Closing the STEM Gap for Girls

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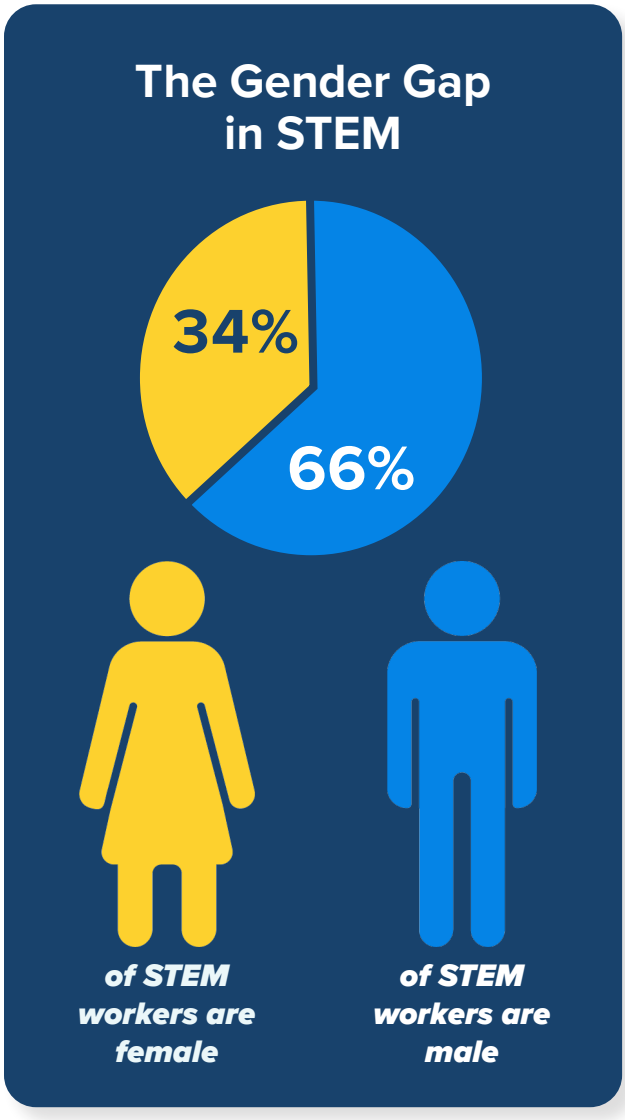
> If you know you are on the right track, if you have this inner knowledge, then nobody can turn you off... no matter what they say.
>
> Barbara McClintock
> Cytogeneticist and Nobel Prize Winner in Physiology or Medicine

It is an exciting time to be alive. Technology is rapidly changing our world, reaching more communities and providing access to more people than ever before. Unprecedented technological developments, including AI, innovative new business models, and evolving work cultures are shaping a promising future with more possibilities for all. The potential is real. We need to ensure that the opportunity is real, too.



Source: National Girls Collaborative Project

Women should have greater participation and impact than they do now and have the wholehearted support of all their colleagues in the workplace so that future innovations are as richly distinct and dynamic as the society we live in—which will be made stronger and more vital as a result. We need to prioritize access to high-quality STEM education for all students to enhance the opportunities they need to take their place in science, technology, engineering, and mathematics (STEM).

A stronger STEM workforce will provide economic benefits that improve life outcomes. But even more important, it brings us closer to fulfilling the promise of technology to empower individuals and communities, and to democratize opportunity. If we can achieve this, we can advance the vision and promise of America.

