

International Day of Women and Girls in Science: 11 February 2019

Summary

On 11 February 2019 the UN marks the fourth annual International Day of Women and Girls in Science. This House of Lords Library Briefing provides a brief background to the day and why it was established by the UN. It then presents statistics on women and girls in science, technology, engineering and maths (STEM) in the UK and examines what barriers women face in pursuing scientific study and careers. Finally, it outlines UK Government initiatives that aim to increase women and girl's participation in STEM.

Background to the Day

International Day of Women and Girls in Science takes place annually on 11 February “to recognise the critical role women and girls play in science and technology communities”.¹ It was established by a [resolution of the UN General Assembly](#) adopted on 22 December 2015, after the idea was generated at the [Inaugural World Women's Health and Development Forum](#) in 2015.² It follows other actions by UN bodies to promote the access and participation of women and girls in science and technology including the [2011 Report of the 55th session of Commission on the Status of Women](#).³ The resolution on Science, Technology and Innovation for Development, adopted on 20 December 2013, states the General Assembly:

recognises that full and equal access to and participation in science, technology and innovation for women of all ages is imperative for achieving gender equality and the empowerment of women, and underlines that addressing barriers to equal access for women and girls to science, technology and innovation requires a systematic, comprehensive, integrated, sustainable, multidisciplinary and multisectoral approach, and in this regard urges governments to mainstream a gender perspective in legislation, policies and programmes.⁴

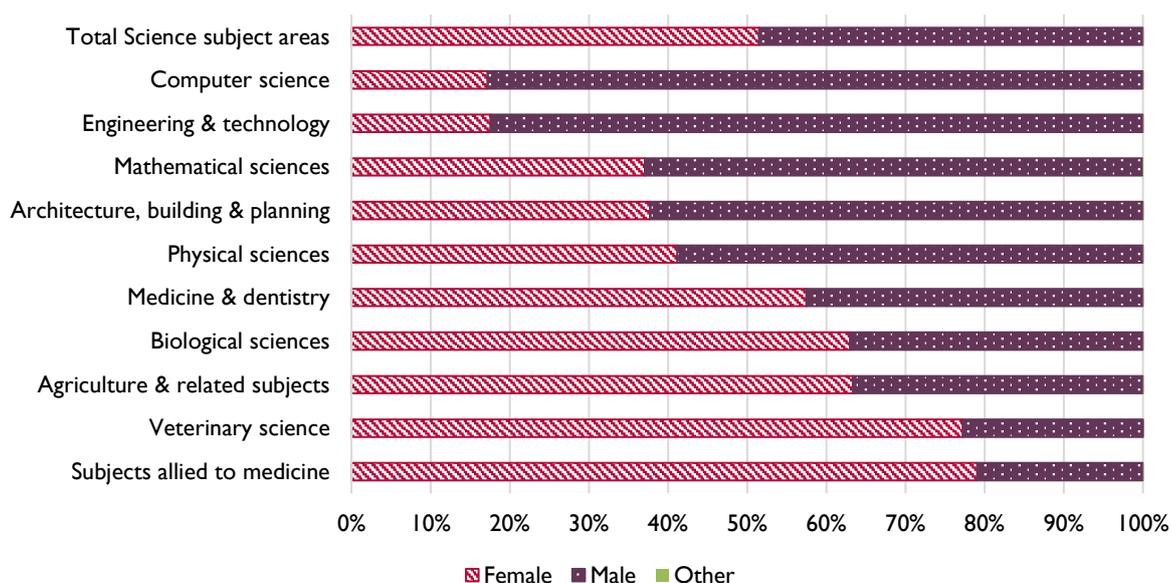
The theme of this year's day is investment in women and girls in science for inclusive green growth, focusing on investment in green growth and sustainable development and the social and economic role of women in this area.

