

Skills
Development
Scotland

Women into STEM pathway development projects

Developing sustainable pipelines to recruit, prepare and progress women aged 16-24 years into STEM careers including progression into Modern and Graduate Apprenticeships in STEM occupations.



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Executive Summary



1. Under-representation of women in engineering, IT and construction roles

The lack of gender diversity in STEM* careers, including STEM apprenticeships, is an entrenched problem. Concerted action across the careers ecosystem is needed if Scotland is to address skill shortages in key growth sectors, enable women to access careers of the future, and close the gender pay gap.

The Scottish government's [STEM Education and training strategy](#) calls for action,

“... efforts to tackle gender imbalances and other inequalities that exist across STEM education and training should continue at pace.”

(Section 2, p 6).

2. Acting systemically

SDS commissioned three expert organisations to lead innovative projects to take co-ordinated action across the STEM pipeline. The projects engaged local stakeholders across the pipeline from senior phase* of education and into STEM workplaces. Employers of apprentices were key partners in all three projects. All projects developed their approaches based on consultation with young women.

- West College Scotland (WiSTEM, women into STEM), Engineering
- Edinburgh Napier University (WiT, women into tech), tech including IT
- University of Highlands and Islands, Inverness, (UHI Inverness) Rurality and mixed STEM roles (especially science, engineering and construction)

3. Findings

All three projects have developed approaches and resources which were impactful and could be implemented across Scotland now.

3.1 WiSTEM

Changed perceptions of STEM subjects and careers

Developed and tested an innovative approach that had young women undertake marketing training which changed their perceptions of STEM careers, as they themselves created campaigns to market STEM careers to other young women. During these activities an SDS careers adviser provided labour market information (LMI) and apprenticeship information. The young women met women STEM role models.

Promoted inclusive recruitment practices

A second major strand was to work with local engineering employers and partner Equate* to review recruitment approaches to be more inclusive of women.

3.2 WiT

Building resilience and capacity of young women to increase their likelihood of remaining in tech roles

The key focus of this project was to support young women who had entered computing and other tech careers to develop their resilience and capacity to thrive and progress their careers through networking and mentoring support from women working in STEM. They did this using their innovative “Connect-Ups” * designed using the participant-centred framework. The participants reported a reduction in feelings of imposter syndrome* and that they were better prepared for the challenges ahead.

Addressing hostile workplace culture in the tech sector

A second and complementary workstream, delivered in partnership with Equate*, was to engage STEM tech employers to work to create more inclusive and female-friendly workplaces. Workplace culture in the tech sector is acknowledged as a major barrier to recruiting and retaining women in Information and Communication Technology (ICT) roles. Since 2016/17 there has been a reduction of 3% of women starting MAs in IT and telecoms; in schools just 19% of young people sitting Higher Computing were female in 2022. ([MA Supplementary tables](#), SDS, and [SQA Attainment Statistics](#))



3.3 UHI Inverness

STEM workshops designed to appeal to young women change perceptions of STEM careers.

This project, through consultation with young women and working with local STEM employers, created and delivered a series of fun and “hands-on” workshops. The workshops were challenge and/or project based; used interdisciplinary learning (IDL) incorporating maths; and designed to align with the interests of the young women with workshops themed around topics, including developing renewable energy and cleaning up oil spills.

“Young women were also found to have more interest in creativity and in making a positive difference through their careers, but do not consider STEM compatible with these attributes”

(Tapping All Our Talents Review 2018 p37).

The workshops were designed to enable young women to use their creativity, which is generally not something young women associate with science and STEM. This addressed one of the key barriers identified in the review of Tapping All Our Talents.

Local employers released female STEM apprentices to be trained to deliver these workshops.

UHI Inverness evaluation demonstrated that the young women enjoyed the workshops and that their perceptions of STEM careers and Apprenticeships had become more positive. Teachers in the schools were keen to learn more. The partners have committed to delivering these workshops in more schools after the project concluded. It must be noted the SDS funding enabled UHI Inverness to purchase equipment for the workshops and transport to take pupils to the venues, with the latter a particular challenge in rural areas.

4. Applying learning from the projects

This report describes the impactful approaches and resources developed based on lived experience which could be implemented across Scotland now. They have shown it is possible to positively change perceptions of STEM subjects and careers amongst young women in senior phase and how to improve transition to and retention in highly segregated STEM industries. We have the pieces of the puzzle we need to take action to improve the representation of women in STEM.

Local STEM stakeholder partnerships that include STEM employers

The projects demonstrated that local collaboration of key stakeholders which actively includes local STEM employers can deliver against key goals and recommendations. This point has been raised in recent reports and strategies, including from the [Structural Barriers to STEM engagement](#) report:

“...there is a real need to ensure that STEM education being provided in schools is rooted in the real world, and of direct relevance not only for their future career choices, but accurately represents STEM-related enterprises and other sectors of the economy as well as its importance in terms of the transition to net zero and learning for sustainability. More and better information regarding STEM jobs is also required.”

