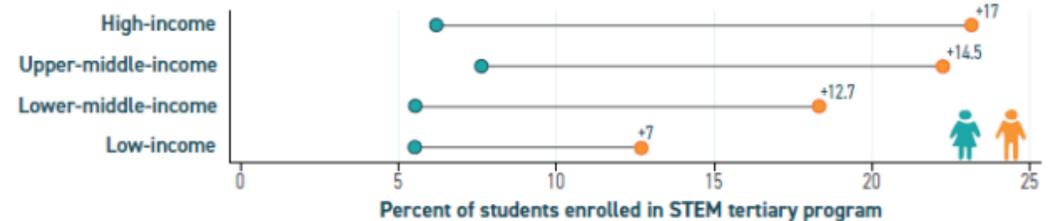
GENDER GAPS IN STEM EDUCATION AND CAREERS



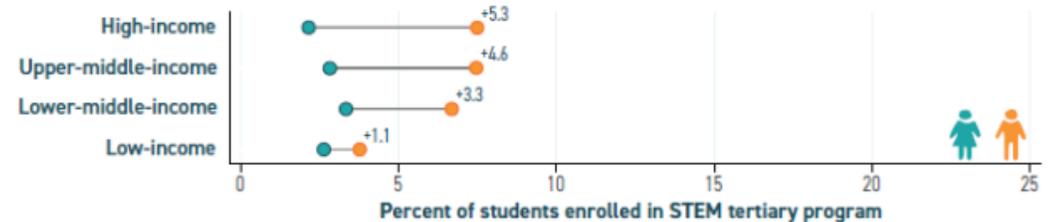
Notable gender gaps at the tertiary level

- Globally, tertiary enrollment and graduation rates are higher among women than men.
- Yet, women are less likely to undertake studies in specific STEM fields: engineering, ICT and physics.

