Universities Scotland's response to the Royal Society of Edinburgh's 'Tapping all our Talents' review

Higher Education Institutions (HEIs) in Scotland are committed to equality across the three 'core' missions of research, teaching and knowledge exchange, and including the wider staff body (this covers non-academic roles). Looking specifically at gender equality in STEM (science, technology, engineering and mathematics) there is a great deal of activity to promote gender balance in academic careers and within taught courses. The sector recognises there is a need for further progress, and there is a long way to go, but encouragingly there is evidence of impact and value in interventions that HEIs are undertaking.

We welcome this opportunity to discuss progress within the sector, reflect on challenges and make recommendations.

Section 1: *In brief*

Q1 Do you believe progress has been made towards achieving gender equality in the STEM workplace in Scotland since 2012? (Yes/no).

Yes. We see evidence of progress within academia (as a STEM workplace), for example:

- In Scotland, since 2012 there has been a growth in Athena SWAN awards from 5 in 2012 to 73 STEM department awards[1].
- All universities in Scotland that have ever renewed or upgraded an Athena SWAN award have increased proportions of female professors; over 3-5 year periods increases have ranged from 3-8% and takes those institutions to 19-33% of professors being female.[2]
- There is a huge amount of work within HEIs – completed and ongoing – to support equality across all aspects of HEIs. Improving conditions, particularly increased support for flexible working and career break support is very valuable as the burden of care (i.e. unpaid care for a regular basis for a dependent, not just childcare) still often falls disproportionately to women.
- We have seen some promising signs with changing patterns globally, with women becoming increasingly better represented in the research base (but this research was conducted over a much longer time scale than this six year

[1] Equality Challenge Unit/Advance HE personal communication, 5 April 2018
[2] Equality Challenge Unit/Advance HE personal communication, 5 April 2018

period)[3] – we have provided headlines at the end of this consultation for information.

Clearly we have not reached equality yet – the recent ECU statistical report showed that 80.7% of professors in science, engineering and technology in the UK were men (2014-15)[4]. There is forward progress within Scottish HEIs but there is a long way to go. Institutions are committed to tackling these barriers and we see an increasing amount of institution-wide work (detailed in Gender Action Plans) to tackle barriers for women's progression. Common interventions within HEIs include:

- Reviewing promotion processes, with a focus on equality and diversity;
- Unconscious bias training for all those involved in promotion decisions and recruitment;
- Internal mentoring or coaching schemes providing support towards promotion applications (often aimed at underrepresented groups including women); and,
- Policy changes to ensure that promotion panels are gender-balanced, or at least not single sex, wherever possible.

There are long standing gender imbalances within specific subjects and there has been work to address this. The Higher Education Academy's (HEA) 2016 report, 'Whose job is it anyway? Analysis of approaches to tackling gender imbalances at the subject level in Scotland's universities and colleges', reported 'an abundance of activities – mainly focused on outreach, marketing and supporting success – and areas of future potential from which the groundwork, and strong models, often already exists'.

Q2 If yes, what action(s) do you believe have had the greatest impact on improving gender equality in STEM in Scotland? (List maximum of 3).

1. Equality and diversity, including gender, is a priority for the leadership of HEIs and colleges which is important to raise visibility and ensure this work is a focus. This interacts and reinforces political commitment and the priority given to this matter by the Scottish Funding Council.
2. The introduction of the Athena SWAN charter – this approach gives institutions a framework to take action which is based on evidence and so appropriate to the local circumstances. There is good evidence to show the value of this approach as ECU's 2017 sector survey findings in Scotland found that 90% of respondents that were involved in Athena SWAN agreed (mean value of 3.9 out of 5) that this had increased their institution's understanding of staff equality and that the knowledge from this activity had been applied in

[3] Elsevier. *Gender in the Global Research Landscape*, 2017 Available from: https://www.elsevier.com/__data/assets/pdf_file/0008/265661/ElsevierGenderReport_final_for-web.pdf [Accessed 26 April 2018]

[4] Equality Challenge Unit. *ECU Key Statistics: Staff*. Available from: http://www.ecu.ac.uk/wp-content/uploads/2017/04/Staff-20170420.pdf [Accessed 26 April 2018]

their HEI (mean value 4).[5] We know Advance HE will continue to focus on the Athena SWAN and Race Equality Charter and see this as a good point in time for review and development of these interventions – which we consider to have been very valuable so far.