(5.4, p 36)

Taking action to diversify the workforce and establish inclusive workplace culture

STEM employers were encouraged to be aware of how they can diversify their workforce, including through taking positive action*. Employers were also made aware of the business benefits of adopting inclusive recruitment approaches and of ensuring their workplace culture is friendly to women to retain skilled staff, including having their expertise available in senior roles.

Co-ordinated collaboration between secondary schools and tertiary education providers to share resources

UHI Inverness showed that an Interdisciplinary Learning (IDL) approach and using college space, equipment and staff is a way of ensuring young women in secondary schools can gain access to engaging workshops aligned to their values delivered in a gender-sensitive way. It would also allow access to computer teaching that engages them, a short-term workaround for the shortage of computing teachers in the region.

5. Recommendations

To develop these STEM pipelines across Scotland delivering a more consistent promotion of STEM in school, several key actions are required at national level. The following recommendations could be delivered largely by using existing structures, resources, and partnerships such as the DYW groups, Regional STEM partnerships and Local Employability Partnerships (LEP)s:

1. Develop a National Implementation Strategy

- The strategy would need to consider:
- how to ensure access to pupils in secondary schools, particularly in senior phase and curriculum space.
- a commitment to some “women only” and “hands-on” activity delivered using gender sensitive approaches.
- which STEM sectors in which geographies.
- how to utilise and co-ordinate the legion of partners working in the STEM landscape to deliver a quality, coherent programme across Scotland

2. Create Co-ordinator roles

Employers and stakeholders are supportive, but a co-ordinator or realignment of existing resources is required to develop a programme, organise partners and resources and work with schools, apprenticeship providers, FE Colleges and HE institutions.

3. Establish a Single National STEM Resources Bank

Many excellent resources currently exist but are scattered across many websites not easily reached by the target audiences. There is a need for a central, nationally available, up to date resource bank.

4. Create a fund for equipment and transport in rural areas

To adopt these interdisciplinary learning workshops and project-based approaches it is essential to fund the purchase of workshop equipment.

If there is to be equity, then funding for transport for pupils in rural areas to the workshops is also required.

1

Introduction




1.1 Context and approach

Low participation of women in STEM occupations is detrimental to women and the Scottish economy.

The under-representation of women and girls in STEM careers in Scotland is well documented, as are the multiple and entrenched barriers which combine to perpetuate the horizontal* and vertical* segregation of the labour market, and the gender pay gap*. This situation is detrimental to women, the Scottish economy and society.

Women continue to be under-represented in the key sectors of engineering, the built environment, and digital technology. Women are well represented in medicine and healthcare professions. The General Medical Council (GMC) in their [Workforce Report 2022](#) reported that in 2021, 50.4% of doctors joining the workforce were women. The report further highlighted that in the academic year 2021/22, 64% of the medical student intake were women (p 28). However, the report shows clear gender imbalances in the different specialisms of medicine with the highest proportion of women in obstetrics and gynaecology (60%), paediatrics (58%), GPs (57%) but the lowest proportion of women doctors was in surgery, just 15% in 2021, a rise from 9% in 2012.

The on-going low participation of women in STEM is of particular concern to the Scottish Government as these are occupations with current and projected skill shortages and they underpin the economic transformation to net zero as stated in the [STEM Education and training strategy](#).



“The long-term goal of promoting efforts to tackle gender imbalances and other inequalities that exist across STEM education and training should continue at pace.”

STEM Education and training strategy.
(Section 2. P6).

Furthermore, if women do not enter STEM careers they will be locked out of “the jobs of the future” with the better pay and career pathways they offer. ([Equate, Women into STEM intersectional analysis](#)).

Partnerships, collaboration, and concerted action are required to tackle entrenched and interconnected barriers.

Evidence from published research identified that partnerships are required to take concerted action over time to address these entrenched and interconnected issues. Evidence from the [Scottish Apprenticeship Advisory Board's Gender Commission report](#) indicates that work should begin in the early years of children's lives with employers involved throughout, not just as end users, if young women are to make successful transitions into STEM careers.

The Royal Society of Edinburgh's [Tapping All Our Talents Review 2018 report](#) includes the recommendation: “Recognising that single intervention does not work, industry should look to create sustainable and strategic partnerships on gender equality with schools, colleges and universities which provide both access to knowledge for teachers and pupils at the school level, and “theory into practice” opportunities for under-represented students through placements, work experiences or engagement events.” (p.100)

Key barriers to address

Pathway preference for university

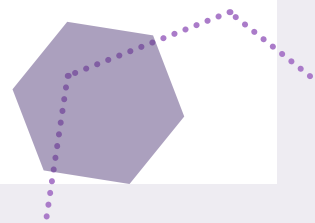
SDS statistical data shows a clear pathway preference for university amongst young people in school in Scotland and this is especially the case for girls. SDS undertakes a survey of pupils every year, [Young People in Scotland Survey](#) (YPSS*). The most recent, in 2022, was conducted by Ipsos Scotland (1533 pupils S1-S6) outlined that 50% of girls surveyed expressed a preference to go to university compared to 36% of boys and just 1% of girls expressed a preference for undertaking a Modern Apprenticeship (MA) and none for a Graduate Apprenticeship (GA).

