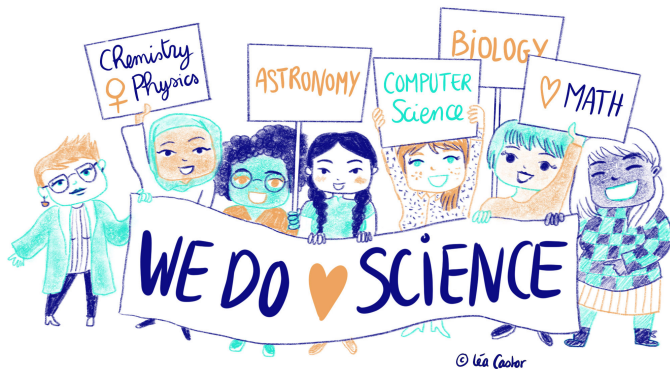


Best Practices to Reduce the Gender Gap

We have assembled a selection of **initiatives for reducing the gender gap** in many countries and disciplines, developed a set of dimensions that characterize “good practices” and applied these to all programs in an attempt to explain *why* they “work”.

Database: <https://www.mathunion.org/cwm/gender-gap-in-science-database>



Project Partners

Union members of the ISC:

- International Mathematical Union (**IMU**)
- International Union of Pure and Applied Chemistry (**IUPAC**)
- International Union of Pure and Applied Physics (**IUPAP**)
- International Astronomical Union (**IAU**)
- International Union of Biological Sciences (**IUBS**)
- International Council for Industrial and Applied Mathematics (**ICIAM**)
- International Union of History and Philosophy of Science and Technology (**IUHPST**)

Organizations:

- United Nations Educational, Scientific and Cultural Organization (**UNESCO**)
- Gender in Science, Innovation, Technology and Engineering (**GenderInSITE**)
- Organization of Women in Science for the Developing World (**OWSD**)
- Association for Computing Machinery (**ACM**)



**International
Science Council**

Full report of the project: <https://doi.org/10.5281/zenodo.3697222>

Booklet by Marie-Françoise Roy & Lucía Santamaría | Cartoons by Léa Castor

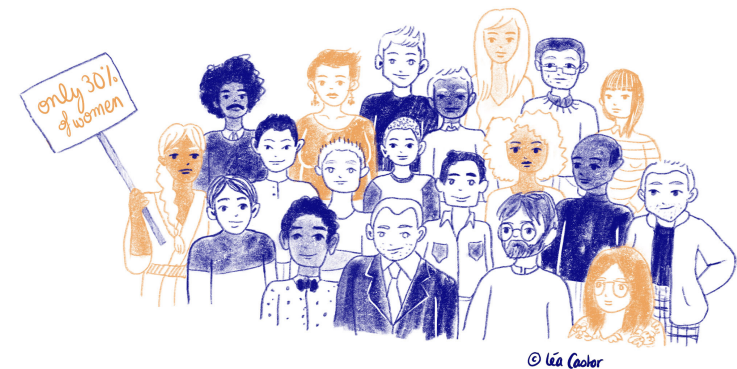
A Global Approach to the Gender Gap in Mathematical, Computing, and Natural Sciences: How to Measure It, How to Reduce It?



The **gender gap** is the difference between women and men “in terms of their levels of participation, access, rights, remuneration or benefits”. According to the UNESCO Institute of Statistics, **fewer than 30% of the world’s researchers are women**, which reflects the existence of a clear gender gap in science. To truly **understand and reduce** it, it is necessary to identify the various factors that deter women from pursuing careers in scientific disciplines.

The project “A Global Approach to the Gender Gap in Mathematical, Computing, and Natural Sciences: How to measure it? How to reduce it?” contributes to this analysis from three complementary perspectives:

