



Response to the Enterprise and Business Committee's follow up inquiry into:

Science, Technology, Engineering and Mathematics (STEM) skills

April 2014

Chwarae Teg exists to deliver our vision of a Wales where women achieve and prosper. We do this by working with women to broaden horizons and build confidence and skills; working with employers to create modern workplaces that are successful by harnessing everyone's contribution; and working with influencers, educators and decision makers to build a society that values, supports and benefits women and men equally.

Research demonstrates that women are under-represented in STEM industries; there are often very few women on the boards of FTSE STEM companies, large numbers of women are not using their STEM qualifications in their careers and young girls are less likely to feel confident in their abilities in these subject areas. We believe that working with young women could help reduce the apparent gender gap in STEM and improve the economic prospects of STEM industries, by utilising the resource that is women in STEM. We welcome the opportunity to contribute to this inquiry and would be keen to work with the committee and the Welsh Government to take our recommendations forward.

Key points

1. Women are under-represented in STEM and targeted interventions at an early age would help to reduce the gap between males and females.
2. It is important that female role models from STEM industries play an active role in STEM engagement and education, to help encourage girls to achieve their full potential and pursue careers in STEM unhindered.
3. Support structures available to assist working parents or carers in STEM careers are vital in ensuring longevity in their careers and creating a more flexible work environment that is family friendly.

Consultation Questions

1. What impact has the Welsh Government's strategy Science for Wales and Delivery Plan had on science, technology, engineering and mathematics (STEM) skills in Wales?

- 1.1. The Welsh Government's investments into *Increasing the Science and Engineering Talent Pool* through STEM engagement projects are invaluable when encouraging young people to access science. The engagement projects available from Techniquest as part of the National Science Academy and their outreach programmes (such as MathCymru) are vital in making STEM accessible. In a PISA survey in 2012, pupils reported that they felt there were higher levels of support from mathematics teachers in Welsh schools than the OECD average¹. However, the information available does not indicate whether more girls are being encouraged to study STEM subjects.
- 1.2. The 2012 PISA survey showed that Wales scored significantly lower than England, Scotland and Northern Ireland and in the OECD average in mathematics and science. The data available was not disaggregated by gender, it is crucial to monitor the progress of boys and girls respectively, to ensure they are identifying with STEM subjects equally.

Recommendation 1: Ensure data is collected to monitor STEM education and employment. This will provide a benchmark and allow progress to be monitored.

2. What progress has been made in addressing the issues identified in the Enterprise and Learning Committee's 2011 inquiry into the STEM agenda?

- 2.1 It is important that initiatives encourage children to be involved in STEM subjects from the Foundation Phase onwards. Engagement projects, such as STEM Cymru, are working to create a positive image for STEM industries for children. Furthermore, STEM Cymru's project *Girls into Engineering* is vital in allowing girls to pursue careers in Engineering and STEM, which are industries which lack equal female representation.
- 2.2 Estyn reported that the majority of secondary science departments in Wales are led effectively by teachers who are enthusiastic about science¹. However, only about half the primary leaders have a clear vision for developing science in their schools. Thus, children from a younger age need to be engaged in science through utilising STEM specialist teachers or retraining teachers in STEM. Furthermore, young girls would benefit from exposure to a female STEM role model, helping them to identify with a subject that often can be gender-biased.

¹ Estyn Report into Science in Key Stages 2 & 3 in June 2013

2.3 The data available does not indicate whether the changes implemented have led to more young girls becoming interested in science. Our own projects, Get on with Science (delivered in partnership with ContinYou Cymru) and Fair Foundations (part of the Agile Nation project, suggest that Science lessons are often not engaging for girls and 'gender lensing' should be carried out to ensure girls benefit equitably.

Recommendation 2: Teaching materials and STEM engagements initiatives should be 'gender-lensed' to ensure that girls and boys are engaged to an equal measure.

3. The adequacy of provision of STEM skills in schools, further education colleges, higher education based learning (including apprenticeships);

3.1 Currently, women remain underrepresented in STEM careers. It is important to ensure that girls are being encouraged to be involved in STEM and ensure that girls are aware of their potential to succeed in these areas. Research shows that girls' self-confidence in the subjects can affect how well they perform in STEM subjects, and their confidence is affected by their exposure to the stereotype that girls cannot succeed in these subjects².

3.2 Women are especially under-represented in STEM apprenticeships, accounting for just 3% of engineering apprenticeships³ for example.

Recommendation 3: Initiatives need to be in place to encourage more women to study STEM at further education, higher education and undertake STEM apprenticeships.

4. Value for money from the additional funding to support and promote STEM skills and whether the supply of STEM skills is meeting the needs of the Welsh labour market;

4.1 We welcome the Welsh Government's commitment towards promoting STEM skills as STEM industries are deemed crucial for the modern economy and hold great potential for economic growth for Wales. Therefore, investment in STEM skills is invaluable to Wales' future economy.