Perceptions of STEM careers and subjects

The Tapping All Our Talents report further highlights that the perception of STEM subjects and careers is a further barrier in terms of perceived difficulty but also in not aligning with what girls and young women consider important in deciding on a career:

“Young women were also found to have more interest in creativity and in making a positive difference through their careers, but do not consider STEM compatible with these attributes”

(Tapping All Our Talents Review 2018, p37)



The YPSS survey asks pupils about their preferred jobs sectors. The sectors that young people consider for their future career vary considerably by gender. Few girls are interested in key STEM sectors: Engineering, 12% (42% for boys); Computing and ICT, 11% (36% for boys); and Construction, 5% (30% for boys). Scottish Qualifications Authority (SQA) data for pupils sitting Scottish Highers demonstrates that girls and young women do not choose subjects that would enable them to move into sectors such as physics and computing. For example, in 2022, 19% of pupils sitting Higher Computing were female, just 650 girls and women, and 26% of pupils sitting Higher Physics were young women, a fall of 9% since 2019. ([SQA Attainment Statistics](#)). The low number of girls and young women studying computing is of concern to the Scottish Government and the [STEM Education and training strategy](#) outlines the challenges in improving the uptake by young women of subjects including computing science, engineering and physics (p15).

Structural barriers in senior phase of schooling

The Scottish Government published [Structural Barriers to STEM engagement](#) in November 2022. It states, "There is a mixed level of commitment to the promotion of a STEM agenda in schools in Scotland".

The report identifies challenges posed by school processes, such as timetabling and heavy emphasis on assessment in the senior phase, and the difficulty recruiting STEM subject teachers. In relation to improving equity the report states: "Many barriers in terms of equity and equality of access to STEM education still exist. Geographical inequality continues to reinforce inequity in STEM take-up, which

is compounded by lack of equity to STEM teaching support, particularly in rural areas. Well-documented cultural and perceptual barriers also persist. Evidence suggests that tackling inequity and inequality is piecemeal, and change is slow." (pii)

Employer recruitment approaches

The [Scottish Apprenticeship Advisory Board's Gender Commission report](#) describes the current state of gender diversity in Scottish apprenticeships and the broader labour market, focussing on the role of employers. The Gender Commission evidence review (3.4, The role of employers in improving gender balance in apprenticeships, 2021) highlighted that, "Positive action* is rarely used in apprenticeship recruitment because employers lack awareness and/or the confidence to implement effective positive action measures".

"Whilst employers are often eager to recruit more women into these roles few take proactive steps to make their processes or industries more accessible to women. Indeed, many industries including construction continue to recruit through "word of mouth".

The Gender Commission report has four recommendations for employers. One of these urges employers to take a proactive approach to develop and maintain a strategy for improving gender diversity, including the use of gender-neutral language, a positive recruitment policy, and pay in line with the [Gender Pay Gap Action Plan](#).