Women and Girls in Science in the UK

In the UK, women and girls remain underrepresented in many fields related to science, technology, engineering and maths (STEM) throughout the various stages of development. The participation gap begins at secondary school where overall, male students outnumber female students taking A level STEM exams. According to the National Audit Office, “in 2016/17, females made up 42% of all STEM A level examination entries, including just 9.4% of entries in computing, 21.2% in physics and 39% in mathematics”.⁵ This picture is not consistent across all science subjects: female students make up 61.8% of A level biology entries.⁶ There is also a significant gender disparity in enrolment for apprenticeships with women representing 50% of starts in total, but just 8% of STEM apprenticeship starts.⁷

The picture in higher education is mixed. According to figures from the Higher Education Statistics Agency (HESA), overall women made up 57% of higher education enrolments in 2016/17 and 52% of enrolments in science subjects. However, as demonstrated by graph 1, although female students are overrepresented in fields such as veterinary science (77%) and biological science (63%), they remained significantly underrepresented in mathematical sciences (37%), engineering and technology (18%) and computer science (17%).⁸

Graph 1: Higher Education Student Enrolments in Science Subject Areas by Subject Area and Sex 2016/17



(Higher Education Statistics Agency, '[What do HE Students Study?](#)', accessed 24 January 2019)

Estimates of the proportion of women in STEM occupations vary depending on how jobs roles are categorised. According to Eurostat the proportion of female scientists and engineers in the UK is 40%, ranking 20th out of 28 EU member states. In Lithuania, Bulgaria and Latvia over 50% of scientists and engineers are women, by contrast the proportion in Luxembourg is a quarter. Analysis from WISE, a UK campaign to promote women in STEM, found that women made up 23% of core STEM occupations in 2017, up from 21% the previous year.⁹ Even in scientific fields where the majority of students are female, there is a still gender disparity at the top of the career ladder; evidence from the Society of Biology found that “in 2011/2012, 61% of bioscience postgraduate students were female while only 15% of professors were female”.¹⁰

Barriers for Women and Girls in STEM

The under-representation of women in STEM is often described as the ‘leaky pipeline’ problem: more women leave scientific fields at each stage of education and career progression than men.¹¹ A 2005 examination of this problem from Western Washington University identified nine explanations put forward in academic literature:

1. Biological differences between men and women.
2. Girls’ lack of academic preparation for a science major/career.
3. Girls’ poor attitude toward science and lack of positive experiences with science in childhood.
4. The absence of female scientists/engineers as role models.

5. Science curricula are irrelevant to many girls.
6. The pedagogy of science classes favours male students.
7. A 'chilly climate' exists for girls/women in science classes.
8. Cultural pressure on girls/women to conform to traditional gender roles
9. An inherent masculine worldview in scientific epistemology.¹²

The study rejected biological difference as an explanation, stating that “there is very little difference in scientific or mathematical ability, and certainly not enough to explain the under-representation of women in STEM careers”.¹³ Similarly, it found that preparation was unlikely to be a factor as even when women were equally prepared for STEM degrees, they were still more likely to drop out than men. The remaining factors, it concluded, are likely to interact and play a part in discouraging women and girls from pursuing science.¹⁴

These conclusions are supported by other evidence. The National Audit Office found that in terms of A level outcomes “females regularly outperform males in many STEM subjects and results overall are very similar”.¹⁵ Psychological studies found that stereotypes associating traditionally masculine traits with the perceived traits necessary to be a successful scientist “may contribute to discrimination and prejudice against female scientists”.¹⁶ Academics have also argued that this problem is particularly acute in certain scientific fields such as computer science, engineering and physics that have “masculine cultures that signal a lower sense of belonging to women than men”. This can in part explain the disparities in gender balance between different STEM fields.¹⁷

In 2014, the House of Commons Science and Technology Committee conducted an inquiry into women in scientific careers that suggested that working arrangements prevented women from progressing from STEM academic qualifications to research careers:

Early academic STEM careers are characterised by short term contracts, which are a barrier to job security and continuity of employment rights. This career stage coincides with the time when many women are considering starting families, and because women tend to be primary carers, they are more likely than men to end their STEM career at this stage.¹⁸

This conclusion was supported by evidence from the Wellcome Trust, which tracked the careers of science PhD candidates. It found clear sex differences in the exit points from academic careers:

Amongst those who commenced their studies in 2003/4 (n=59), two years post-PhD (2009) 70% of women were employed in academia, compared with 88% of men. After four years, this gap had widened further and in 2012, only 54% of women were still in academia, compared with 81% of men.¹⁹