Engineering, Manufacturing, and Construction



Information and Communication Technologies

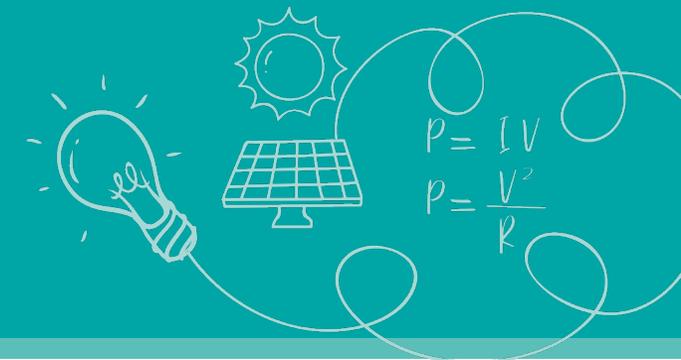


There is a “gender-equality paradox” in STEM

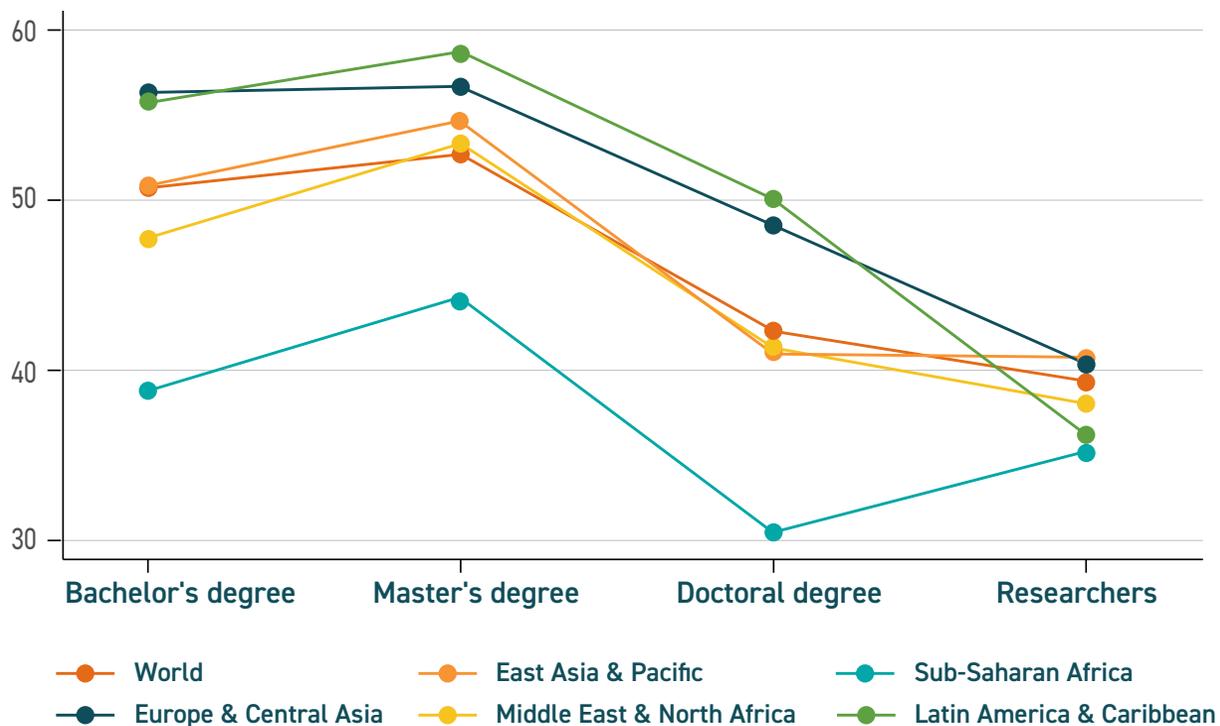
- Some countries, such as Finland, Norway, and Sweden, are characterized by greater gender equality, but have large STEM gender gaps.
- Gaps are wider in these countries than in countries that rank poorly in gender equality. This has been described as a gender-equality paradox.



GENDER GAPS IN STEM EDUCATION AND CAREERS



Proportion of female graduates by program level and those employed as researchers

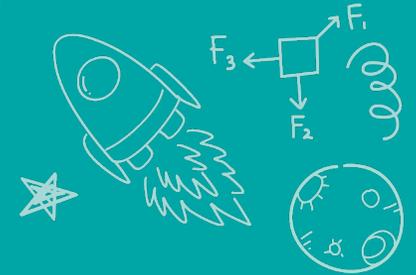


- Although global STEM labor market data are lacking, research careers have been used as a proxy.
- Relative to the share of women who have gone to university, women's participation in research shows a precipitous drop—although women account for 54% of university graduates globally, they represent only 34% of researchers.
- There is little research on STEM careers outside academia, and most of the research centers on the STEM labor market in the United States.



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WHAT FACTORS DRIVE STEM GENDER GAPS?



Gender stereotypes and biases are widespread

- Curricula and other types of educational materials reinforce gender stereotypes, including textbooks in Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Romania, and the United States.
- Biases are evident among teachers and professors. For e.g., between 8 and 20 percent of mathematics teachers in Latin America reported that they believe mathematics is easier for boys.
- In Zimbabwe, boys received more teacher-initiated contact than girls, more attention and more feedback.
- In the US, an experiment found that despite identical transcripts, school counselors were less likely to recommend Black female students for advanced placement calculus and rated them as the least prepared.
- Men and women professors in the US assigned lower ratings for competence to women among equivalent applications from science students for a laboratory manager position. They considered the women applicants less competent and suitable for the job and offered a lower salary and less mentoring.





WHAT FACTORS DRIVE STEM GENDER GAPS?