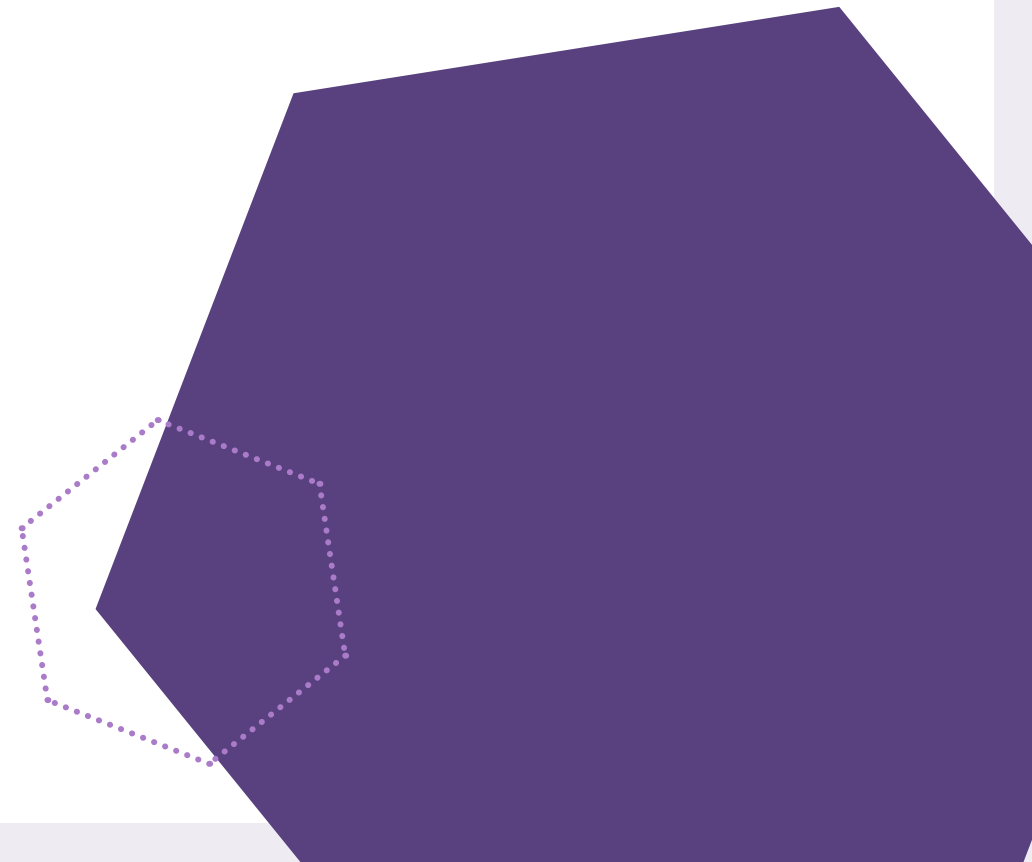
Workplace Culture

There is evidence that some male-dominated workplaces are unwelcoming to women and as a consequence women do not enter these roles, or if they do, they are less likely to remain in them. Workplace culture is an issue for the tech sector. Jeanie York, Chief Technology Officer at Virgin Media, explained: "This toxic "tech bro" culture is leading to worse outcomes for women, perpetuating the gender pay gap and allowing the pernicious narrative that certain roles are better suited to men to go unchallenged. It's also leading to worse outcomes for businesses." ([SYSTEM UPDATE. Addressing the gender gap in tech](#), Fawcett Society, 2023).

The Gender Commission Evidence review highlights that, "... although women are more likely to complete apprenticeships than men, this is occupation dependent. Being a woman in a male-dominated occupation increases the probability of dropping out significantly, so there is an interaction between gender and apprenticeship framework." (3.2, p 6). Therefore, the Commission suggests in Recommendation One that employers should create an inclusive workplace culture, giving confidence and offering opportunities to employees of all genders and backgrounds. The

Commission recommends the use of the Think Business, Think Equality [self-assessment tool](#) developed by Close the Gap* for small and medium businesses and third sector organisations.

In Scotland there is a plethora of tools, resources, websites, and organisations to support this work. However, many employers and other key influencers including schools are unaware of them.



1.2 The approach

Why did SDS commission these projects?

“Gaps are noticeable in the evidence base on initiatives to encourage gender diversity in apprenticeships.”

(Skills Development Scotland (2021) Gender Commission Evidence Review.)

Evidence shows that tackling this lack of diversity in STEM occupations remains fragmented; change is piecemeal and slow. The multiple and entrenched barriers are well-documented. There were no examples available that demonstrate how to address these entrenched barriers in the concerted, long-term way required.

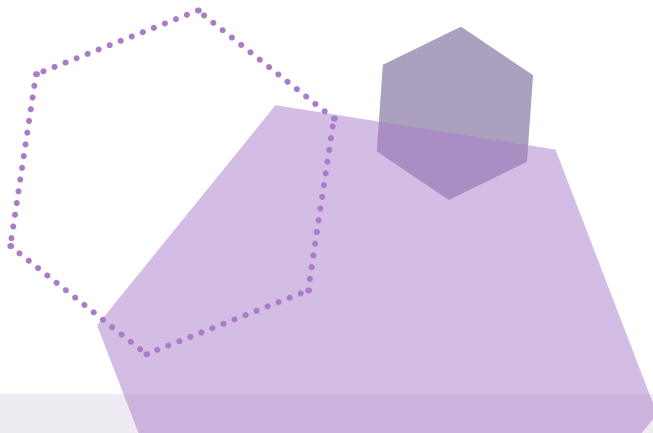
Skills Development Scotland (SDS), the national skills body supporting the people and businesses of Scotland to develop and apply their skills, identified the need to procure expert organisations or consortia to:

- test out how to implement the collaborative, co-ordinated approach required to establish sustainable pipelines. They included STEM employers of apprentices;
- test actions and approaches to identify impactful activities that address the different and interconnected barriers that could be scaled up and transferred to other geographic regions or sectors;
- raise awareness of the benefits of the apprenticeship pathways.

Objectives and requirements

To identify impactful approaches and actions that could be shared geographically and scaled up it was decided to put three lots out to competitive tender:

- urban
- rural
- tech



The rural and urban projects could select a STEM sector or have a more general STEM focus, provided they focussed on sectors where women are significantly under-represented, such as construction, engineering and tech. Furthermore, they had to include the option to train through an apprenticeship.

SDS were keen that the projects each decided their own focus and methodologies but asked that the following key requirements underpinned or were incorporated into the project design:

1. Initial scoping and project plan

Undertake a scoping exercise to identify and address specific barriers, gaps and challenges for young women 16-24 in the STEM pipeline in the delivery context of the partnership. This was to include some consultation with the target group.

2. Evidence-led

The project design should be based on evidence and research, with a clear rationale for the activities and milestones chosen including measuring the progress to address perceived barriers, gaps and challenges identified in the scoping exercise.