3. The collection and publication of data are important – this has been a consistent message from feedback we received. Having the evidence to demonstrate challenges stimulates change. However, as we noted in our response to the SFC's Gender Action Plans we remain concerned on the setting of targets at a national level as a realistic measure of lasting societal change in attitudes and behaviours[6]. The Higher Education Academy's (HEA) 2016 report, 'Whose job is it anyway?' clearly emphasised the need for evidence-based interventions, with appropriate adjustments for context (whether subject or institutions). The report also highlights the need for measurement as appropriate to the project/intervention and not narrowed solely on application numbers. Measures of success should include: retention; attainment; success; and, satisfaction information too.

Q3 Where you do not believe progress has been made, or could be improved upon, what do you believe have been the key limiting factors? (List maximum of 3).

It's important to realise the wider societal factors at work that impact on the STEM workforce. While HEIs can have a transformative impact on individuals and society, playing their part in changing that wider societal problem, it is hard to capture this impact. To realise gender equality within the STEM academic workforce and STEM education will be a long-term and cross-sector endeavour. We need to be realistic about the scale of the challenge, without shying away from what can be done within higher education.

1. From an academic perspective there are barriers to, largely, women's progression across careers. Uptake of shared parental leave is very low in Scotland[7] and accessibility and affordability of childcare in Scotland remains a challenge[8] – this is wider than HEIs but impacts on researchers within institutions, likely disproportionately impacting on women's careers.
2. Resourcing remains a challenge to ensure follow up, particularly longitudinal studies, to understand how interventions lead to behaviour change. Greater resource available for design, implementation and evaluation of interventions would be welcome. HEA's 'Whose job is it anyway?' made recommendations to 'develop resources, further research and staff development resources'

[5] Equality Challenge Unit/Advance HE personal communication, 5 April 2018
[6] Universities Scotland. *Response to the publication of the SFC's Gender Action Plan*. Available from: https://www.universities-scotland.ac.uk/response-to-the-publication-of-the-sfcs-gender-action-plan/ [Accessed 26 April 2018]
[7] The Herald, *Only 1% of fathers take shared parental leave option*. Available from: http://www.heraldscotland.com/news/14403979._Only_1__of_fathers_take_shared_parental_leave_option_/ [Accessed 26 April 2018]
[8] Audit Scotland, *Early learning and childcare*, 2018. Available from: http://www.audit-scotland.gov.uk/uploads/docs/report/2018/nr_180215_early_learning.pdf [Accessed 26 April 2018]

alongside 'support institutional release of staff capacity, time and space through provision of, or direction towards, financial and resourcing support'.

3. In future, we see a need to further consider intersectionality in work to promote equality. The ASSET survey[9], for example, showed that in each of the six aspects of working life investigated there was at least one area in which BME females experienced compounded disadvantages. Although not a protected characteristic we also need to consider the intersection with economic disadvantage too – recent evidence indicated young people in the most deprived areas of Scotland were less likely to choose STEM subjects[10].

Q4 Which of the recommendations made in the 2012 *Tapping All Our Talents* report do you believe should be prioritised going forward? (List maximum of 3).

Reflecting on the limiting factors we noted in question 3 we see the need for continued focus on:

- Recommendation 1c – improve the provision of high quality, accessible childcare (to Scottish Government)
- Recommendation 2a – employment law to reflect the equal responsibilities of both parents (to UK Government)

Below we reflect on the recommendation to universities (recommendations 5a and b) and we address in question 5 the need to continue this work. We have also reflected on progress by our major funders (recommendations 4a and b) and provide some considerations on the future. Both of these are of continued importance.