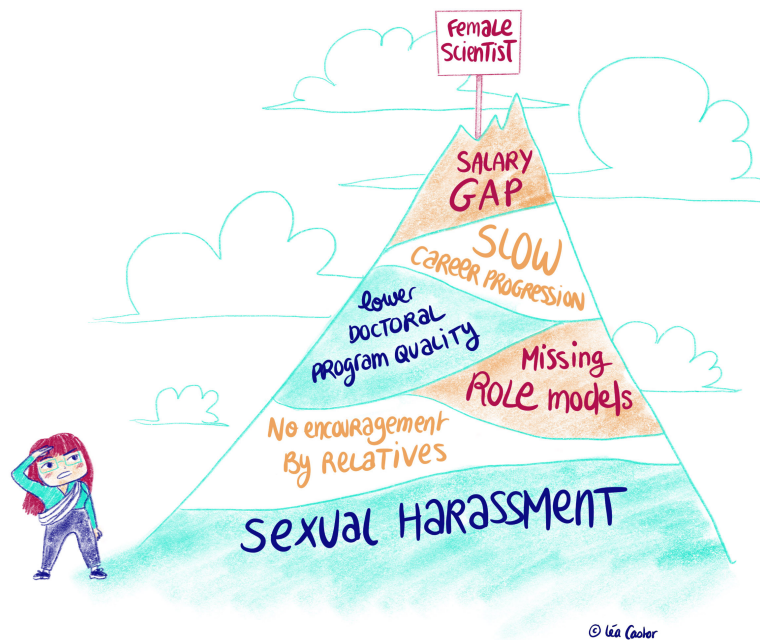
- The **Global Survey of Scientists** addresses issues related to missing role models, feelings of critical exclusion, harassment, or low participation and retention rates.
- The **Study of Publication Patterns** provides insights on the proportion of women as research authors or the presence of women publishing in renowned journals.
- The **Database of Good Practices** introduces a conceptual framework to analyze them, in order to provide evidence of effectiveness and impact.



Website of the project: <https://gender-gap-in-science.org/>

Global Survey of Scientists

The survey was answered by 32,000 scientists, of which 50% were male and 50% female. Its results confirm that the Gender Gap in Science is very real: it exists across all regions, disciplines, and development levels. Women's experiences in both educational and employment settings are consistently less positive than men's.



- Over a quarter of women reported **personally experiencing sexual harassment** at school or work. Women were over 14 times more likely than men to report being personally harassed.
- There continues to be a **salary gap** between women and men. Becoming a parent had **significantly different impact** on the lives of women and men.

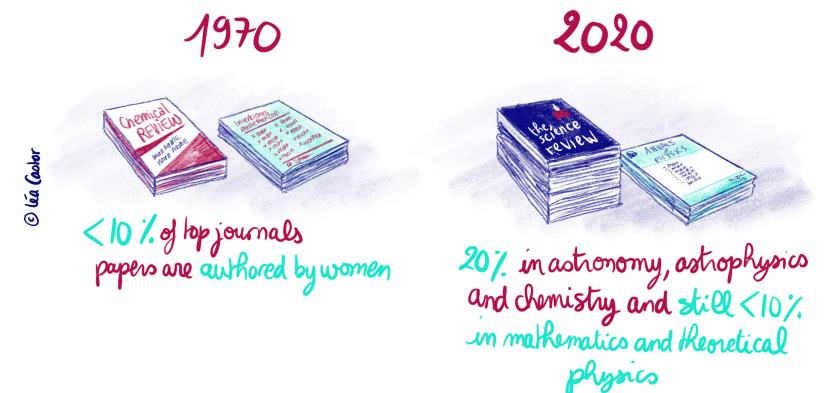
List of all survey questions: <http://bit.ly/GSSQuestionList>

Analysis of Publication Patterns with Bibliographic Data

Successful academic careers are strongly tied to a prolific scholarly record, and **scientific publications** play a key role in scientific reputation. Understanding publication practices in various disciplines is paramount.

Extending previous research in Mathematics to also include Astronomy, Theoretical Physics, and, partially, Chemistry, **we analyzed millions of publications** from 1970 to present day. For their specificity and comprehensivity we chose zbMATH, ADS, and arXiv as data sources.

Our findings offer deep insights on the dynamics of academic publishing: the proportion of **women authoring scientific papers** in these disciplines has **increased steadily**. However the proportion of **women authoring papers in top journals** has stagnated in Mathematics and Theoretical Physics and remains static at around 10%, while it increased in Astronomy and Chemistry. We identify a pattern of **fewer women authors in theoretical disciplines** and subdisciplines while a **larger presence of women** is found in **applied and collaborative fields**.



Interactive tool on publication patterns:

<http://gender-publication-gap.f4.htw-berlin.de/>

4. Actively promote the **visibility of female scientists**, in particular at conferences. Program a session for all participants on diversity and inclusion in their discipline in union-sponsored conferences. Develop policies on gender balance for funding conferences with representative speaker and panel lists, scientific organizing Committees and local organizing committees. Request a reporting mechanism for these concerns at the conference.
5. Encourage the **diversification of scientific awards**, actively encouraging the nomination of women. Add 18 months per child to all age-limits in scientific awards for people having taken care of children.
6. Encourage the presence of **women in editorial boards** in your discipline and publish reports on the proportion of papers published by women. Use double blind reviews. Manage constructive feedback on submitted papers.
7. **Welcome families** in scientific activities. For scientific meetings that you sponsor or support, encourage taking care of all issues of family attending with children and putting a budget in place to offer childcare solutions.
8. Create a **committee for women** and/or gender equality, with an assigned budget line. Organize specific meetings to promote women's networking. Support women in writing better grant proposals. Develop websites on women in science, reporting all the news relevant for women in science such as success stories of female scientists, conferences or activities relevant to women in science. Encourage and advertise books and media written by women, biographies of women, and media releases.
9. Actively **promote gender balance** at every level of your organization, including its leadership, committees and institutional events.
10. In all outreach and educational programs and products, **raise awareness** about the gender gap and include specific actions and events that aim at reducing the gender gap. When role models are introduced, include diverse backgrounds, genders and ages and those who did not necessarily have a straightforward traditional career, including scientists not employed in academia.

Recommendations

These guidelines are based on the findings of the project and from discussions held within the network created around the project.



We start with **instructors and parents**, who have an important role to play in changing societal perceptions and stereotypes towards women in science and in engaging girls in primary, secondary, and higher education. We continue with recommendations for **scientific or educational organizations**

of all kinds, since these are the places where scientific life takes place daily. We conclude with recommendations for **Scientific Unions** and other worldwide organizations, in particular the unions members of the project.

For instructors and parents

1. Avoid **gender stereotyping and unconscious gender bias** in interactions with female students and children. Adopt practices that encourage girls to participate in scientific activities in schools and non-school settings. Teach boys and girls gender equity.
2. Avoid books and social media that reinforce the gender gap in science. Use books and media **promoting gender balance** and highlighting the contributions of women in science.
3. Develop **gender awareness** in the classroom and encourage girls in their learning of scientific subjects. Track who you are engaging in class to ensure that every student has a chance to participate and that girls feel comfortable in speaking up.
4. Encourage **relevant single-sex activities** to raise and boost girls' self-confidence and possibilities for expressing themselves.

For local organizations

These are to all types of scientific or educational venues, such as universities' science departments, conference centers, research groups in industry, among others.

1. Promote a **respectful, collegial working atmosphere**. Monitor support, well-being, and mentoring of female academics.
2. Define best practices to prevent, report, and address **sexual harassment and discrimination** in professional spaces.
3. Address the **impact of parenthood** on the careers of women. Introduce proper accounting for child care responsibilities (18 months per child recommended) when evaluating candidates in hiring and promotions processes. In practice, this applies mainly to women. Encourage provision of a research-only year after maternity or parental leave. Acknowledge and accept the existence of discontinuous careers and family responsibilities and take these into account in hiring and funding policies.
4. Ensure **transparency** of statistics on salaries, course loads, bonuses, hiring and promotion, observing progress or difficulties experienced by female academics. Encourage policies to help reduce gendered salary disparities. Ensure female and male representation on recruitment committees and provide unconscious bias training for all members. Make the gender lens the responsibility of a dedicated person.
5. Welcome families and provide **child friendly environments**. Provide improved support systems for parents. Allocate teaching loads with suitable hours for parents. For conference centres, take care of the issues of families attending with children and equip family rooms in the guest houses to cater for all basic needs (for instance children's toys, high chairs, and changing tables for babies).

6. Address **gender equality** in all institutional policies. Identify a person or a group in charge of gender equality inside the organization, looking at the gender balance in all kinds of activities. Put in place initiatives encouraging women. Involve men in identifying barriers and addressing them. Diversity action plans should have financial consequences if not met.
7. In all outreach and educational programs, include the **aim of reducing the gender gap**. Adapt such programs to the region or discipline concerned by the organization and evaluate their effectiveness. Develop gender awareness of future teachers and provide training in critical thinking.

For scientific unions

By Unions we mean worldwide members of the International Science Council, in particular those that are members of our project.

1. Work collectively to **change culture and norms** to reduce the various aspects of the gender gap. Share policy, toolkits and learnings to enable member organizations and members. Launch campaigns to increase awareness of the benefits to society of reducing the gender gap.
2. Define and advertise **best practices** to prevent, report and address sexual harassment and discrimination in professional spaces.
3. In order to address the disproportionate **impact of parenthood** on the careers of women, recommend and disseminate in the scientific community proper accounting of child bearing/caring responsibilities (18 months per child recommended) when evaluating candidates in hiring and promotion processes. Recognise the existence and impact of discontinuous careers and suggest strategies for developing responsive hiring and funding policies. Encourage policies to help reduce salary disparities.