3. Partnership approach

Establish a partnership and pipeline which builds capacity to support women into STEM during and after the period of the funded project.

The partnership was to include partners connecting the supply of young women to the learning providers and employers. Partnerships should include one or more other local organisations needed to deliver the project such as schools, HE/FE institutions, or specialist third sector. Partnership must be supported by industry representation including local employers who have or will recruit Modern and/or Graduate Apprentices to relevant STEM frameworks.

4. Progression to apprenticeships

Raise awareness of the pathways into STEM careers and aspiration to move into these pathways including Modern and/or Graduate Apprenticeships.

5. Share learning

To produce resources appropriate to the specific project that can be shared such as toolkits, case studies, reports or other tangible resources.

Bidders were aware from the outset of the challenge ahead that the target group, girls in S4-S6, would already be likely to have formed stereotypical career choices and pathway preferences by the time that the projects engaged them.

Bidders had to demonstrate that they understood the key issues pertinent to the brief and that they had the capacity to deliver the project. The projects were to last for 18 months.

2

The Projects



Introduction

Contracts were awarded in July 2021 to the successful bidders. Each lead organisation was to establish a steering group that included local STEM employers who recruit apprentices.

The STEM projects			
Lot	Lead Organisation	Focus	Key partners
Urban	West College Scotland WiSTEM	Engineering	<ul style="list-style-type: none"> • Forth Valley College • Equate Scotland • Young Enterprise Scotland • Project steering group members including employers and sector body ECITB.
Rural	University of the Highlands and Islands UHI Inverness	Mixed STEM including engineering and construction	<ul style="list-style-type: none"> • Highland Council including DYW co-ordinators • Diageo • Opportunity Cromarty Firth • Lifescan • West Fraser and Strathspey
Tech	Edinburgh Napier University Women into Tech WiT	Computing and IT	<ul style="list-style-type: none"> • University of Stirling • Forth Valley College • Equate Scotland • Ada Scotland • Steering group members

Each project produced a final report on their work across all their workstreams. In this report, particular examples from each project have been selected for inclusion as they exemplify impactful, scalable approaches to address barriers and to build capacity across the pipeline, from work in school to being in employment, to support young women to enter and sustain STEM careers.

In addition, the examples demonstrate how to implement and deliver key recommendations of several SG policies or key reports including: -

- [the STEM education and training strategy, refresh, 2022](#)
- [Structural Barriers to STEM engagement, 2022](#)
- [The Career Review recommendations, 2022](#)
- [Tapping All Our Talents review of 2018](#)
- [Scottish Apprenticeship Advisory Board's Gender Commission report](#)

2.1 West College Scotland (partner Forth Valley College): WiSTEM

In this engineering focussed pipeline project the key themes to be addressed were:

- greater female representation in STEM roles
- the “leaky” pipeline* (the continuous loss of women at consecutive career stages in educational and career pathways)

The project had three major workstreams to deliver this.

The STEM projects	
Workstream	Actions delivered
Employers	Equate to: <ul style="list-style-type: none"> • undertake a baseline survey regarding recruitment of women to STEM roles • deliver series of workshops promoting inclusive recruitment and workplace culture
Apprentices (young women)	Workshops led by Equate with current apprentices to address issues identified included: - <ul style="list-style-type: none"> • Managing change and confidence • Goals and obstacles • Assertiveness • Networking and peer support
Female pupils in S5 and S6 in schools in Renfrewshire and Forth Valley	Raise awareness of STEM roles and apprenticeships by engaging pupils in marketing training. They were to create marketing campaigns for STEM careers or subjects. Delivered by Young Enterprise Scotland, YES, supported by SDS careers adviser, and input from apprentice role models.

Outputs and outcomes

A key conclusion of the Structural Barriers to STEM engagement, 2022 was the need to make STEM subjects more enjoyable and engaging by adopting a gender aware approach tailored by subject. This approach will also be important for tackling issues of perceived or actual difficulty, and learner confidence, particularly in relation to gender. (5.5, p 37)

The approach taken by WiSTEM to engage young women and change their perceptions of both STEM careers and apprenticeships was highly innovative and effective. Girls in the senior phase were offered the opportunity to learn about marketing, this was the “hook” as it was the vehicle to deliver information on STEM careers and pathways. It was led by Young Enterprise Scotland and recruited young women from S5 and S6: “We are challenging senior phase pupils to create a marketing campaign to encourage their peers to get into STEM.” This approach attracted young women and was the way to make them aware of the interesting careers in STEM and of the apprenticeship pathways.

The pupils attended four workshops to learn about marketing: methods and techniques; analysing demographics to target an audience; and pitching. The workshops all included STEM inputs from inspiring female apprentices, a variety of roles in STEM and information on the circular economy.

They all elected to use emotional marketing and diversity marketing as they believed it would be the option most likely to have an impact on other young women. They chose to deliver this through social media, focussing on TikTok and YouTube as the platforms they and their peers use.

