Comment – Women in STEM: how gender inequality could damage Scotland's economy

by Fiona McNeill, *Heriot-Watt University*

Like much of the world, Scotland has a problem with gender equality when it comes to science, technology, engineering and maths. From a very young age, outdated assumptions about who is suited to STEM subjects often mean girls are steered away from them.

Those who do pursue them in school and university face many barriers in their careers that lead to the notorious "leaky pipeline", where women are seen in lower and lower proportions at every stage of seniority.

Negative assumptions about the place of women and girls in STEM need to be challenged.
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This is a huge issue not just for women but also for the economy. There is increasing demand for STEM professionals but a significant shortfall in young people graduating with the relevant qualifications. But things will never change if half the population is not being encouraged to engage with these subjects in the first place.

Challenging the status quo

In 2012, the Royal Society of Edinburgh (RSE) launched the Tapping All Our Talents report (TAOT), which was a comprehensive evaluation of the status quo, and a call to action for government, academia and business across Scotland. So what has changed since then? Has progress been made in addressing these issues? Is the high-profile debate of gender

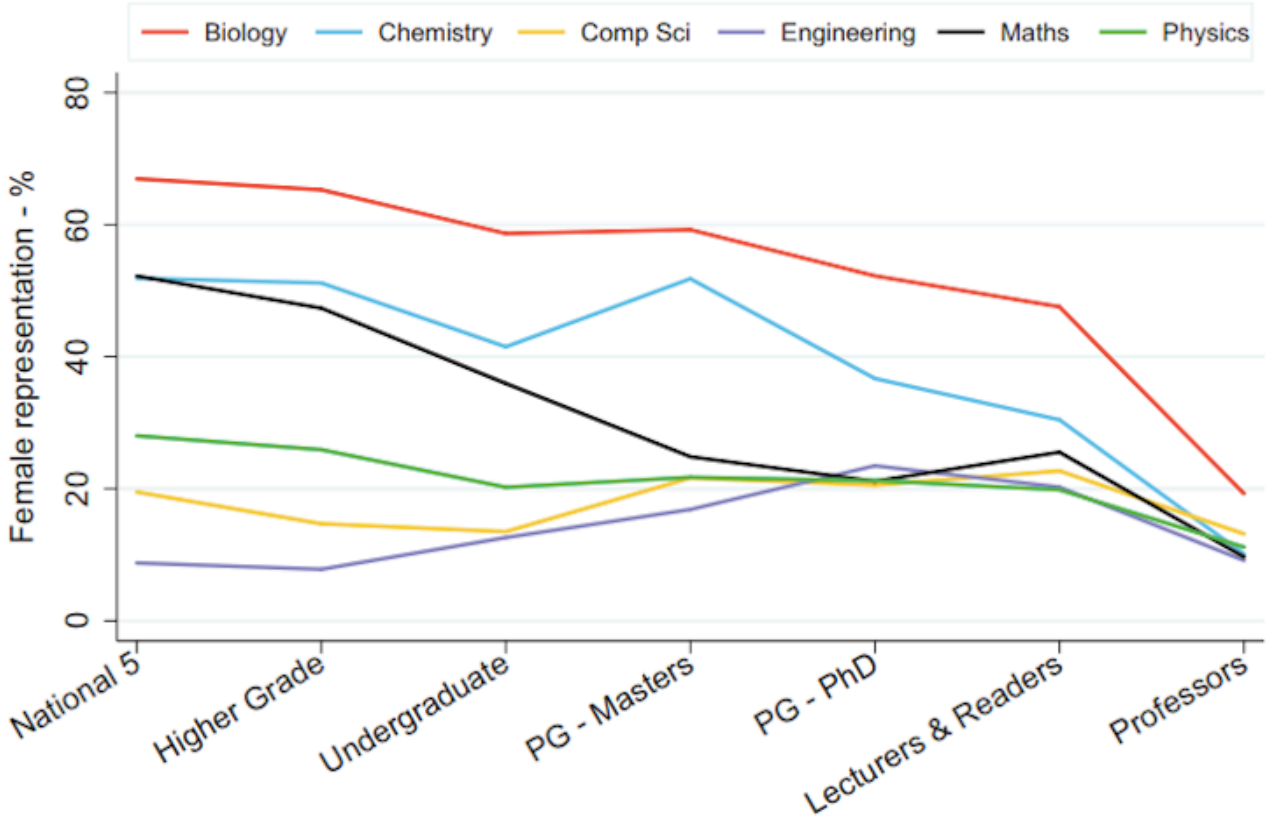
issues in the media these days feeding into positive action for women in STEM?