It found that both women and men perceived issues such as unstable contracts, the need to secure funding, a long working hours culture and the pressure to move to be challenges, but that women “were more likely to report that the challenges outweighed the risks”.²⁰

Government Initiatives to Promote Women and Girls in STEM

In answers to recent parliamentary questions, the Government identified a number of initiatives which it has created or supported that aim to increase women and girls' participation in STEM, these include:²¹

- **2017 Careers Strategy**—In its 2017 career strategy, the Government committed to

improve careers guidance and engagement for STEM subjects. Specifically, on women in STEM it said:

We are learning more about what works to tackle gender stereotypes in both schools and employment, and across Government there are significant programmes aimed at encouraging more people into STEM careers. Government has committed to deepen the understanding of the gender disparity in subject choices at age 16 by exploring how to improve the accessibility and transparency of data on this issue by institution and subject. We will also work with the Government Equalities Office to take positive steps towards eradicating gender norms in the classroom that lead to girls narrowing their career choices. We are exploring how to close the gender divide in STEM across educational and professional routes, such as STEM apprenticeships and the new T levels.²²

- **Year of Engineering 2018**—2018 was the ‘year of engineering’, “a cross-government campaign which aims to tackle the engineering skills gap by raising the profile of UK engineering and widening the pool of young people that consider a career in the profession”. The campaign aimed to provide young people with direct experiences of engineering through programmes and events, including activities targeted at encouraging women, including more black, Asian and minority ethnic girls into pursuing STEM careers.²³
- **Stimulating Physics Network**—Jointly run by the Institute for Physics and the Department for Education, the stimulating physics network is an ongoing support network for students and teachers. It includes partner school programmes, workshops for schools and teacher mentoring. It also has a specific [gender balance programme](#) which runs pilot projects investigating how best to address gender inequality in physics take up.²⁴
- **STEM Ambassador Programme**—STEM ambassadors are volunteers working in STEM industries who aim to promote progress in STEM subjects amongst young people through activities, presentations, mentoring and career talks. The ‘[people like me](#)’ campaign targets the recruitment of girls into STEM by training ambassadors to work with girls aged 11 to 14.²⁵
- **Apprenticeship Diversity Champions Network (ADCN)**—According to the Government, the ADCN “champions apprenticeships and diversity amongst employers and encourages more people from underrepresented groups, including those with disabilities, women and members of the black, Asian and minority ethnic (BAME) communities, to consider apprenticeships”.²⁶ The ADCN engages in best practice to increase the number of women in STEM apprenticeships including: anonymised CVs and unconscious bias training, using role models and STEM ambassadors, women-only work experience, and schools outreach.²⁷
- **National Centre for Computing Education**—In November 2018, the Government announced £84 million of investment for the National Centre for Computing Education. The centre will provide resources and training to schools and teachers to improve participation and teaching for the new computer science GCSE. On the launch of the centre, chief executive of STEM Learning Yvonne Baker said “high quality, knowledgeable teaching of computer science is the cornerstone of achieving our aims. Evidence tells us this is fundamental to raising attainment and driving up participation, particularly for girls”.²⁸

Further Information

- National Audit Office, [Delivering STEM \(Science, Technology, Engineering and Mathematics\) Skills for the Economy](#), 17 January 2018, HC 716 of session 2017–19
- House of Commons Public Accounts Committee, [Delivering STEM Skills for the Economy](#), 22 June 2018, HC 691 of session 2017–19; and [Government Response](#)
- All Party Parliamentary Group Women and Work, [Making the Industrial Strategy Work for Women: Annual Report 2017](#), 2018
- House of Commons Science and Technology Committee, [Women in Scientific Careers](#), 6 February 2014, HC 701 of session 2013–14
- Donna Strickland, '[Nobel Winner Donna Strickland: 'I Was About 10 When I Saw My First Laser. It Was Love at First Sight'](#)', *Financial Times* (£), 6 December 2018
- WISE, '[Why Gender Diversity Makes Business Sense](#)', June 2018
- Nathalia Gjersoe, '[Bridging the Gender Gap: Why Do So Few Girls Study Stem subjects?](#)' *Guardian*, 8 March 2018
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- Natasha Codioli McMaster, '[Women are Less Likely to Study STEM Subjects—But Disadvantaged Women Are Even Less So](#)', LSE British Politics and Policy Blog, 10 July 2017
- Linda L Carli et al, '[Stereotypes About Gender and Science: Women ≠ Scientists](#)', *Psychology of Women Quarterly*, 6 January 2016, vol 40 no 2, pp 224–60 at p 240
- Jacob Clark Blickenstaff, '[Women and Science Careers: Leaky Pipeline or Gender Filter](#)', *Gender and Education*, October 2005, vol 17 no 4, pp 369–86 at p 369