Girls and STEM: Breaking Down the Barriers

With the need for STEM jobs expected to grow by 11 percent through 2032, the U.S. will have more than 1 million STEM occupations to fill.[1]As Lakshmi Puri, Assistant Secretary-General of the United Nations, noted, "For too long, discriminatory stereotypes have prevented women and girls from having equal access to education in science, technology, engineering and math (STEM). As a trained engineer and former teacher, I know that these stereotypes are flat wrong. They deny women and girls the chance to realize their potential—and deprive the world of the ingenuity and innovation of half the population."[2]

The sentiment is solid, but the fact is that only 34 percent[3] of the STEM workforce today is female, and that needs to change. Beyond the availability of interesting positions and the opportunity for women to contribute to global progress, filling those positions means more women will likely earn more equitable salaries since STEM occupations tend to see the smallest wage gap between men and women.[4]

Girls are interested and participate in STEM courses at high rates. But they are much less likely to aspire to a STEM career.

Can we change this interest into action?

Source: National Girls Collaborative Project

Research by The National Girls Collaborative Project shows that the achievement levels of girls and young women in math and science is at the same level as that of boys. Yet there is a notable difference in their interests, confidence, and sense of belonging in the STEM areas. If we follow young women's choices in higher education and careers, we see less women with STEM degrees and careers. How can we encourage girls to pursue their interest in STEM and overcome barriers, both self-imposed and cultural?

We've identified three clear solutions to help close the STEM gap for girls.

- The Inclusion of Female Role Models and Mentors
- Real-World and Cross-Curricular Connections (STEAM)
- Expansion of STEM Opportunities and Programs for Girls

> Every girl deserves to take part in creating technology, that will change our world and change who runs it.[5]

"

Malala Yousafzai,

Teenaged Co-Winner of the 2014 Nobel Peace Prize

Inspiring Girls with Role Models and Mentors

In alignment with what we know girls say about the desire to help people, women are motivated to prioritize helping others as part of their career choice.[6] Girls and young women need to understand that occupations in mathematics, engineering, and computing are places where they can actualize their aspirations of making a difference in work environments that emphasize communal goals and collaboration. That happens when we consciously provide female role models and mentors in those types of careers.

Female role models can also encourage girls who have a confidence issue in STEM areas of study. In fact, Gen Z females are nearly 20 percent more likely than males to say they are not interested in a STEM career because they don't believe they will be good at it.[7] The more female STEM role models these girls see in their daily lives, the more likely they will overcome their hesitancy and lack of confidence.

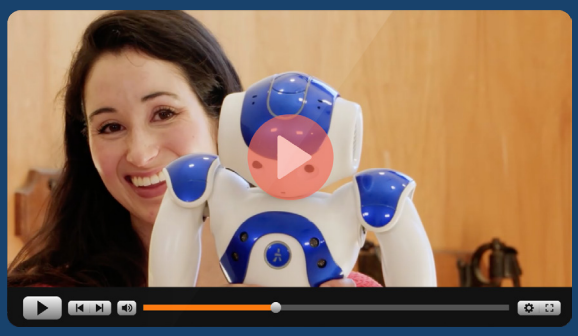
Lastly, as girls begin to consider college majors and careers, it's critical that STEM jobs are presented to them as realistic and desirable options. The lack of female role models can reinforce the male "computer geek" stereotype that unfortunately dissuades girls and young women from STEM pursuits,[8] even though the earliest computer programmers were mostly female.

Once women reach college and enroll in classes, it's critical they connect with female role models and mentors to help them persevere in STEM majors. Research from several disciplines suggests that the presence of female peers and faculty members[9] increases female retention in STEM majors.

The good news is that there are organizations actively providing STEM role models and mentors for girls, including The IF/THEN Collection, The STEM Careers Coalition, Techbridge Girls, Girls Who Code, and SheHeroes, to name a few. They are a part of a growing movement to lift girls and young women into more STEM opportunities and show them that STEM leaders today can, and do, look just like them.

Astronaut Sally Ride summed it up best: **"If you can't see it, you can't be it!"**[10] Stereotypes and self-limiting ideas should not stand in the way of girls' ambition, abilities, and deep desire to contribute to their world.

