



**unesco**

# **UNESCO CALL TO ACTION**

# **CLOSING THE GENDER GAP IN SCIENCE**

# Introduction

---

Today, just one in three scientists is a woman. Achieving gender equality in science will be essential if we are to address the complex global challenges we face, such as climate change, biodiversity loss, extreme poverty and the need for ethical approaches to artificial intelligence. The complexities of the 21st century require multifaceted approaches and new perspectives, making it imperative for both men and women to contribute to science. Despite some progress in recent decades, gender equality in science remains elusive, particularly in certain disciplines and countries.

Lack of gender equality in science is not just a problem that affects women. It also limits scientific progress and hampers a country's development and its efforts to build peaceful societies [i]. Achieving gender equality in science is all the more necessary today as we witness backsliding in some countries with regard to equal access to education and knowledge as well as increased numbers of women scientists living in conflict and disaster-hit areas.

This *Call to Action* is addressed to the global community: to policy-makers and decision-makers at the level of governments, universities, research and educational institutions, funding organizations, philanthropic organizations and the private sector.

It is a call to ensure that girls are never discouraged from pursuing their aspirations to become scientists and to convey to them that such goals are indeed attainable. It is also a call to dismantle the barriers that hinder women from realizing their full potential in science, in order to break the glass ceiling that prevents them from attaining leadership positions in scientific systems across the world.

This *Call to Action* builds on the insights and analyses that emerged from the Global Forum on 'The Future for Women and Girls in Science' [ii] organized by UNESCO in June 2023. It integrates contributions from a multitude of stakeholders, including representatives of international organizations, government institutions, non-governmental organizations and academia as well as from both the private and public sectors. Through these reflections, key challenges and factors have been identified, which form the basis for the subsequent recommendations aimed at tackling the root causes of the gender gap in science.

# Current Status of Women and Girls in Science

---

## *Status around the world*

Globally, women constitute approximately one third of scientific researchers, a ratio that has demonstrated minimal variation over the past decade [iii]. At the upper levels of scientific hierarchies, this proportion declines: for instance, only 12% of the members of the national academies of science are women [iv]. These percentages vary among countries, with no specific correlation between a country's wealth and its success in achieving gender parity in science [v].

The percentage of women scientists varies by region. According to the latest data from the UNESCO Institute of Statistics, this ranges from 23% of female researchers (in head counts\*) in South Asia to 27% in Southeast Asia, 32% in sub-Saharan Africa, 34% in the European Union, 41% in Arab States, 44% in Latin America and the Caribbean, 47% in Central Asia and 52% in Southeast Europe.

However, not all countries have reliable data, limiting reporting on the extent of gender gaps in science. In the dataset gathered by the UNESCO Institute of Statistics, 98 countries have not supplied data for the period 2018 to 2021.

The gender gap varies across scientific disciplines. Some fields, such as physics, tend to attract more men than women, whereas life sciences and health disciplines often showcase a more balanced gender distribution and, in some countries, a majority of women [vi]. The gaps are greatest in engineering and computer science. Globally, women composed only 28% of engineering graduates and 40% of computer science graduates in 2018 (latest available data) [vii]. In high-income countries, according to *Nature Reviews Physics*, the percentage of women in post-graduate physics positions has stalled at just below 20% [viii]. In general, women continue to constitute a minority within domains pivotal to propelling the Fourth Industrial Revolution and shaping the future landscape of the job market, such as in artificial intelligence where women constitute a mere 22% of professionals [ix].

\*Headcounts indicate the total number of persons employed in research and development. The headcount value includes staff employed both full-time and part-time.

## ***Factors contributing to these trends***

The observed differences in women's participation in science in various countries and scientific disciplines demonstrate that the gender gap in science is neither a product of innate differences between women and men nor correlated with a country's level of economic development. Rather, these differences mirror an array of societal factors and systemic barriers that hinder the access of women and girls to scientific careers. These barriers include social, cultural and gender norms which guide expectations and roles and which generate low levels of self-efficacy, lack of visible role models, underrepresentation in leadership roles, poorly qualified teachers, unsupportive learning environments and inadequate professional structures and work cultures [x]. All these factors contribute to the 'glass ceiling' phenomenon preventing women from rising to higher positions or achieving equal success compared to their male colleagues.