Recommendations to universities (4a and b)

In response to the recommendation facing universities, we consider that institutions have continued to work hard on assessment and action driven by the Athena SWAN charter. Not every HEI has achieved a silver award but nonetheless Scottish HEIs have performed well:

- The application success rate in Scotland generally exceeds the overall success rate.
- In 2012 there were five awards, and as of 2017, ECU estimate there are 73 Scottish STEM departments holding awards (using HESA data)[11]

[9] Aldercotte, A., Guyan K., Lawson J., Neave S., Altorjai, S. *ASSET 2016: experiences surrounding gender equality in biosciences and medicines, and their intersections with ethnicity and disability*, Equality Challenge Unit, 2017. Available from: http://www.ecu.ac.uk/wp-content/uploads/2017/10/ASSET-2016-biosciences-and-medicine-report.pdf [Accessed 26 April 2018]

[10] Somerville, S-A. *STEM careers should be open to all*. Available from: https://www.scotsman.com/future-scotland/tech/shirley-anne-somerville-stem-careers-should-be-open-to-all-1-4721491 [Accessed 26 April 2018]

[11] Equality Challenge Unit/Advance HE personal communication, 5 April 2018

We have to be open about the challenges that remain within academia, including STEM. Research[12] does show continuing issues around the experience of women academics across the UK– particularly around ensuring fairness in allocating roles to academics (to ensure women are able to access strategic roles that are more likely to support progression) and more clearly recognising the different contributions of academics (including pastoral duties) in promotions. Relatedly, there are issues in the informal networks and 'norms' within academia that can be challenging for women to thrive in for a variety of reasons. Through interventions designed through Athena SWAN, Gender Action Plans and other mechanisms institutions are aware of, and working to address these issues.

Recommendations to funders (5a and b)

Looking towards the future we see scope for this report to helpfully make recommendations that relate into the launch of UKRI. There has been a lot of work since 2012 amongst funders including Research Councils UK (RCUK) 'Statement of Expectations for Equality and Diversity' (2013) and the RCUK gender action plan (2016). The new UKRI statement of expectations will be launched in May 2018 for UKRI[13]. HEIs, of course, are aware of and required to meet such expectations.

The launch of UKRI is an important opportunity to consider how the broader UK-wide research system can support equality and diversity in the research base. In Professor Sir Mark Walport's speech on his vision for UKRI he emphasised supporting the 'brightest minds' and the role of diversity within this. Evidence from 'Women in Academia Now' suggests the importance of long term personal fellowships at an early career stage as valuable to establishing research teams[14] which may be a productive route to explore for RSE and UKRI (i.e. how to provide more early stage opportunities).

Q5 What further recommendations (if any) would you make to policy-makers, educators or employers to tackle gender inequality in STEM in Scotland? (List maximum of 3).

Our recommendations are:

1. Universities should continue with their work and commitment as articulated in Athena SWAN action plans and Gender Action Plans.
2. There is a need to engage everyone – whether within academia/HEIs or the wider workforce - with the importance of equality and the actions that can be

[12] Cohen L., Duberley J. *Gender equality: universities are still all talk and too many trousers*, Times Higher Education. Available from: https://www.timeshighereducation.com/comment/gender-equality-universities-are-still-all-talk-and-too-many-trousers [Accessed 26 April 2018]

[13] UKRI, *Principles and Statement of Expectations for Equality, Diversity and Inclusion*. Available from: https://www.ukri.org/about-us/policies-and-standards/equality-diversity-and-inclusion/principles-and-statement-of-expectations-for-equality-diversity-and-inclusion/ [Accessed 26 April 2018]

[14] Fyfe, A. (ed.), De Moortel, I. (ed.), Ashbrook, S (ed.). *Academic Women Now: experiences of mid-career academic women in Scotland*. Available from: https://www.st-andrews.ac.uk/news/archive/2016/title,545643,en.php [Accessed 26 April 2018]

taken to support this. The ECU ASSET survey[15] showed that generally men perceived their STEMM departments to be more committed to equality than women. Feedback from our membership indicates that often work under, for example Athena SWAN, disproportionately falls to women – and often women at the mid-career level.

3. Where possible we would like to see alignment of reporting requirements (across Equality Act duties, Athena Swan, Outcome Agreements and Gender Action Plans) to minimise reporting burden. We consider the data to be very important to demonstrating the need for action but this can be challenging and resource intensive to collect for multiple different reporting mechanisms, which can divert time from the initiatives and work to deliver on action plans.

Section 2: *In detail*

Women in STEM in Scotland 2018

Q6 What lessons do you believe have been learned from initiatives undertaken since 2012 to tackle gender inequality in the STEM workforce across the public, academic and/or industry sectors? Examples of good practice would be useful.