The participants’ attitudes were benchmarked at the outset and the end. There was a marked positive change of attitude particularly to the perception that STEM careers are hard to get into, and of their own interest in a STEM career.

Change in attitude to STEM resulting from participation in marketing workshops			
Workstream	Statement	Workshop 1 % in agreement	Workshop 4 % in agreement
1	“There are a wide range of STEM-related careers”	69%	73%
2	“STEM-related careers are well paid”	73%	84%
3	“STEM-related careers are hard to get into	63%	14%
4	“I am interested in a STEM-related career or job”	38%	73%
5	“STEM-related careers are mostly suited to men”	48%	0%

(Table data from WiSTEM final report, West College Scotland)

The apprentice workstream workshops were designed to enable young women apprentices to identify their unique strengths as women in female-only workshops; this helped them gain confidence. The apprentices identified issues of concern and potential solutions that would benefit all apprentices such as having a buddy or mentor.

The employer and ECITB attendance at the Equate workshops demonstrated their commitment to increasing the participation of women in STEM occupations. The workshops were well received. It was noted that the inclusion of men in such training from the employers could be helpful to developing and embedding inclusive practices rather than leaving it to women themselves to drive change. One major engineering employer on the group had altered their recruitment advertising following advice from Equate and reported an increase in women applying.

The steering group highlighted that whilst there is a lot of STEM information available it is not available in one place in a format that appeals to the target audience. Therefore the two colleges, West College Scotland and Forth Valley College, collaborated to create a website that will continue post-project to house inspiring [case studies](#) and accessible information on [STEM careers on their Women in STEM website](#).

2.2 Women into Tech (WiT) (Edinburgh Napier University and Stirling University)

WiT (Focused on post-school activity)	
Workstream	Actions delivered
Lack of awareness of digital jobs (girls believing these jobs are not characterised by creativity, collaboration nor that tech “helps” people or communities.)	<ul style="list-style-type: none"> Diverse case studies of women into tech; Events to support awareness raising and peer mentoring
Predominantly male environments: study and workplaces. (Perception by women these environments are challenging for them)	<ul style="list-style-type: none"> Bring women together through skills workshops and peer mentoring events (Connect-Ups); Create materials for seed networks to hold their own Connect-Ups; CPD to support women’s leadership skills. Pilot the SDS funded Participant-Centred Planning Framework.
Lack of access and support in some schools to computing qualifications and/or work experience (perception it is not female friendly)	<ul style="list-style-type: none"> Publish and publicise case study profiles and materials to establish Connect-Ups; Work with SICSA (Scottish Informatics and Computer Science Alliance) to encourage female-friendly open days for computing departments; Work with WiT Steering group and Ada Scotland to improve communications with schools.

The “leaky pipeline”

It is well documented that women face barriers entering STEM employment and in being retained in these roles. This attrition of women at every stage of education and employment in STEM and technical fields is often referred to as the “leaky pipeline”. (Women in the Scottish STEM Landscape, 2023, p 14)

Tapping All Our Talents review of 2018 investigated whether women’s participation in STEM workplaces in the UK had improved between 2012 and 2017 and found: -

- there was a 10% rise in the proportion of women in core STEM occupations to 23% in 2017
- “The proportion of female engineering professionals doubled, from 5.5% to 11%”
- In skilled trade occupations proportion has quadrupled from 2% to 8%.
- The proportion of both female ICT professionals and science professionals has increased by only 2% (for ICT 15% to 17%; for science 40% to 42%)” (p 66).
- a small rise in women in management roles in science, engineering and technology from 10% in 2012 to 15%

In Modern Apprenticeships in STEM frameworks, recruiting significant numbers every year, the trend has been a very small improvement in participation by women since 2016/17 except in IT and telecoms. (Modern Apprenticeship Supplementary tables)

Participation of women in STEM MAs as a percentage of starts			
Framework	% of starts 2016/17	% of starts 2022/23	Change in %
Automotive	2%	5%	+3
Construction: Building	2%	3%	+1
Electrical Installation	1%	2%	+1
Engineering	5%	7%	+2
IT & Telecommunication	16%	13%	-3
Plumbing & Heating	1%	3%	+2
*Percentages rounded to nearest whole number			

We know from the career aspiration survey (YPSS 2022) that few young women are interested in the apprenticeship route, opting for further and higher education.

Furthermore, if young women were to seek entry to these trades at an older age when they may feel they have the resilience to train and work in a male-dominated workplace, the low wages may put them at a disadvantage. The wages for first-year apprentices, set by the UK Government, can be as little as the minimum legally allowed of £6.40 per hour from 1st April 2024 for those who are under 23 in the first year of their apprenticeship. The Resolution Foundation calculated the wage required for those 18+ as £12.00 (2024). This low wage can be off putting or impossible unless individuals have financial support from their networks.