4.2 There is limited data available on the supply and demand of individuals with STEM skills to the UK workforce and ambiguity over the skills desired by the industry. This is thought to lead to a lack of clarity over what STEM education should be trying to achieve⁶.

4.3 Women are still under-represented in STEM industries and thus skills of women in STEM will not be fully utilised in this area of potential economic growth. It is thought that harnessing the full potential of women could generate economic growth. Thus, it

² Simpkins, S.D. and Davis-Kean, P.E. (2005). The intersection between self-concepts and values: Links between beliefs and choices in high school. *New directions for child and adolescent development*. Pg. 31-47

³ http://www.thedataservice.org.uk/statistics/statisticalfirstrelease/sfr_supplementary_tables/Apprenticeship_sfr_supplementary_tables/

is important that when promoting STEM skills, that all genders are equally targeted, to help women access a career in STEM and fully use their potential.

Recommendation 4: Work with STEM employers to understand skills gaps and identify how they can make sure all skills are being fully utilised.

5.The supply of education professionals able to teach STEM subjects and the impact of Initial Teacher Training Grants and the Graduate Teacher Programme on recruiting STEM teachers and education professionals;

5.1 There is currently limited data available concerning the number of recently STEM graduates becoming teachers. Research indicates that a shortage in STEM teachers leads to a reduced number of students studying STEM subjects at A-level⁴.

5.2 Anecdotal evidence suggests to us that low levels of gender awareness amongst teachers and careers advisers is creating a barrier for girls wanting to engage with STEM occupations. We therefore, urge that PGCE, Master of Education and Careers qualifications include specialist training. CPD should also be available for these professionals to reinforce the learning and ensure it has an impact.

Recommendation 5: Gender awareness should be embedded in PGCE, Master of Education and Careers Service professional training to increase understanding of gender stereotyping and how to encourage more women into STEM⁵.

6.The effectiveness of the education and business links between education institutions and STEM employers.

6.1 There is limited data available concerning the supply and demand of individuals with STEM skills in the UK workforce, which has ultimately led to uncertainty over the skills desired by potential employers and what STEM education should aim to achieve.

Recommendation 6: Stronger links between schools and local businesses are promoted, focusing on offering a broader range of options to girls through positive role models and meaningful work experience⁷.

7. Whether any progress has been made on addressing negative perceptions and gender stereotypes of STEM and promoting good practice to encourage women to acquire STEM skills and to follow STEM related careers.

7.1 Women occupy around 15% of STEM positions and make up 42% of FTSE STEM company boards. Furthermore, a significantly lower number of female STEM graduates go on to work in STEM roles in comparison to male graduates. Thus, there is still work needed to be done to address these gender gaps.

⁴ Nath, C. and Border, P. (2013). STEM education for 14-19 year olds. Parliament.UK

⁵ Chwarae Teg Manifesto (2014). A Wales Where Women Achieve and Prosper. Cardiff, Chwarae Teg

7.2 Chwarae Teg and Continuu Cymru's project *Get On With Science* identified the importance to engage school aged girls in science and provide professional female role models to demonstrate their potential⁶. This reinforces research that showed the positive effect exposure to female role models has on school aged children. This also altered their attitude about science and women in industries⁷.

7.3 Research shows that the largest contributing factor towards the participation of girls in STEM subjects is self-confidence. It is thought that the negative stereotype that girls are less able in STEM subjects worsens their performance in the subjects. Therefore, it is important to actively address the falsehood of this stereotype, to prevent girls from being deterred from this subject. OECD Pisa Test showed that in most countries girls under perform in Maths in comparison to boys. However, in the countries that offer more equal opportunity and resources to men and women (such as Iceland, Norway and Sweden), the STEM gender gap significantly decreases⁸.

7.4 The nature of STEM industries means that work often runs outside of office hours and thus breed an inflexible environment that isn't family friendly, resulting in difficulties for employees with a family (the responsibilities of which often effect females more than males). Furthermore, due to the constantly changing nature of the STEM industries, any break from a career can result in being left behind, this problem largely effects women in STEM, as family responsibilities more often fall on women's shoulders and result in career breaks. It is important that there is a supportive structure in place that allows flexibility and assistance for working parents or carers in STEM industries.

Recommendation 7: Initiatives need to be put in place to encourage girls from a young age to be encouraged into Science, this should include the promotion of female role models. Support structures must also be implemented to help working parents in STEM industries.

For further information from Chwarae Teg, please contact:

- Christine O'Byrne – christine.o'byrne@chwaraeteg.com
- 02920 478900 / 07787 295658
- www.chwaraeteg.com

⁶ Chwarae Teg (2012) *Get On With Science*, Cardiff, Chwarae Teg

⁷ Smith, W.S. and Owen, T. (2006) Effect of women in science career role models on early adolescents' attitude toward scientists and women in science. *Journal of Research in Science Teaching*, Pg 667-676.

⁸ OECD Report (2014) *Are boys and girls equally prepared for life?*