Focussing on STEM, from the November 2016 award submissions to Athena SWAN there has been a great deal of best practice drawn out by experts at the Equality Challenge Unit[16] at both the institutional and departmental level. Looking more closely at STEM departments, this includes:

- Edinburgh Napier's School of Computing: the schools' centre for computing education research will conduct a study into the motivations for women selecting computing courses
- Queen Margaret University Division of Nursing: four divisional away days per year with Athena SWAN integrated into each away day
- University of Aberdeen, Rowett Institute of Nutrition and Health: the institute will monitor the length of time staff spend at particular grades for gender differences and encourage those at the top of their grades to apply for promotion
- University of Dundee, School of Dentistry, Medicine and Nursing & Health Sciences: accommodation provided free of charge for children and carers at the annual away day
- University of Edinburgh, School of Engineering: PhD stipend including outreach
- University of Glasgow, Institute of Molecular, Cell and Systems biology: the institute hosts a 'meet the speaker' sandwich lunch following the fortnightly

[15] Aldercotte, A., Guyan K., Lawson J., Neave S., Altorjai, S. *ASSET 2016: experiences of gender equality in STEMM academia and their intersections with ethnicity, sexual orientation, disability and age*, Equality Challenge Unit, 2017. Available from: http://www.ecu.ac.uk/wp-content/uploads/2017/10/ECUs-ASSET-report-November-2017.pdf [Accessed 26 April 2018]
[16] Equality Challenge Unit, *ECU's Athena SWAN Charter: Awards Ceremony November 2016*. Available from: https://www.ecu.ac.uk/wp-content/uploads/2014/07/Athena-SWA-awards-booklet-Nov-2016.pdf.pdf [Accessed 26 April 2018]

research seminar which provides networking opportunities for postgraduate students and postdoctoral researchers
- University of St Andrews, School of Medicine: as part of a review of the school's promotion process, a pre-promotion review committee was established to provide proactive support to school staff applying to the university process
- University of Strathclyde, Department of Biomedical Engineering: development of an equality and diversity impact assessment for the refurbished building and temporary accommodation

All Scottish institutions participate in the Aurora programme which is a women-only leadership development programme. From the first report from a five year longitudinal study of the programme 'there are strong indications of positive effects of Aurora'. [17]

There are disparities in the number of women involved in innovation activities and there is work to address this. This includes the clear national priority of equality and diversity within the Scottish Funding Council's University Innovation Fund[18] and 2018 is the first year of a national Ingenious Women Scotland (funded by CAN DO) programme to 'empower women in STEM roles to take control of their professional development and careers'. This programme targets women working in STEM at the early to mid-career stage. [19] We also see promising signs through national level interventions such as Converge Challenge where 30% of founders, and 30% of winners, are female[20].

Q7 In 2018's economic, political and social context, what do you consider to be the key influencers (positive and negative) on gender equality in STEM in Scotland?

The social context is critical and there are huge issues around damaging gender stereotypes with a significant body of evidence that this occurs at a young age, for example:

- Looking across 15 countries and interviewing children aged 10-14, research showed that damaging gender stereotypes are in place by age 10[21]

[17] Leadership Foundation for Higher Education, *Onwards and Upwards? Tracking women's work experiences in higher education summary*. Available from: https://www.lfhe.ac.uk/en/research-resources/research-hub/2016-research/onwards-and-upwards-tracking-womens-work-experiences-in-higher-education.cfm?utm_source=research&utm_campaign=aurora [Accessed 26 April 2018]
[18] Scottish Funding Councils, *Innovation Funding*. Available from: http://www.sfc.ac.uk/innovation/innovation-funding.aspx [Accessed 26 April 2018]
[19] University of Edinburgh, *Ingenious Women*. Available from: https://www.ed.ac.uk/institute-academic-development/research-roles/research-only-staff/leadership-in-research/women [Accessed 26 April 2018]
[20] Kozlova, O, *Females need to be bolder to achieve true gender balance in all walks of life*, Converge Challenge. Available from: https://www.convergechallenge.com/blogs/competition/2017-03-08-females-need-to-be-bolder-to-achieve-true-gender-b/?platform=hootsuite [Accessed 26 April 2018]
[21] Coghlan, A., *Kids everywhere have damaging gender stereotyping set by age 10*, New Scientist. Available from: https://www.newscientist.com/article/2147963-kids-everywhere-have-damaging-gender-stereotyping-set-by-age-10/ [Accessed 26 April 2018]