The WiT project recognised that it was essential to address the negative perceptions of workplace culture in the tech sector to attract more women to this skill shortage area of well paid, and interesting careers. Working with Equate, WiT identified and tested approaches to deliver key recommendations for businesses to address the leaky pipeline from Tapping All Our Talents review of 2018 :-

- **“Enhance progressive policies, practices and organisational culture**, particularly in relation to providing and normalising high-quality part-time and flexible work, positive perceptions of shared parental leave, and innovative gender-neutral recruitment and promotion processes.
- **Invest in women’s networks and positive action measures** proportionate to overcoming challenges of severe under-representation of women in STEM industries.
- **Set up partnerships with equalities organisations** and deliver programmes of work together to achieve holistic change within companies.
- **Develop sustained partnerships with schools, colleges, and universities** to support the delivery of multiple interventions aimed at encouraging girls and young women into STEM” (p84).

The above recommendations were echoed by Fawcett Society research, SYSTEM UPDATE. Addressing the gender gap in tech. (2023). In the forward, Jeanie York, Chief Technology Officer at Virgin Media highlights the detrimental effect of the perceived workplace culture stating, “This toxic “tech bro” culture is leading to worse outcomes for women, perpetuating the gender pay gap and allowing the pernicious narrative that certain roles are better suited to men to go unchallenged. It’s also leading to

worse outcomes for businesses. From product design to service delivery, diversity is proven to drive innovation and facilitate more inclusive and sustainable business growth. Without diversity in tech, we all suffer”. (Forward, p7)

The report also calls for the countering of gender stereotypes in school curricula, including that careers advice “does not discourage girls from considering tech careers” (p14).

Outputs and outcomes

Predominantly male environments

A key element of the WiT project was to address the perceived barrier of entering predominantly male dominated environments, learning and workplaces through establishing “Connect-Ups”. Connect-Ups are essentially networking activities or events that bring women together through skills workshops and peer mentoring events. The Connect-Up sessions were designed and implemented using the “Participant Centred Planning Framework”; this approach was developed by Professor Caron Shankland of Stirling university, funded by SDS to work to address lack of participation in ICT careers by women. The aim was to the support effective design of engaging activities, data collection and evaluation.

The feedback from participants suggests that Connect-Ups were valuable in counteracting predominantly male working environments by reducing feelings of imposter syndrome, and in providing support to women, including mentoring.

A female design student designed templates for the Connect-up materials and case studies. Available free for anyone to use on the [WiT blog](#).

INTRODUCING CONNECT-UPS

GUIDELINES



MAKING CONNECT-UPS A SUCCESS

This document is designed to help run Connect-Ups as part of the Women into Tech project.

The document has the following sections:

- Guidelines for making your Connect-Up a success
- Introductions: Connect-Up 1 Facilitator Notes
- Inclusive by Design: Connect-Up 2 Facilitator Notes
- Making a Difference: Connect-Up 3 Facilitator Notes



ABOUT CONNECT-UPS

Connect-Ups are opportunities for women in tech (studying, working, apprentices) to get together (online just now) to chat and support each other. The Connect-Ups are part of Women into Tech, a project by Edinburgh Napier University and University of Stirling, funded by Skills Development Scotland.

CONNECT-UP OUTLINES

We've created 3 outlines to get the Connect-Up support conversations. They are based on our research.

CASE STUDIES

Our research told us that there are many, diverse women in tech, asking them about their jobs, their studies, their case study profiles. These are fascinating in themselves and about the challenges we face as women in tech.

These materials and approach could be disseminated to MA and GA Providers and their associated employers through SDS regular CPD for Providers or COPs. Providers could encourage apprentices and employers to access the blogs and case studies developed (<https://blogs.napier.ac.uk/womenintotech/>).

WiT recommendations

For providers

The Connect-Ups were well received, WiT recommended SDS make Connect-Ups available to apprenticeship providers (for example, through the GA Community of Practice) and encourage their use in commencing discussions about inclusion at the boundary of work and study.

Apprenticeship providers should be encouraged to invite apprentices on FA, MA, and GAs to form women's networks across providers. These could use the Connect-Ups to provide a focus for meetings, advertise via the Connect-Ups LinkedIn group, and could replicate the STEM networks established by Equate Scotland across Scotland's universities.

To address lack of awareness of digital jobs

It was recognised there are a variety of routes into tech careers including apprenticeships however young women in senior phase need to be encouraged to access the information and supported to consider tech roles.

WiT acknowledged the difficulty recruiting specialist computing teachers especially in rural areas and called for action to address this as well as for upskilling training on digital skills and inclusion for primary and secondary teachers.


WiT created [case studies](#) and have made these available online to inspire other young women. It would be useful to link to My World of Work and to make Careers Advisers aware of these resources to help them to work with young women to explore their skills and look at relevant tech careers as well as reach out to parents and carers.

When promoting tech careers and routes, doing so in a female-friendly way should be tried to encourage interest from women.

For employers

Tech employers should be encouraged to consider workplaces as locations for encouraging equality, diversity, and inclusion. For example, by setting up women's networks or providing time off work for women to attend cross-organisational women's network events, such as [Scotland Women into Tech](#) events. Equate Scotland run relevant courses that look at inclusion in the workplace. ScotlandIS, the trade body for tech in Scotland, could promote these activities.