## **Call to Action**

---

The pursuit of gender equality in science, which includes breaking the glass ceiling in elevation to leadership positions, is not a distant aspiration; rather, it stands well within our reach. To attain it, we shall need concerted multistakeholder action in all sectors - public and private - to:

- **Dismantle gender stereotypes and biases in science**
- **Open educational pathways for girls in science**
- **Create workplace environments that attract, retain and advance women scientists**

# **01** Dismantling Gender Stereotypes and Biases in Science

*through the enhanced visibility of female role models*

## **Background:**

Gender stereotypes in the field of science are deeply ingrained through the socialization process, resulting in persistent gendered roles, expectations and bias in many countries across the world. These stereotypes erroneously perpetuate the idea that boys inherently excel in maths and science. Desirable traits for scientists, such as objectivity and rationality, are often erroneously considered solely male gender-normative characteristics [xi]. This misperception contributes to the belief that women, with their supposed 'communal' and less agentic traits, lack the qualities required to succeed in pursuing a career as a scientific researcher or in other science-related occupations [xii]. Gender biases can manifest themselves in prejudiced reference letters, unfair peer-review processes, underrepresentation in prestigious journals and limited invitations for women to speak at scientific gatherings, among other ways. These gender biases not only dissuade girls from considering scientific careers but also affect women's self-perception and retention in the field. Fortunately, these gender stereotypes can be dismantled through specific targeted actions, including those focusing on the younger generation [xiii].

## **Recommended actions:**

- **Include more discoveries and stories from female scientists, with images, in school textbooks** to establish a positive association between women and science from an early age and to recognize women's contributions to science.
- **Increase the presence of female scientists in the media** (newspapers, magazines, [community] radio[s], television and internet) **as well as in popular culture and the entertainment industry** to showcase the variety of science-related careers and dispel gender-based misconceptions.
- **Organize and provide funding for outreach activities featuring female scientists** to empower these women to share their professional journeys with the general public, as well as in formal and informal educational settings to support career orientation.
- **Ensure an equitable representation of women and men on relevant boards, committees and panels** to foster a culture of inclusivity within the scientific community.
- **Increase opportunities for women scientists to access research grants** and other sources of research funding.
- **Promote a global network and platforms for women scientists** to create meaningful professional networking connections worldwide.

## 02 Opening Pathways for Girls in Science

### *through innovative and inspiring educational strategies and initiatives*

#### **Background:**

A greater proportion of girls are currently enrolled in school than at any point in history; however, they often enjoy fewer opportunities than boys, hindering their ability to engage fully in, and benefit from, education according to their preferences. This inequality is particularly evident in science, technology, engineering and mathematics (STEM) education, where girls are already disadvantaged in early childhood care and education. By the time they reach higher education, women represent only 28% of engineering graduates and 40% of computer science graduates, for instance [xiv]. This gender gap in STEM education is a product of complex interactions between socialization and learning processes [xv]. Therefore, early intervention in a child's life is essential to ensure that every boy and girl can make choices about their education and career that align with their passions. Education plays a pivotal role in making the path to a career as a scientist seem both appealing and accessible. To establish an environment of equal opportunity and quality science education, both girls and boys must receive support in developing positive self-identities with regard to their capacity to do science [xvi].

#### **Recommended actions:**

- **Ensure that science is introduced into the curriculum from an early age**, beginning in pre-school, and that teachers employ methods that engage young learners, both boys and girls, in a playful and entertaining manner to spark their curiosity and to inculcate a culture of science from an early age.
- **Remove gender bias and stereotypes from teaching and learning materials** and support training for curriculum and textbook specialists to ensure gender-balanced and gender-equitable representation in learning materials as well as the promotion of gender equality.
- **Invest in rewarding excellent performance of girls in STEM subjects** through provision of scholarships, awards and other incentives.
- **Engage parents and primary caregivers through school-based or advocacy initiatives** to counter common misconceptions about science fields as well as gendered expectations that affect girls' identities, beliefs, behaviours and choices.

- **Prioritize interactive interdisciplinary and equal learning environments with hands-on experiments and activities** ensuring the participation of girls, taking advantage of existing digital tools, among others, to build a strong knowledge foundation while fostering a passion for inquiry and exploration.
- **Allocate resources for extracurricular STEM programmes**, including clubs, after-school activities, field trips and summer immersion programmes, to extend learning beyond traditional classrooms and expose learners to women in scientific fields.
- **Invest in specialized teacher trainings** to equip educators with the skills they need to provide quality interdisciplinary gender-responsive STEM education in an interactive and learner-friendly environment that dismantles the gender stereotypes and roles associated with distinct scientific disciplines.
- **Provide gender-transformative counselling and guidance** within formal and informal educational settings to expose students and their parents to myriad scientific careers and job opportunities, including through exchanges with female scientists who can act as role models and mentors.
- **Encourage businesses to implement corporate social responsibility initiatives** supporting women and girls in science through community outreach programmes and partnerships with educational institutions to support young women and girls pursuing careers in science fields.