- By just age 6, gendered attitude towards 'brilliance' have been shown to emerge and at just age 6, girls start to avoid activities that are said to be for children who are 'really, really smart'[22]
- 60% of 12 year old girls in the UK and Ireland believe that STEM subjects are too difficult to learn[23]

There is clearly much to be done to tackle ingrained prejudices. There is a need for a holistic, systemic approach to these issues – working across sectors and public agencies.

However, from a positive perspective as we see more women in the workforce, including STEM, this improves the evidence base for the value of diversity. Evidence suggests, for example, an 'innovative dividend' through working in diverse teams in academia[24] and evidence of the case for diversity in business including that firms with the highest levels of gender diversity are 15% more likely to outperform rivals[25]. Reinforcing this message –the economic value of diversity - across sectors will be important to maintain action.

Q8 To what extent to you believe that the issue of gender inequality in STEM is being recognised as a priority and to what extent do you believe that rhetoric is being met with action?

This is a priority for Scottish HEIs and there is a great deal of activity in this area– not least due to the ongoing work of institutions via Athena SWAN and our action and ambitions articulated within Gender Action Plans which cover students and staff. This Gender Action Plan approach was launched in 2016 which raised the visibility of work and contextualised the approaches in a national framework. We welcome the acknowledgement in the Gender Action Plans that across Higher Education and Further Education Outcome Agreements, SFC saw 'great work happening across the sector to tackle gender inequality' and recognised a 'strong commitment in the sectors to making progress'[26].

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[22] Bian L., Leslie S-J., Cimpian A., Gender stereotypes about intellectual ability emerge early and influence children's interests, *Science*. 2017;355(6323): 389-391. Available from: https://d2ufo47lrtsv5s.cloudfront.net/content/355/6323/389 [Accessed 26 April 2018]

[23] Accenture, *Accenture Finds More Than Half of 12 Year Old Girls in the UK and Ireland Believe STEM subjects are Too Difficult to Learn*. Available from: https://newsroom.accenture.com/news/accenture-finds-more-than-half-of-12-year-old-girls-in-the-uk-and-ireland-believe-stem-subjects-are-too-difficult-to-learn.htm [Accessed 26 April 2018]

[24] Neilson MW., Alegria S., Borjeson L., Etzkowitz H., Falk-Krzesinski HJ., Joshi A., Leahey E., Smith-Doerr L., Williams Woolley A., Schiebinger L., Opinion: Gender diversity leads to better science. *PNAS* 2017; 114 (8): 1740-1742. Available from: http://www.pnas.org/content/114/8/1740#F1 [Accessed 26 April 2018]

[25] CBI, *Workplace diversity at risk of 'going backwards'*. Available from: http://www.cbi.org.uk/news/workplace-diversity-at-risk-of-going-backwards/ [Accessed 26 April 2018]

[26] Scottish Funding Council, *Gender Action Plan*, Available from: http://www.sfc.ac.uk/web/FILES/Corporate_publications_SFCCP052016_GenderActionPlan/SFCCP052016_Gender_Action_Plan.pdf [Accessed 26 April 2018]

Education

Q9 What do you believe should be done to encourage more girls and young women to engage with STEM subjects in early years, primary and secondary education?

We see that there is a lot of excellent outreach work undertaken by HEIs, in partnership with schools and others. This includes a huge range of activity with a couple of examples including: involvement with Science Centres; researchers going into primary schools to work with young children; University of Dundee organised the world's first festival dedicated to celebrating women in science; or, access initiatives targeting girls into STEM:

- Heriot Watt's 'Dragonfly Days' to encourage girls in the early years of secondary school to develop an interest in engineering. This event offers S2 girls with an interest in science to gain hands-on experience of science and engineering subjects in a university setting to help shape subject choices at S3.
- Queen Margaret University's 'Broken Bodies' for P5-S6 which targets primary and secondary pupils and aims to inspire female pupils to consider a career in science and male pupils a career in nursing/allied health professions.
- University of Strathclyde's 'Engineering the Future for Girls', a one week summer school hosted by the Faculty of Engineering to engage girls in a range of engineering challenges. It is open to all S3 girls but with a focus on low progression schools and learners from deprived backgrounds. Places are funded by BP and BAM Nuttall so student costs are covered.

