Reducing Boys' Gender Bias & Improving Girls' Anticipated Fit in STEM

ENGENDERING SUCCESS IN STEM

How can we encourage girls to consider STEM as viable career paths? We research middle school students.

Theories & Data Behind Our Research[1]

Women have lower STEM identity fit ⟷ **Stereotyping in STEM climate**

Women's fit in STEM is underestimated by women & men[5-7]

What affects identity fit?

The SAFE Model[2]

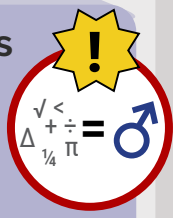
- **Person - environment fit** — Extent to which **self concepts align** with **perceptions of the environment**; includes values[3], self-concept[2], & social[4] fit.
- **Feelings of fluency** — Concepts that are fluent feel more true, desirable, achievable.[2]
- **State authenticity** — Variable socio-emotional experience (vs. stable trait authenticity).
- **Career trajectory: engagement to exit** — All of these affect a person's career engagement to exit.

In STEM fields, women have:

- **lower participation** women earn 35% of STEM degrees[12]
- **lower completion** 60% of female vs. 80% of male engineering students graduate[11]
- **lower compensation** a 7% gender wage gap persists, even with demographic controls[12]

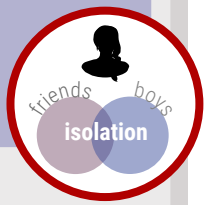
Stereotypes

Children as young as 6 associate **math = boy** implicitly & explicitly[8]



Connections to female STEM colleagues are seen as **low value**[9,10]

Girls may fear being **doubly isolated** by boys in STEM & girls outside of STEM[4]



Our core objective is to design interventions that directly increase girls' identity fit & interest in STEM, & improve the climate by reducing boys' stereotyping.

Our Interventions & Results[1]

We studied several middle school science camps (1200+ participants) over 3 summers.

For Girls

Baseline: boys' interest & current/future fit in STEM > than girls

Female STEM role model shared stories of:

Communal values

Self-expression in STEM

Inclusion by STEM boys & non-STEM girls

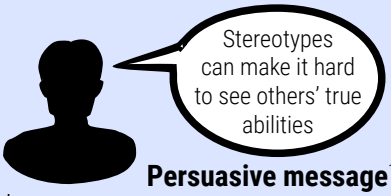
Result: improved girls' identity fit & interest in STEM

For Boys

Baseline: boys stereotype girls as having lower STEM abilities

Near peer male STEM role model shared stories of:

Value affirmation (stalls potential backlash or defensiveness)[14]



Persuasive message[16] & anecdote from a **persuasive source**[15]

Result: boosted boys' belief in girls' STEM competence

Next steps: distributing intervention for boys to more settings; reiterating & refining girls' intervention.