Inspiring Women Are Making a Difference

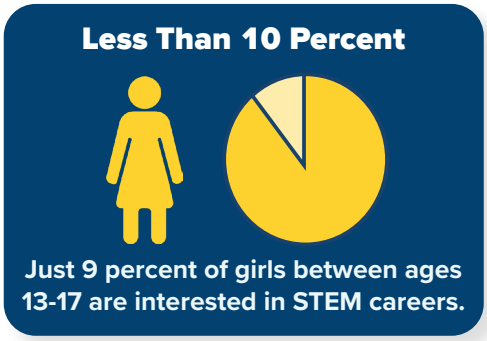


Girls of all backgrounds can be encouraged to pursue a wide variety of STEM careers with role models like robot choreographer Catie Cuan.

More Female Role Models Means Less Social Pressures

Research[11] suggests that girls may prefer to study language, arts, and humanities over math and science because they believe, often on an unconscious level, that demonstrating ability in stereotypically male areas makes them less attractive. Researcher Lora E. Parks said, "Women are exposed to sociocultural messages about the importance of being attractive and especially attuned to these goals in young adulthood. That's precisely the time that women start to show less interest in STEM fields."[12]

The decrease in girls' math achievement during middle school coincides with a range of new interests and social pressures, which may impact their engagement with STEM subjects. Teachers can include more female STEM leaders in everyday lessons to shift perceptions of what a typical scientist and engineer looks and sounds like. By demonstrating to students that a woman in a STEM career can successfully balance family commitments with professional and personal interests, one can break down the stereotype that a STEM career means sacrificing in other segments of their lives.



Source: Junior Achievement USA

Putting the "M" in STEM First—and Adding an "A."

Even when girls do focus their interests on the arts and humanities over math and science, we can help them understand the importance of mathematics in all fields. Math is not only the language that makes science, technology, and engineering fields accessible, it also holds them together. It is important in its raw form, and it is an essential component of the arts and to designing solutions to issues that affect our daily lives.

Most girls and young women identify as creative and want to have an impactful job that helps the world. But relatively few see STEM careers as a way to pursue these interests.[13] Weaving the arts into STEM education can spark girls' curiosity and involvement and can demonstrate how they can use STEM skills in the areas of design, performing arts, and creative planning. An integrative approach may also help revive the interest that girls already have, but often fail to pursue.

"Incorporating the A in STEAM—art—brings in personal expression, empathy, meaning-making and the purpose of what you're learning," states Dr. Kristin Cook, associate dean of Bellarmine's Annsley Frazier Thornton School of Education and longtime science educator. [14]

Cross-curricular connections between arts and STEM give girls the opportunity to see real-life applications of technology and sciences in a way that appeals to their creative identities and sense of wanting to help others.

> Sciences provide an understanding of a universal experience; Arts is a universal understanding of a personal experience... they are both a part of us and a manifestation of the same thing... the arts and sciences are avatars of human creativity.[15]
>
> Mae Jemison,
>
> Astronaut, Chemist, Biologist, Accomplished Dancer, and Humanitarian

Connecting Creativity with Confidence

Creativity is a driving force of innovation. And being creative sometimes means being bold and confident. However, some of our brightest girls have STEM abilities, but they do not necessarily have the confidence to follow through on their goals. Researcher Carol Dweck[15] from Stanford University found that “bright girls believe that their abilities are innate and unchangeable, while bright boys believe they can develop ability through effort and practice.” Girls need to understand—be taught—that “mistakes” are great, allow our creativity to flourish, and are part of the pathway to the right answer. Dweck has found that interventions to help girls understand how the brain works can help them reset their thinking, counteract stereotypes, and raise achievement in math or science. “Every time [girls] stretch out of their comfort zone, do hard things, stick to hard things, their brains form stronger and stronger connections and over time, their abilities can grow.”[16]

