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Notes from NCER & NCSER

Gender Stereotypes in STEM: Emergence and Prevention (/blogs/research/post/gender-stereotypes-in-stem-emergence-and-prevention)

📅 April 9, 2021 👤 Blog Editor (http://ies.ed.gov/blogs/research/author/blogeditor) 💼 NCER (/blogs/research/category/NCER)

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In 2018, Dr. Allison Master and co-PI Andrew Meltzoff were awarded a grant, Gender Stereotypes in STEM: Exploring Developmental Patterns for Prevention (https://ies.ed.gov/funding/grantsearch/details.asp?ID=2173)*. This 4-year project explores how and when gender stereotypes about STEM career pathways emerge. The study also seeks to identify ways to mitigate the effects of such stereotypes, such as whether a growth mindset can lead to changes in student attitudes and outcomes toward STEM. As an undergraduate student majoring in microbiology at UCLA, Yuri Lin, virtual intern at NCER, was interested in learning more about gender inequalities and stereotypes in STEM education. She recently had a chance to talk with Dr. Master about her research and its implications for increasing STEM participation among women.*

How is American culture affecting the STEM gender gap, and how does the US compare to other countries on this issue?

When children grow up in American culture, they see lots of TV shows and books where mathematicians, scientists, and engineers are men (https://seejane.org/wp-content/uploads/portray-her-full-report.pdf). STEM-based toys are also heavily marketed toward boys (https://search.proquest.com/openview/eaa5f665af 82e76329798e40e2b4fbcf/1?pq-origsite=gscholar&cbl=18750&diss=y) rather than girls. Some countries have begun changing the portrayal of gender stereotypes in the media. For example, the UK's Advertising Standards Authority has recently started banning TV commercials that reinforce gender stereotypes. Some cross-national studies have shown that gender-STEM stereotypes favoring men are linked to women's lower success (https://www.pnas.org/content/106/26/10593.full? sid) and participation (https://eric.ed.gov/?id=EJ1071507) in STEM. The United States is one of many Western countries in which women have more equality (https://www.pnas.org/content/117/49/31063? casa_token=Ui2xOT3ttLsAAAAA%3AisdgYeuY2dWLed0K_-PvABzggsO-iqgSlwkEPal31QOn3mbA7mllaa_lZDyP2riA98lvu5SiywyK2Wl) and freedom to choose their careers but are much less likely to choose STEM careers than men. We still have a lot of work to do in the United States to break down barriers for women in STEM, and we need to focus on helping girls and women see the value in choosing pathways into STEM.

Why do you think it is important to examine growth mindset as a potential way to reduce the effects of stereotypes and increase STEM interest in students?

Growth mindsets are beliefs that personal characteristics can be changed (http://studentexperiencenetwork.org/wp-content/uploads/2015/09/Praise-That-Makes-Learners-More-Reslient.pdf), through effort or the right strategies. This is contrasted with fixed mindsets, which are beliefs that those characteristics can't be changed. Growth mindsets are particularly helpful for struggling students. Students who have a growth mindset remain focused on learning rather than looking smart (https://srcd.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1467-8624.2007.00995.x? casa_token=KjyHaOPldLMAAAAA:ZZXjeu4zlj_rhdOKk7r9RPzUl6FvxgCBbkZxhLdUhio9yysqfm 24ot9mspsLoZjqbfDVbBNhOkGUj_5z), believe effort is important, and stay resilient even when

they experience setbacks. These attitudes translate into putting forth more effort and determination, which lead to greater success. In our project, we want to know if a growth mindset can help girls stay motivated in computer science, a subject that can have a steep learning curve. Girls in particular (https://web.apsanet.org/cswp/wp-content/uploads/sites/4/2015/08/bian-lin-et-al.-gender-stereotypes-abt-intell-ability-emerge-early-Science-Jan-2017.pdf) often get discouraged when they feel that they don't have what it takes (https://cpb-us-e1.wpmucdn.com/blogs.uoregon.edu/dist/4/2521/files/2013/03/Smith-et-al-2012_PSPB-27izus0.pdf) to succeed in STEM. We hope that teaching girls to have a growth mindset will protect them from these negative stereotypes and increase their confidence in themselves and their sense of belonging in computer science.

Considering that your project includes students from grades 1 to 12, how do you plan to share your findings with teachers, students, and policymakers? Are there differences in how you might communicate the information for different age groups?

As a developmental psychologist, I think it's important to communicate the information about different age groups to everyone! It can be very valuable to frame student motivation in the broader context of how students are growing and changing. Students start to endorse stereotypes about computer science and engineering very early—Grades 1-3—so elementary school is a great time to start counteracting stereotypes by showing a broad representation of who enjoys and succeeds in STEM. We start to see big gender gaps in computer science interest during middle school, so this is a great time to have girls participate in fun and engaging coding classes. And we've already noted how important it is for girls in high school to have a growth mindset in their STEM classes.

We have different goals for communicating with teachers, parents, and policymakers. We know that teachers are very busy, so we try to condense things into the most important practical tips. We've made short videos (https://www.youtube.com/watch?v=uh0qPTD2CLk) and infographics about our research for teachers. For policymakers, we write policy briefs, which combines our research with other findings that are relevant to education policy. And when we talk to parents (https://youtu.be/0FfT8xaZIVQ), we try to focus on the importance of the experiences they provide for their kids. We really value spreading the word about our research to make sure it reaches people who can use it to make a difference. For more information and access to the various resources, please visit the I AM Lab website. (http://depts.washington.edu/iamlab/index.html)

Allison Master (http://depts.washington.edu/iamlab/about.html)*, PhD (@AllisonMaster* (https://twitter.com/AllisonMaster)*), a developmental psychologist and an assistant professor at the University of Houston, has conducted extensive research on the development of motivation*

and identity in STEM education.

Written by Yuri Lin (ylin010101@g.ucla.edu (mailto:ylin010101@g.ucla.edu)), intern for the Institute of Education Sciences and a Microbiology, Immunology, and Molecular Genetics major at UCLA.

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