There is more to do to build 'science capital' of the close advisors of young people. Accenture research in the UK and Ireland showed that more than half of parents felt ill-informed on the benefit of STEM subjects and only 14% of parents said they understood the different career opportunities that exist for their daughters.[27]

In early 2018, the Scottish Government started work on plans to run a campaign to encourage interest in STEM amongst school-age pupils in Scotland. It is important that this project is developed with stakeholders, parents and young people at a pace that allows their full involvement, and is delivered in a way that is accessible to hard-to-reach communities and with a focus on STEM to challenge gender stereotypes in the home

We also need to be aware of access to subjects at schools, with recent Scottish Government data that showed Advanced Higher provision in Scottish secondary schools was challenging with just 78% of all schools offering Physics Advanced Higher, and 31% offering Computing Science[28]. We are also aware of some concerns

[27] Accenture, *Accenture Finds More Than Half of 12 Year Old Girls in the UK and Ireland Believe STEM subjects are Too Difficult to Learn*. Available from: https://newsroom.accenture.com/news/accenture-finds-more-than-half-of-12-year-old-girls-in-the-uk-and-ireland-believe-stem-subjects-are-too-difficult-to-learn.htm [Accessed 26 April 2018]

[28] Scottish Government, *Learner Journey: Analysis of Scottish education and training provision for 15 to 24 year olds*, 2018 (Table 5.9, page 65) Available from: http://www.gov.scot/Resource/0053/00532996.pdf [Accessed 26 April 2018]

that the number of S4 options are limited in some schools which may limit access at an early age to the subject mix needed to pursue STEM courses[29].

Q10 What innovative or impactful practice do you know of or believe should be taking place in universities and colleges to tackle issues of gender disparities in STEM subjects? What do you think can be done to embed STEM gender equality thinking across universities and colleges?

Universities take the issue of gender balance in subjects very seriously, as reflected in the sector's Gender Action Plans. A total of 13 Scottish HEIs are involved with the Attracting Diversity[30] project to grow diversity within the student population with an emphasis on protected characteristics and socio-economic disadvantage – this includes women into engineering and other STEM subjects. Promisingly this project has now expanded to be UK-wide. Other activities that HEIs commonly undertake include:

- Unconscious bias training for admissions and marketing staff;
- Ensuring open day, outreach and marketing materials (including prospectuses) use balanced and/or counter-stereotypical content and that any representatives of the institution or student body at outreach or recruitment events include the under-represented gender;
- Research work to understand barriers and how to overcome them for subjects with gender imbalances; and,
- Highlighting alumni and honorary graduates as positive, counter-stereotypical role models

We are also increasingly seeing how equality and diversity is being included in the curriculum which will increase student awareness of such issues as they progress into employment or further study. A recent HEA[31] project worked with six Scottish HEIs to support mainstreaming of equality and diversity in learning and teaching practices and processes.

We would note that, where gender imbalances exist within degree subjects the imbalance has narrowed relative to imbalances at Higher level, for example in 2013 the gender imbalance in Higher Physics was 71% male, 29% female and acceptances to undergraduate level physics in Scottish HEIs was 61% male, 39% female[32]. Looking

[29] Seith, E. *Scottish curriculum narrows and attainment drops under new regime*. Available from: https://www.tes.com/news/scottish-curriculum-narrows-and-attainment-drops-under-new-regime [Accessed 26 April 2018]

[30] Equality Challenge Unit, *Attracting and increasing student diversity*. Available from: https://www.ecu.ac.uk/guidance-resources/student-recruitment-retention-attainment/student-recruitment/attracting-and-increasing-student-diversity/ [Accessed 26 April 2018]

[31] Higher Education Academy, *Embedding equality and diversity in the curriculum strategy enhancement programme.* Available via: https://www.heacademy.ac.uk/embedding-equality-and-diversity-curriculum-strategic-enhancement-programme-1 [Accessed 26 April 2018]

[32] Universities Scotland. *Response to the publication of the SFC's Gender Action Plan*. Available from: https://www.universities-scotland.ac.uk/response-to-the-publication-of-the-sfcs-gender-action-plan/ [Accessed 26 April 2018]

at all UK HEIs with >1000 STEM students shows that Scottish HEIs fill 3 of the top 6 institutions for percentage of STEM students who are female.[33]

Cultural Change

Q11 In what ways do you believe industry can lead by example to tackle inequality within workplace culture?