In March 2018, the RSE, together with the Young Academy of Scotland, launched TAOT 2018 to explore these questions, and the resulting report was published in November 2018. As well as looking back at the targets set in 2012 and analysing how the field is changing for women, TAOT 2018 also broadened the scope of its enquiry.

In the intervening six years it has become clear that gender equality can only be achieved through a fundamental shift in the way society perceives the place of women in STEM and the stereotyping issues that put them off. The report looked not only at women already working in STEM and studying in higher education, but also at girls in school, from secondary to early years.

One of the most potent images from the 2012 report was the leaky pipeline graph, showing how the percentage of women engaged in STEM subjects dropped at every stage from standard grade to professorial level. The graph below shows the ratio between the 2008 figures (which the 2012 report was based on) and 2018, and the good news is that things are looking up.

Female representation at each level in academia, 2017



National 5 and Higher data sourced from SQA Attainment Statistics and refer to Scotland. Undergraduate and postgraduate data refer to UK statistics sourced from HESA Student Statistics. Data for lecturers, readers and professors are sourced from HESA Staff Statistics and refer to UK figures.

This indicates that initiatives such as Athena SWAN awards (UK-wide recognition for gender equality in academia) are working, and fairer access to funding from bodies such as the Scottish Funding Council are succeeding – but not fast enough. Even if things continue to improve at this rate, Scotland is still decades away from equality.

Trends for concern

Broadening the focus to schools highlighted some worrying trends. At SCQF (Scottish Credit and Qualifications Framework) levels 3-5, the percentage of girls has stayed the same for most STEM subjects between 2012 and 2018. Biology remains female dominated at school level, with chemistry and maths at about 50%, and physics remaining around 30%.

More concerning is engineering, which has shown slight improvements but still has less than 10% female participation, and computer science, which has seen a drop from 32% in 2012 to 18% in 2018. This is against a backdrop of a dramatically increasing skills gap in computing-related industries, where the demand for technologically skilled professionals outstrips the number of young people studying these subjects. The failure to engage girls in the subject significantly reduces the potential pool of future professionals and will have an impact on the Scottish economy.

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Very similar trends can be seen at higher level in all subjects. At university level, there is again a fairly stable picture across the six years since the 2012 report, with both maths and computing showing a decline in female participation over the years – though in computer science this is much less than in schools. This drop at school level is likely to hit female recruitment to university computer science courses in coming years.

The Scottish Funding Council has introduced its Gender Action Plan, which requires Scotland's higher and further education institutions to develop plans to ensure that all courses have a gender imbalance less than 75:25 by 2030. But change of this magnitude is unlikely in subjects with significant gender imbalance without specific, targeted initiatives not just in higher education but also in schools and early years.

At staff level, the picture in universities is more encouraging, with both percentages of female faculty members and female professors increasing in most STEM subjects, some dramatically – for example, female professors in maths

increased from just 3% in 2012 to a more respectable (though still shockingly low) 10% in 2017. There are also now have 73 STEM departments in Scottish universities with Athena SWAN accreditation, demonstrating a serious commitment to tackling these issues.

As well as analysing academia and education, the 2018 report also focuses on government and business across Scotland. It identifies strong leadership by the Scottish government to drive culture change and significant improvements in many aspects of business, such as sustained partnerships between education and industry. But it emphasises that such initiatives "must be driven faster and further" to make an impact. Other key findings include the need for better data to understand, track and provide solutions to gender inequality in STEM, and a focus on behaviour change that means bias and discrimination are unacceptable.

It is heartening to see that the attention that has been focused on women in STEM across Scotland over the last few years has yielded positive results and the country is moving in the right direction. But there is still much to be done.

Tackling inequality to smash the barriers that women and girls face in STEM is a huge challenge, and one that requires commitment and persistence in education, business and government. Wavering in that commitment could have serious consequences for the ability to develop and sustain the kind of STEM-based innovation in which Scotland has been world-leading for centuries.

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