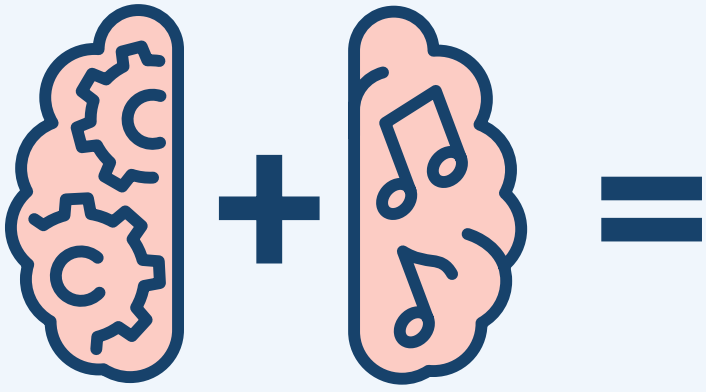
As Dweck points out, showing girls that they can acquire skills that they originally believed to be natural talent, and more importantly how to acquire those skills, can greatly increase their confidence and opportunity to pursue a career in STEM.

The combination of analytical and creative skills is a powerful thing. It results in a person who can present innovative new ideas and find a creative way to make those ideas a reality, especially if she is driven by a greater purpose to help others.

Four Things You Can Do to Help Girls Succeed in STEM

A TED Talk by Pretty Brainy Founder and CEO Heidi Olinger

STEAM education will create a generation of problem solvers ready for the future workforce.



Innovator and problem solver

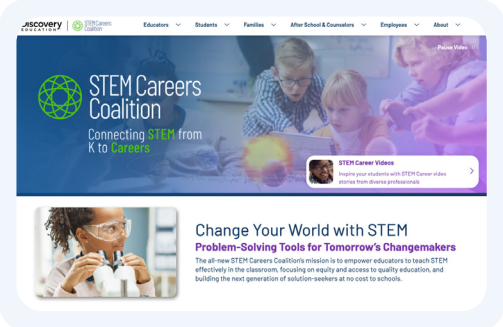
Expanding STEM Opportunities and Programs for Girls

There are many more STEM opportunities and programs for girls and young women than just a few years ago. And while there has been a modest increase in women in STEM careers, the disconnect between girls' interest in STEM and their realization of a career in STEM still exists.

We must not forget that learning goes beyond the classroom—into the after-school activities, home life, and communities of students. Involving these areas in STEM education would logically help expand STEM opportunities for girls and allow them to make real-world, personal connections between their STEM interests and career aspirations.

There are many ways to expand STEM opportunities and programs for girls. Here are a few pro-active steps any education leader can take to help overcome STEM gaps for girls.

Partner with local organizations for STEM-related activities, mentorships, and apprenticeships. Especially organizations that have women leaders.



The STEM Careers Coalition: Connecting STEM from K to Careers

Expand STEM curriculum to include real-world applications that improve lives, like AI. This will increase student engagement and better prepare them for the future workforce.

> Our AI program is 4 weeks and covers everything from ethics and core AI principles to creative applications and career options. We created this to help all students, especially girls, see the potential in STEAM and how they can be an integral part of the future workforce.
>
> Dr. Elizabeth Álvarez
>
> Superintendent of Forest Park School District 91, IL

Review policies and traditional course requirements. Are programs setting up certain student groups for failure? Or is there flexibility to encourage participation in STEM?

> Kids aren't going to 'break' the course, even if they are struggling. So why would we deny them access because a 'gatekeeper' decided what the course requirements are? We have to challenge some of those policies that restrict too much and don't give all students a fair opportunity to show us their potential genius.
>
> Dr. Monique Darrisaw-Akil, Superintendent of Schools at Uniondale Union Free School District

Build a support system for girls in STEM that goes beyond the school day. For example, a summer bootcamp can help prepare students for advanced courses in math and science.

Establish STEM clubs for girls that give them a sense of belonging and encourage them to participate in STEM challenges, competitions, and scholarships, like the 3M Young Scientist Challenge.