# 03 **Creating Workplace Environments that Attract, Retain and Advance Women Scientists**

*through policies and actions that promote inclusion, diversity and equity*

## **Background:**

Achieving gender equality in science necessitates addressing ongoing workplace challenges. While some women may voluntarily opt to leave scientific careers, many do so due to unsupportive, biased or even hostile workplace cultures. Often, the lack of family-friendly, work-life balance measures and affordable childcare make it difficult for parents (mostly mothers) to stay in the system. In addition, instances of sexual harassment and inappropriate behaviour remain widespread in science, with one in two female scientists having reported experiencing sexual harassment at work in a 2022 study [xvii]. A shift in the structure and culture of science workplaces is urgently needed to attract, retain and advance women scientists. Encouragingly, fostering a diverse scientific workforce is increasingly viewed as a marker of investor confidence and excellence in the private sector [xviii].

One trend of concern is known as the ‘leaky pipeline’, in which the gender gap widens as women progress in their scientific careers. In academia, women's representation diminishes at each career stage, as women progress from doctoral students to early-career professors or lecturers, then to tenured professors and to directors of research, deans or other leadership positions. Women are also underrepresented in elevated positions in research governance structures, including in academies of science and science councils [xix].

## **Recommended actions:**

- ➔ **Enact evidence-based gender-responsive institutional policies**, including by:
  - **instituting mandatory training sessions on gender stereotypes and gender-responsive leadership** for managers, evaluation committees and recruitment officers to recognize and address implicit biases in their decision-making processes and underlying technologies, such as hiring, promotions and funding allocations;
  - **applying equal remuneration** for work of equal value **and mandating transparency** in pay and promotion decisions;
  - **prioritizing longer-term contracts** to support life choices and family planning;
  - **actively supporting work-life balance** by enhancing childcare support measures, improving maternity leave, paternity leave, adoption leave and shared parental leave benefits, and by providing flexible working hours and teleworking arrangements;
  - **establishing re-integration pathways** for women scientists whose careers have been affected by **motherhood and other family-related reasons**;
  - **establishing re-integration pathways** for female scientists whose careers have been **disrupted by harassment or discrimination**;
  - **monitoring the impacts of the gender-responsive policies** put in place.



→ **Take action against gender-based violence, including sexism and sexual harassment, by:**

- ▶ **implementing effective anti-harassment policies or strategies and clear human resources guidelines**, covering both prevention (training to address sexism and sexual harassment) and response (strict punishments for perpetrators), with thorough impact assessment;
- ▶ **establishing robust mechanisms and guidelines for reporting harassment** in a safe environment which is equipped with adequate support systems;
- ▶ **fostering a culture of accountability and collaboration** as opposed to supporting work environments that elevate individual team leaders to an 'untouchable' status and support an abuse of power.

→ **Promote women in leadership positions by:**

- ▶ **collecting and reporting gender-disaggregated data at each management level** to monitor and promote gender equality within organizations;
- ▶ **supporting open-access soft skills training programmes**, such as in leadership and negotiation, to enhance the professional development of female scientists;
- ▶ **increasing the number of female members of academies of science**, hence providing exemplary figures who inspire and pave the way for others;
- ▶ **developing accessible databases and platforms that identify and provide contact information** for female leaders in science to facilitate their involvement in panels, events and committees;
- ▶ **promoting collaborations among female scientists**, including through formal mentorship, sponsorship and networking programmes to allow them to share their experience with others and to facilitate collective learning.

→ **Foster collaborative research environments** that nurture group efforts, reward teamwork and incentivise excellence in research including that which addresses societal needs and benefits society at large, including the vulnerable and the most marginalized.

→ **Foster welcoming research environments** that provide training and opportunities for all participants within a culture of equality, building shared norms of gender equality through education, trainings and allyship endeavours for men and women in science.

→ **Encourage partnerships with female-owned or female-led businesses** in the science sector.

→ **Invest in collecting sex- and gender-disaggregated data on a regular basis at country level** to devise evidence-based policies and monitor progress in closing the gender gap. Such data should indicate female representation and inclusion among researchers and trainees across disciplines, educational levels and career levels.