Copyright © ESS 2020
For more information, visit: successinstem.ca

THE UNIVERSITY OF BRITISH COLUMBIA · UNIVERSITY OF TORONTO · UNIVERSITY OF WATERLOO · SFU SIMON FRASER UNIVERSITY

Reducing Boys' Gender Bias & Improving Girls' Anticipated Fit in STEM

ENGENDERING SUCCESS IN STEM

References

1. **Cyr, E. et al. (in prep). Debiasing boys: Value affirmation and latent ability.**
2. Schmader, T. & Sedikides, C. (2017). State authenticity as fit to environment: The implications of social identity for fit, authenticity, and self-segregation. Personality and Social Psychology Review, 22(3), 228-259. doi:10.1177/1088868317734080
3. Diekman, A. B., Steinberg, M., Brown, E. R., Belanger, A. L., & Clark, E. K. (2017). A goal congruity model of role entry, | engagement, and exit: understanding communal goal processes in STEM gender gaps. Pers. Soc. Psychol. Rev. 21, 142-175. doi:10.1177/1088868316642141
4. Cheryan, S., Lomard, E.J., Hudson, L., Louis, K., Plaut, V.C., & Murphy, M.C. (2019). Double isolation: Identity expression threat predicts greater gender disparities in computer science. Self and Identity, 19(4), 412-434. doi:10.1080/15298868.2019.1609576
5. Fredericks, J.A., & Eccles, J.S. (2002). Children's competence and value beliefs from childhood through adolescence: Growth trajectories in two male sex-typed domains. Developmental Psychology, 38, 519–533. doi:10.1037/0012-1649.38.4.519
6. Herbert, J. & Stipek, D. (2005). The emergence of gender differences in children's perceptions of their academic competence. Journal of Applied Developmental Psychology, 26(3), 276-295. doi: 10.1016/j.appdev.2005.02.007
7. Walton, G.M. & Spencer, S.J. (2009). Latent ability: Grades and test scores systematically underestimate the intellectual ability of negatively stereotyped students. Psychological Science, 20(9), 1132-1139. doi:10.1111/j.1467-9280.2009.02417.x
8. Cvencek, D., Meltzoff, A.N., & Greenwald, A.G. (2011). Math-gender stereotypes in elementary school children. Child Development, 82(3), 766-779. doi:10.1111/j.1467-8624.2010.01529.x
9. Hewlett, S.A., Luce C.B., Servon L.J., Sherbin, L., Shiller, P., Sosnovich, E., & Sumberg, K. (2008) The athena factor: Reversing the brain drain in science, engineering, and technology. New York, NY, USA: Center for Work–Life Policy.
10. Ibarra, H. (1992). Homophily and differential returns: Sex differences in network structure and access in an advertising firm. Administrative Science Quarterly, 37(3), 422–447. doi:10.2307/2393451
11. Bell, A.E., Spencer, S.J., Iserman, E., & Logel, C.E.R. (2003). Stereotype threat and women's performance in engineering. Journal of Engineering Education, 92(4), 307-312. doi:10.1002/j.2168-9830.2003.tb00774.x
12. National Center for Education Statistics. (2019). Status and trends in education of racial and ethnic groups, indicator 26: STEM degrees [Data set]. https://nces.ed.gov/programs/raceindicators/indicator_reg.asp
13. Corbett & Hill (2015). Solving the equation: The variables for women's success in engineering and computing. American Association of University Women. https://cra.org/crn/2015/04/solving_the_equation_the_variables_for_womens_success_in_engineering_a/
14. Sherman, D. K., & Cohen, G. L. (2006). The psychology of self-defense: Self-affirmation theory. In M. P. Zanna (Ed.), Advances in experimental social psychology: Vol. 38. Advances in experimental social psychology, Vol. 38 (p. 183–242). Elsevier Academic Press. doi:10.1016/S0065-2601(06)38004-5
15. Kline, S.L., & Clinton, B.L. (1998). Developments in children's persuasive message practices, Communication Education, 47(2), 120-136. doi:10.1080/03634529809379117
16. Cacioppo, J.T., & Petty, R.E. (1984). The elaboration likelihood model of persuasion. In T.C. Kinnear (Ed.) NA - Advances in Consumer Research Volume 11, (p. 673-675). Provo, UT : Association for Consumer Research.

About Project PRISM

How can we make STEM a more attractive and meaningful option for adolescent girls and boys alike? Project PRISM (Promoting Rising Inclusion and STEM Motivation) investigates best practices for boosting girls' belonging in STEM, while bolstering boys' respect for girls' abilities. To combat obstacles girls may face in pursuing a STEM career, Project PRISM tests interventions that: (1) change boys' beliefs about girls via implicit bias training and presenting real evidence that test scores underestimate girls' abilities, (2) expose girls to successful role models who share their values and preferences, and (3) encourage girls to identify with STEM by recognizing that a STEM career can help them accomplish some of their most cherished goals.

About Engendering Success in STEM (ESS)

Engendering Success in STEM (ESS) is a research partnership focused on evidence-based solutions to foster positive working environments for people in STEM (Science, Technology, Engineering, and Math). We bring together social scientists, STEM experts, and stakeholders in STEM industry and education to use an evidence-based approach to break down barriers people face on their pathway to success. Canada's Social Sciences and Humanities Research Council reviewed and funded this project.

Copyright © ESS 2020

For more information, visit:
successinstem.ca

THE UNIVERSITY OF BRITISH COLUMBIA
UNIVERSITY OF TORONTO
UNIVERSITY OF WATERLOO
SFU SIMON FRASER UNIVERSITY