- ¹ United Nations, '[International Day of Women and Girls in Science, 11 February](#)', accessed 4 February 2019.
- ² International Day of Women and Girls in Science, '[From Dream to Reality](#)', accessed 4 February 2019.
- ³ United Nations Commission on the Status of Women, [Report on The Fifty-Fifth Session \(12 March 2010, 22 February–4 March And 14 March 2011\)](#), 1 April 2011, p 1.
- ⁴ General Assembly Resolution 66/220, [Science, Technology and Innovation for Development](#), 20 December 2013.
- ⁵ National Audit Office, [Delivering STEM \(Science, Technology, Engineering and Mathematics\) Skills for the Economy](#), 17 January 2018, HC 716 of session 2017–19, p 26.
- ⁶ *ibid.*
- ⁷ *ibid.*, p 28.
- ⁸ Higher Education Statistics Agency, '[What do HE Students Study?](#)', accessed 24 January 2019
- ⁹ WISE, '[Women in STEM Workforce 2017](#)', accessed 4 February 2019.
- ¹⁰ Society of Biology, [Women in Academic STEM Careers](#), September 2013.
- ¹¹ Jacob Clark Blickenstaff, '[Women and Science Careers: Leaky Pipeline or Gender Filter](#)', *Gender and Education*, October 2005, vol 17 no 4, pp 369–86 at p 369.
- ¹² *ibid.*, pp 371–2.
- ¹³ *ibid.*, p 373.
- ¹⁴ *ibid.*
- ¹⁵ National Audit Office, [Delivering STEM \(Science, Technology, Engineering and Mathematics\) Skills for the Economy](#), 17 January 2018, HC 716 of session 2017–19, p 26.
- ¹⁶ Linda L Carli et al, '[Stereotypes About Gender and Science: Women ≠ Scientists](#)', *Psychology of Women Quarterly*, 6 January 2016, vol 40 no 2, pp 224–60 at p 240.
- ¹⁷ Sapna Cheryan et al, '[Why Are Some STEM Fields More Gender Balanced Than Others?](#)' *Psychological Bulletin*, 2016, vol 143 no 1, p 1.
- ¹⁸ House of Commons Science and Technology Committee, [Women in Scientific Careers](#), 6 February 2014, HC 701 of session 2013–14, p 3.
- ¹⁹ House of Commons Science and Technology Committee, '[Written Evidence Submitted by the Wellcome Trust](#)', *Women in Scientific Careers*, September 2013.
- ²⁰ *ibid.*
- ²¹ [HC Hansard, 17 December 2018, cols 511–13; HC Hansard, 17 May 2018, cols 414–15; HC Hansard, 28 June 2018, col 1027](#); House of Commons. '[Written Question: STEM Subjects: Females](#)', 3 July 2018, 158682; and House of Commons, '[Written Question: STEM subjects: Apprentices](#)', 26 April 2018, 136950.
- ²² Department for Education, [Careers Strategy: Making the Most of Everyone's Skills and Talents](#), December 2017, p 16.
- ²³ Department for Transport, '[Launch of 'Year of Engineering 2018'](#)', Government Communications Service Blog, 25 January 2018.
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- ²⁶ UK Government website, '[Apprenticeship Diversity Champions Network](#)', accessed 6 February 2019.
- ²⁷ Apprenticeship Diversity Champions Network, [One Year on Progress Report](#), March 2018, p 17.
- ²⁸ Department for Education, '[Tech Experts to Provide National Centre for Computing Education](#)', 7 November 2018.

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