# Conclusion

---

The path to achieving gender equality in science is not without its challenges, but it is a path well worth pursuing. While women and men both face difficulties along their scientific journey, some of these challenges are unique to the experiences of women. These hurdles often result from deeply ingrained societal norms and expectations. We are seeing visible progress as more women enter the scientific arena and ascend to excellence in science and advancement to leadership roles, but progress could stall if we lower our guard.

To pull down the barriers that women face, we must challenge stereotypes, biases and cultural expectations imposed by our gendered societies at the systemic level. We need to foster diversity of thought and insight, ensuring that young women are encouraged to pursue their scientific dreams without reservation and that meaningful careers await those who take this path. Science thrives on diverse voices and skills, so every woman with the potential to make groundbreaking or modest contributions to science should be supported in realizing her aspirations.

It is imperative that we move beyond discussion to take meaningful short-term and long-term steps. This *Call to Action* serves as a rallying cry for us to seize the opportunity provided by our growing understanding of gender-related issues in science and the current momentum to create an inclusive society in which women and girls are not deterred from entering science or held back in their progress. Even minor changes at the societal level, such as that of raising the visibility of women role models, can make a substantial impact. The actions recommended here cover a wide spectrum, ranging from innovative learning strategies and appropriate career counselling to role models, from enhancing inclusive and fair workplace environments to promoting women in leadership positions. These actions and their potential impacts have relevance far beyond the field of science.

Implementing these recommendations requires collaboration and partnership among diverse stakeholders, including governments, legislators, universities, research centres, non-governmental organizations, civil society and the private sector. Policymakers should prioritize the inclusion of women's perspectives to ensure well-rounded policy development.

We cannot assess our progress if we fail to collect and share information. Gathering sex and gender-disaggregated data on a regular basis at country level is essential to devise evidence-based policies and monitor progress in closing the gender gap. Many countries have initiated gender-equality specific policies in science, indicating their growing commitment to the cause.

With concerted efforts, we can pave the way for a future in which science truly knows no gender boundaries.

# Bibliography

- [i] Nair-Bedouelle, S. (2023). The Lack of Gender Equality in Science Is Everyone's Problem. *United Nations Chronicle*.
- [ii] For more information, please visit the following [event page](#).
- [iii] UNESCO. (2021). To Be Smart, the Digital Revolution Will Need to Be Inclusive: Chapter 3 in UNESCO Science Report: The race against time for smarter development. Paris.
- [iv] UNESCO. (2023). UNESCO in Action for Gender Equality: 2022-2023. Paris.
- [v] UNESCO. (2021). To Be Smart, the Digital Revolution Will Need to Be Inclusive: Chapter 3 in UNESCO Science Report. Paris.
- [vi] Pew Research Center. (2021, April). STEM Jobs See Uneven Progress in Increasing Gender, Racial, and Ethnic Diversity. Washington, D.C.
- [vii] UNESCO. (2021). To Be Smart, the Digital Revolution Will Need to Be Inclusive: Chapter 3 in UNESCO Science Report. Paris.
- [viii] Skibba, R. (2019). Women in Physics. *Nature Reviews Physics*, 1, 298–300.
- [ix] UNESCO. (2021). To Be Smart, the Digital Revolution Will Need to Be Inclusive: Chapter 3 in UNESCO Science Report. Paris.
- [x] UNESCO. (2017). Cracking the Code: Girls' and Women's Education in Science, Technology, Engineering and Mathematics (STEM). Paris.
- [xi] Ibid.
- [xii] Carli, L. L., Alawa, L., Lee, Y., Zhao, B., & Kim, E. (2016). Stereotypes About Gender and Science: Women ≠ Scientists. *Psychology of Women Quarterly*, 40(2), 244-260.
- [xiii] Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018). The Development of Children's Gender-Science Stereotypes: A Meta-analysis of 5 Decades of U.S. Draw-A-Scientist Studies. *Child Development*, 89(6), 1943-1955.
- [xiv] UNESCO. (2021). To Be Smart, the Digital Revolution Will Need to Be Inclusive: Chapter 3 in UNESCO Science Report. Paris.
- [xv] Ibid.
- [xvi] Vincent-Ruz, P., & Schunn, C. D. (2018). The Nature of Science Identity and its Role as the Driver of Student Choices. *International Journal of STEM Education*, 5, 48.
- [xvii] Ipsos & Fondation L'Oréal. (2023). One in Two Women Scientists Say They Have Experienced Sexual Harassment at Work. Ipsos.
- [xviii] UNESCO. (2021). To Be Smart, the Digital Revolution Will Need to Be Inclusive: Chapter 3 in UNESCO Science Report. Paris.
- [xix] Ibid.