> For as long as I can remember, I've wanted to help people. I enjoy solving problems.
>
> Laasya Acharya
>
> 2020 3M Young Scientist Challenge Finalist

Involve the family and community. Research shows that when girls are encouraged by their parents, teachers, and local community, their interest and success in STEM grow significantly.[17]

Opening Doors: Tomorrow's STEM Enabled by Today's Technology

Technology and its availability for anytime, anywhere learning is a powerful tool to break down barriers for all students, boy or girl, rich or poor, no matter where they live or how they learn. It allows students to be involved in their own acquisition and demonstration of knowledge using technology, and with the support of their teachers and mentors in a way that is not limited by traditional means of demonstrating mastery.

If you have fourth graders ready for sixth-grade content, technology will help facilitate that. By providing the right digital tools and access, we can satisfy the natural curiosity and thirst for knowledge that girls have, and foster a lifelong love of learning for math, science, or any other area—to unlock their learning potential and in doing so, unleash their innate human capabilities. With greater access to online resources, girls can also seek out more female role models in STEM careers who would otherwise be difficult to meet.

Every child should be well-equipped to embrace their interest in STEM-related careers and effectively close the equity gap. A key component of closing that gap is involving the community and providing ease of use and accessibility, so students can learn inside and outside of the classroom—and at their own pace and level. Additionally, online tools can allow girls to find other female students interested in the same problems or creative solution seekers to form smaller communities to support their ideas in the STEM space.

The role of learning technologies like those offered by Discovery Education and strategic partnerships like the STEM Careers Coalition is to empower and engage all learners—especially girls—to take full advantage of next-generation learning experiences.

When we help girls reach their full potential, everyone wins.

Girls Can Become Real-World Problem Solvers with the Right Support

Leanne Fan, the 2022 Winner of the Young Scientist Challenge, shows how her creativity and interest in STEM led to an innovative idea addressing hearing loss.

Learn more about the power of technology and strategic partnerships to provide greater education experiences for all students.

Discovery Education Technology Solutions

Corporate Education Partnerships

Powered by investments from the corporate community and anchored in schools by Discovery Education, the STEM Careers Coalition reaches nearly 3 million students every school year in thousands of school districts across the nation.

STEM Careers Coalition

About Amy Gensemer

Amy has 23 years of educational experience in Science, Technology, and Engineering as a high school classroom teacher, department chair, district curriculum specialist, and teacher coach. Most recently, she served as supervisor for Science, Technology, and Engineering for the largest school system in Maryland.

At the district level, Amy started a Girls in Engineering summer camp program for middle school girls to provide them opportunities to learn upper-level course content, as well as interact with female high school engineering teachers and professionals. Additionally, Amy served as the K-12 liaison to the Women in Engineering board with the University of Maryland, focused on recruiting and retaining female engineering students at the post-secondary level.

Prior to her supervisor position, Amy designed and delivered STEM professional development at the national level and authored national STEM curriculum materials. At Discovery Education, she uses her numerous years of experience in education and the technology space to design and create highly engaging and impactful core instructional materials used globally. She has served as a co-leader of the Women at Discovery Education employee group and is currently an active member of the leadership planning group aimed at elevating and supporting women in the company.

About Discovery Education

Discovery Education is the worldwide edtech leader whose state-of-the-art digital platform supports learning wherever it takes place. Through its award-winning multimedia content, instructional supports, innovative classroom tools, and corporate partnerships, Discovery Education helps educators deliver equitable learning experiences engaging all students and supporting higher academic achievement on a global scale. Discovery Education serves approximately 4.5 million educators and 45 million students worldwide, and its resources are accessed in over 100 countries and territories. Inspired by the global media company Warner Bros. Discovery, Inc. Discovery Education partners with districts, states, and trusted organizations to empower teachers with leading edtech solutions that support the success of all learners. Explore the future of education at **www.discoveryeducation.com.**

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