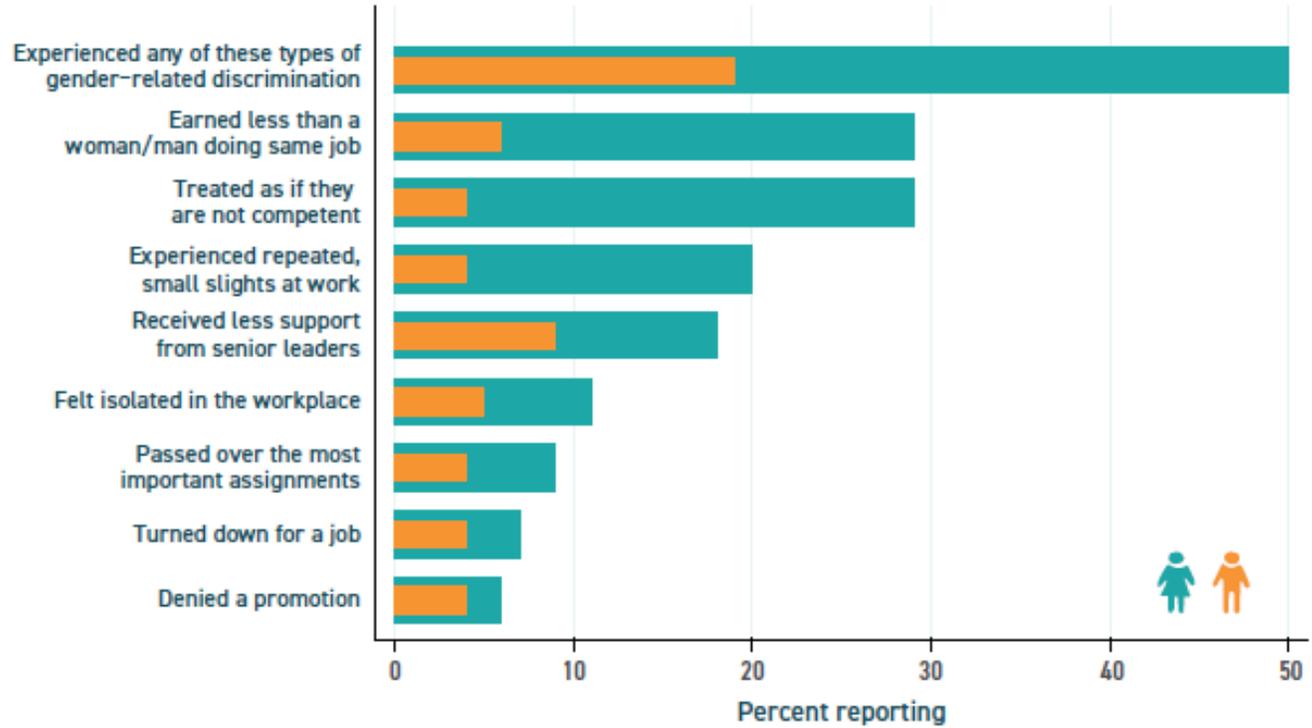


- In Hungary, Chile and Mexico (among other countries), parents have a greater expectation that their sons will pursue STEM careers.



- In STEM jobs in the US, women are much more likely than men to report workplace discrimination on the basis of sex.

STEM jobs are associated with more discrimination against women

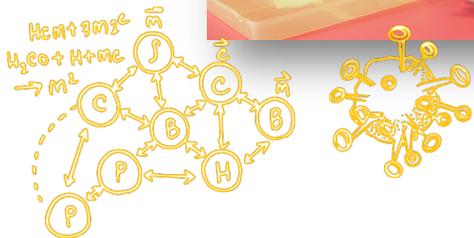
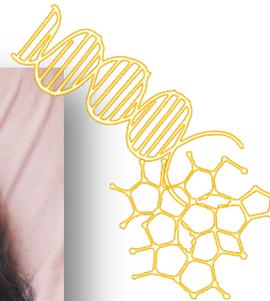


Source: Funk and Parker 2018.

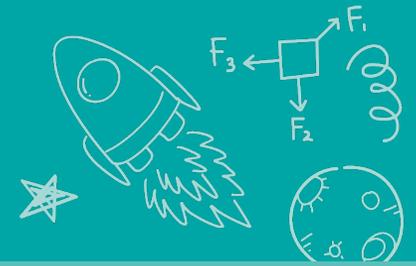
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WHAT FACTORS DRIVE STEM GENDER GAPS?