Organisations such as Equate Scotland[34] (hosted by Edinburgh Napier University) are contributing to supporting industry to improve gender equality and diversity in the workplace.

From our perspectives, partnership is important. Employer engagement through schools, universities and colleges is important to inspire girls into STEM careers. An example is the work of SmartSTEM, founded by Seric Systems, with Glasgow Caledonian University (GCU) on an engagement day which featured 10 workshops from GCU staff and students, and 18 workshops from external companies and SmartSTEMs volunteers. This all aims to inspire girls aged 11-14 to get involved with STEM subjects[35].

Q12 What do you believe are the most effective ways to challenge and change deep-rooted attitudes and institutional culture in order to improve gender equality in STEM?

We recognise the key role of leadership in culture change, as well as the wider drivers in the system that can impact on equality and diversity.

Leadership is at all levels and this relates back to our recommendation that promoting equality and diversity should be shown as something everyone can contribute to – including all levels of institutional leadership.

From the drivers perspective there is a lot of high profile work under the Gender Action Plans through to the Research Excellence Framework (REF) for researchers. The REF is important to institutions for a number of reasons including allocation of underpinning, quality related funding. Work is ongoing within the four UK funding bodies to develop REF2021 and crucially for institutions the final decisions on rules are needed to begin planning. Institutions require this guidance as soon as possible as it is important to have the guidance for codes of practice to fully develop the institutional approach to selecting outputs (and identifying the eligible pool of staff, where appropriate) to ensure these reflect best practice for equality and diversity considerations and time to consult and engage with staff.

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[33] STEM Women, *Which Universities Have The Most Female STEM Students And Why Does It Matter?* Available from: https://www.stemwomen.co.uk/blog/2017/11/which-universities-have-the-most-female-stem-students-and-why-does-it-matter# [Accessed 26 April 2018]

[34] Equate Scotland, *What we do*, Available here: http://www.equatescotland.org.uk/about/what-we-do/ [Accessed 27 April 2018]

[35] Glasgow Caledonian University, *GCU STEM event aims to inspire young* women, Available here: https://www.gcu.ac.uk/newsroom/news/article/index.php?id=177517 [Accessed: 27 April 2018]

Q13 How do you suggest culture change can be measured in a meaningful way?

We see the need for a multi-layer approach to assessing culture change, that does not just focus on one or simple measures, and covers a mix of quantitative and qualitative measures.

Additional information: Gender in global research

Elsevier's recent research looked over 20 years, 12 comparator countries and regions, and 27 subject areas which gives an interesting picture of the global research, using authorship information. This showed that:

- The proportion of women amongst researchers and inventors is increasing
- In the UK, women formed 31% of researchers (or authors) in 1996-2000 and this has increased to 40% in 2011-2015.
- Women continue to be under-represented in Physical Sciences globally, and women are poorly represented on patent applications (10% in 1996-2000, 14% in 2011-2015).
- Women are less likely to collaborate at an international level on research papers and are less internationally mobile.

Looking just at the UK level and across STEM related disciplines the proportion of female researchers has increased across all disciplines[36] looking at 1996-2000 compared to 2011-2015.

This does show there has been change but, with reference to the 2012-2018 time period, demonstrates the length of time for change and the need to continue to focus on gender equality.

Contact:
Ruth Meyer
Senior Policy Officer (Research and Innovation)
Universities Scotland
ruth@universities-scotland.ac.uk
0131 225 0705

[36] We reviewed: agriculture and biological sciences; biochemistry, genetics and molecular biology; chemical engineering; chemistry; computer sciences' earth and planetary sciences; energy; engineering; environmental sciences; health professions; immunology; materials science; mathematics; medicine; neuroscience; nursing; pharmacology, toxicology and pharmaceutics; physics and astronomy; psychology; and veterinary