



## Portray Her 2.0: An Analysis of 15 Years of Women in STEM On-Screen, 2007–2022

The subject of this study is if and how entertainment media perpetuates STEM representation inequalities. We initiated this research because entertainment media shapes our self-perception and how we view others. This includes influencing our attitudes towards STEM and our beliefs about who can pursue STEM interests. In the U.S., women are still significantly underrepresented in STEM fields, a situation partly attributed to prevailing perceptions about STEM.

For this study, we collaborated with IF/THEM® (an initiative of Lyda Hill Philanthropies) to analyze the portrayal of women in STEM on screen over 10 years, from 2007–2017. We also include a survey of girls and young women (in middle school, highschool, and college), to better understand their STEM experiences and the role of fictional STEM characters on their STEM interests and ambitions.

Below is a summary of our main findings, as well as recommendations to equip members of the entertainment industry with insights to bring more diverse and nuanced STEM portrayals to screens, everywhere.

# Main findings:

## **On-screen, men in STEM still outnumber women in STEM. From 2007–2017, 37% of STEM characters were women.**

From 2018–2022, 38% of STEM characters were women. There has been little change in women's representation of STEM characters for all levels of prominence.

## **There has been a big increase in STEM characters of color.**

From 2007–2017, 29% of STEM characters were people of color. From 2018–2022, that number increased to 42%. This change, however, was concentrated in medical professions and not seen across STEM fields.

## **In newer films and TV shows, women are shown in more diverse STEM fields.**

From 2007–2017, nearly 66% of female characters in STEM were in the life sciences (primarily the medical field). From 2018–2022, about 56% of female characters in STEM were shown in the life sciences. There was a marked increase in female characters shown as engineers (from 2% to 13%), and computer scientists or programmers (from 7% to 15%).

## **In newer films and TV shows, more women in STEM are given the role of the villain.**

In films and TV shows from 2007–2017, men in STEM were eight times more likely than women to be villains (8% of all male STEM characters, compared with 1% of all female STEM characters). In films and TV shows from 2018–2022, men in STEM are still about two times as likely as women to be villains (11% of all male STEM characters, compared with 6% of all female STEM characters). Overall, this represents a sharp increase for women. This is important because villains are prominent roles and allow for more diverse STEM portrayals.

## Male STEM characters were more likely than female STEM characters to be professionally motivated by selfish reasons.

In film and TV from 2018–2022, male STEM characters were more likely than women to be motivated by glory, pride, or financial gain (22% compared with 13%), which reinforces a gendered depiction of STEM pursuits as well as potentially harmful norms surrounding masculinity.

## Well-known STEM tropes, like the “mad scientist” or “unkempt” computer programmer, were rare.

But 11% of STEM characters were “uncool” and 12% were shown to have “innate” talent, both of which are depictions that are likely to discourage girls and young women from STEM pursuits.

## More girls and young women want to see female STEM characters on-screen.

In 2023, 71% of survey respondents agree that it is important to have female representation of STEM characters on-screen, a 20-percentage-point increase from 2018. Additionally, most girls and young women say that they enjoy watching movies or television shows about STEM-related topics (62%) and wish there were more female STEM characters in movies and on TV (72%).

## Girls and young women think most STEM characters on TV are men.

Characters who play civil engineers, software developers, and mathematicians are overwhelmingly recollected to be portrayed by men, suggesting that viewers are taking note of women’s underrepresentation on-screen.

## STEM characters played by women of color have a positive impact on young women of color who are watching.

Among respondents of color, 72% said that Shuri and 68% said that Riri Williams (characters in *Black Panther: Wakanda Forever*) had a positive influence on their interest in STEM, compared with 52% of white respondents who said the same for both characters. This finding points to the importance of audiences seeing a character they identify with, especially with respect to race/ethnicity.



## Recommendations

### **What role can entertainment media play in fostering more gender inclusion in STEM?**

Because media representations of STEM careers impact young audiences by shaping their career ambitions, there is a critical need for media to actively and intentionally avoid inaccurate and potentially harmful stereotypes when creating stories, and instead write authentic and aspirational STEM characters.<sup>1</sup> We present the following recommendations to disrupt pernicious STEM stereotypes in hopes of ushering in a more diverse STEM workforce.

1. Steinke, J., Lapinski, M. K., Crocker, N., Zietsman-Thomas, A., Williams, Y., Evergreen, S. H., & Kuchibhotla, S. (2007). "Assessing media influences on middle school-aged children's perceptions of women in science using the Draw-A-Scientist Test (DAST)." *Science Communication*, 29(1), 35-64.

## 1. Diversify STEM careers for women on-screen.

STEM careers are multifaceted and diverse, but research shows gender gaps vary greatly, depending on the field. This report revealed that in reality and on-screen, women are represented most in life sciences, such as medical careers. But showing girls and women with an array of STEM interests and careers, such as engineering, computer science, and mathematics, will broaden girls' and young women's imaginations about what is possible. Branch out beyond the life sciences when thinking about female characters' STEM interests and professions.

## 2. Don't overlook representation in minor and background roles.

Girls and young women think it's more important than ever to see women in STEM (up from 51% in 2018 to 71% in 2023). But our survey suggests they may overestimate gender imbalance in STEM on-screen relative to reality. We encourage creators to think broadly about representation and include women not only in leading and supporting roles, but also in minor and background roles to further disrupt the perception that STEM professions are dominated by men.

## 3. Intersectionality matters.

Our survey found that STEM characters of color were more influential for girls and young women of color than for white STEM characters. When casting female STEM characters, remember the significance of race, gender, ability, LGBTQIA+ identity, body size, and age, and portray women in STEM on-screen with diverse identities.

## 4. Model work-life balance among STEM characters.

Perceptions that STEM careers are family-friendly are increasing (from 49% in 2018 to 56% in 2023) but remains relatively low. Model work-life balance to highlight the reality of STEM professionals of all genders, many of whom are primary caregivers in their families.

## 5. Disrupt gender stereotypes when writing STEM characters.

STEM characters that possess mainly male-coded traits, such as reason, rationality, autonomy, and lack of empathy, reinforce gender bias in STEM portrayals. Create dynamic depictions of STEM character personalities by showing men and women with male and female-coded traits, and recognize the value within each of these categories.

## **6. Portray STEM skills as learned, not innate.**

Show STEM characters learning in the classroom, making mistakes, and building skills. Our study shows that STEM was sometimes shown as an innate ability, which can reinforce the idea that STEM experts come to that skill naturally, and this notion can discourage young people from pursuing STEM if they struggle even a little. Studies show that perceiving STEM as an innate rather than learned skill disproportionately discourages female students and students of color from pursuing STEM professions. Although STEM savants can be fun characters, their overrepresentation can have negative repercussions.

## **7. Write STEM characters and careers in ways that appeal to young girls and women by highlighting collaboration and the ways STEM is important to society.**

A powerful way to attract girls and young women to STEM careers is by showing that these fields align with values of girls and young women. Based on findings from this study, we suggest showing STEM industries and careers as more family-friendly, STEM work as in pursuit of the greater social good, professionals working together, and environments that are safe for women and girls from marginalized communities (e.g., disabled women, women of color).