These stereotypes and biases can contribute to a decrease in confidence, interest and aspirations

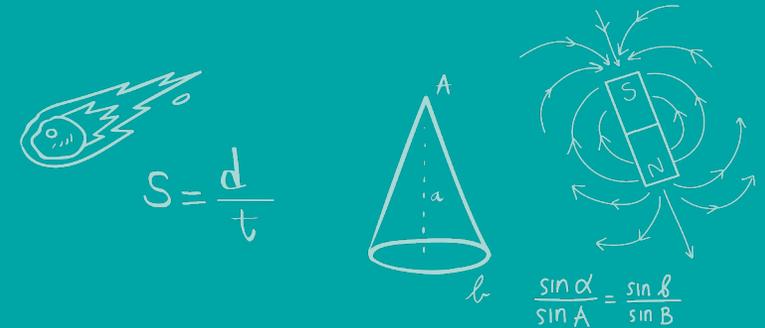


- In the US, by age 6, girls are less likely to associate brilliance with their sex and start to avoid activities that are aimed at children who are “really, really smart.”
- In the UK, girls ages 10–11 who had not expressed aspirations in science associated science with masculinity and could not “imagine themselves as scientists”.
- In Croatia, although girls score better in physics, they are significantly less likely than boys to choose physics in their school leaving exams.



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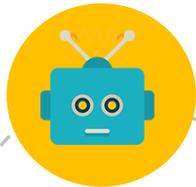
WHAT WORKS TO CLOSE GENDER GAPS IN STEM?



On the path to tertiary



Start early among young children with STEM play

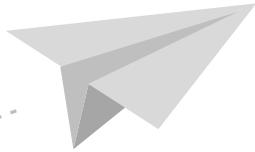


Encourage extracurricular activities such as competitions, clubs, and robotics and coding camps

Identify and address biases in classrooms and learning materials



Mentoring and female role models to boost confidence and aspirations



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WHAT WORKS TO CLOSE GENDER GAPS IN STEM?



In universities



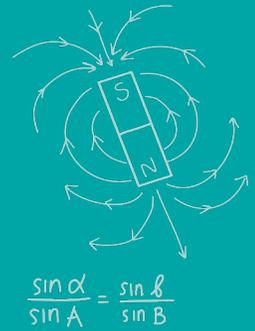
- Female role models are especially salient, providing examples of achievements and embodying the traits and behaviors that can contribute to success.
- Female peers also matter. The presence of more female peers in classrooms might help reduce women's implicit bias.

Other promising approaches that need testing

- Specialized training programs
- Financial incentives
- Results-based approaches
- Giving information about differential returns to STEM

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WHAT WORKS TO CLOSE GENDER GAPS IN STEM?



In workplaces



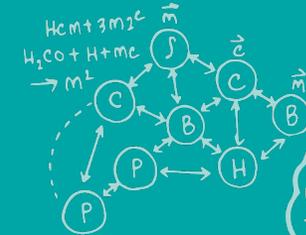
- Parental leave policies, flexible work, employer-supported childcare, anti-sexual harassment policies.
- Salary history bans; pay transparency; joint evaluations and, in some cases, anonymizing applications can equalize opportunities in hiring and starting pay.
- Address “gendered wording” in job post descriptions to broaden pool of applicants.

Other promising approaches that need testing

- Role models and mentors for women in male-dominated sectors of work.
- Combining mentoring with professional development; creating male advocates; increased visibility of female faculty.

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LOOKING AHEAD



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 $C_2H_2OM_2$
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- More research is needed from low and middle-income contexts using rigorous methodologies, larger and much more diverse samples.
- Building consensus on defining STEM jobs in labor force and other surveys would be of value.
- Comparable global data is needed to track gender gaps in STEM jobs, especially outside of academia.
- An important challenge is to disentangle preferences and choices from the influence of social norms.
- More testing on the relative influence of female versus male role models would enhance the evidence base.



THANK YOU



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