Employers should also encourage women to take leadership courses, specifically designed for women. [ScotlandIS](#) could usefully promote these courses.



LAURA ANDERSON


Cyber Security Analyst and final year Graduate Apprentice

What does your current role involve?

I'm a Cyber Security Analyst, working in the Cyber Operations Team. So we're looking at the alerts that are coming in from our different applications and tools, and we look at the vulnerabilities we have across Social Security Scotland. I've been in this role for a couple of months now. I'm still at university as well, doing the Graduate Apprenticeship scheme, at Edinburgh Napier. It's really good having the on job experience as well as having the university side of it. I feel like I can bring in some of the skills that I learn in university into my current job role, which is beneficial for me and for the team as well.

What do you enjoy about your role?

There's always something new every day. Every day is a learning day, because tech is ever-changing and there's always something new. Sometimes it can be quite challenging, but the challenge is always good. There's always something new going on that you have to try and develop more and work with your team. I think we've got a really good team as well, there's so much support here.



WOMEN
INTO
TECH

To review this and other case studies follow this link [case studies](#).

2.3 University of the Highlands and Islands (UHI Inverness)

The UHI Inverness project was not focussed on one specific sector but on pipeline development in a rural setting for varied STEM careers. The project plan was informed by an initial survey of women apprentices the key findings of which were:

- women were taking circuitous routes into STEM apprenticeships,
- widespread perception of apprenticeships as “second rate” compared to a university STEM qualification.

The project set out to develop an approach that encourage young women to take a more direct route into STEM apprenticeships. To understand what would engage young women in STEM workshops, the project undertook a survey of hundreds of pupils aged 15-18, with the support of Highland Council. The survey information was used to the design the STEM workshops and included delivery by local STEM employers who recruited apprentices.

UHI Inverness- rural	
Workstream	Actions delivered
Understand rural barriers and perceptions of STEM	Undertake a large-scale survey of female pupils to identify how to engage and interest pupils in STEM
Develop STEM workshops	<ul style="list-style-type: none"> • Local apprentice employers involved in design and delivery of pupil workshops • Training of young women STEM apprentices to mentor at workshops and shape content
Trial STEM workshops for impact	<ul style="list-style-type: none"> • Delivery and evaluation of workshops • Create a toolkit • Establish tracking system

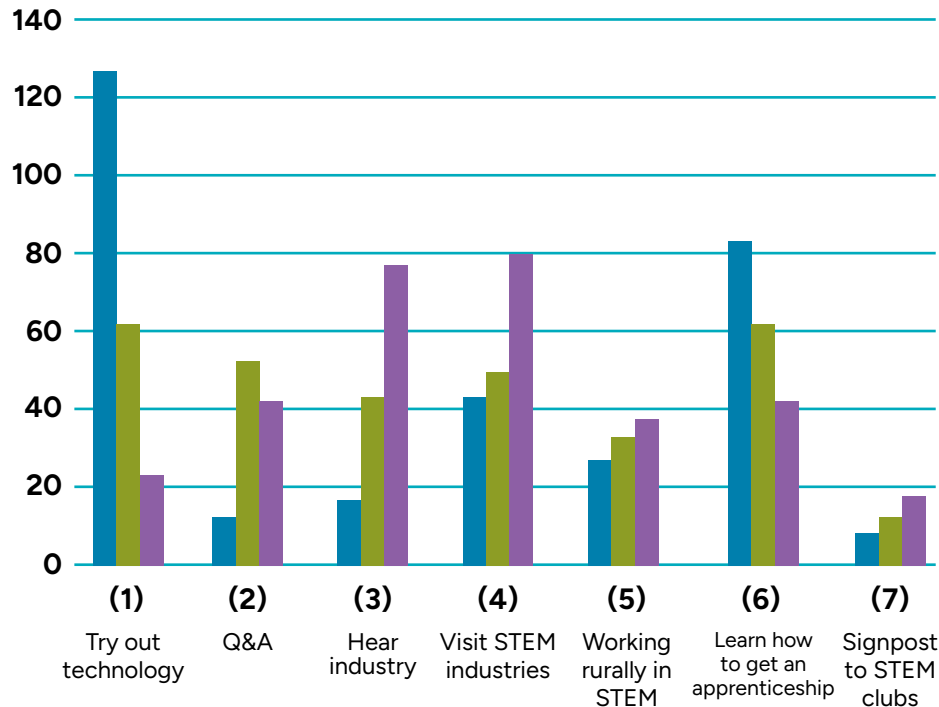
Outputs and outcomes

1. Designing engaging workshops with senior phase pupils

A major focus of this project was the use of consultation with senior phase pupils to design key aspects of the workshops. Their research confirmed well documented attitudes such as a strong preference for university route, however they also established there is a preference for interactive workshops where pupils could get hands on experience and try technology. This is encouraging as almost 60% of these senior phase pupils had no firm career ideas.

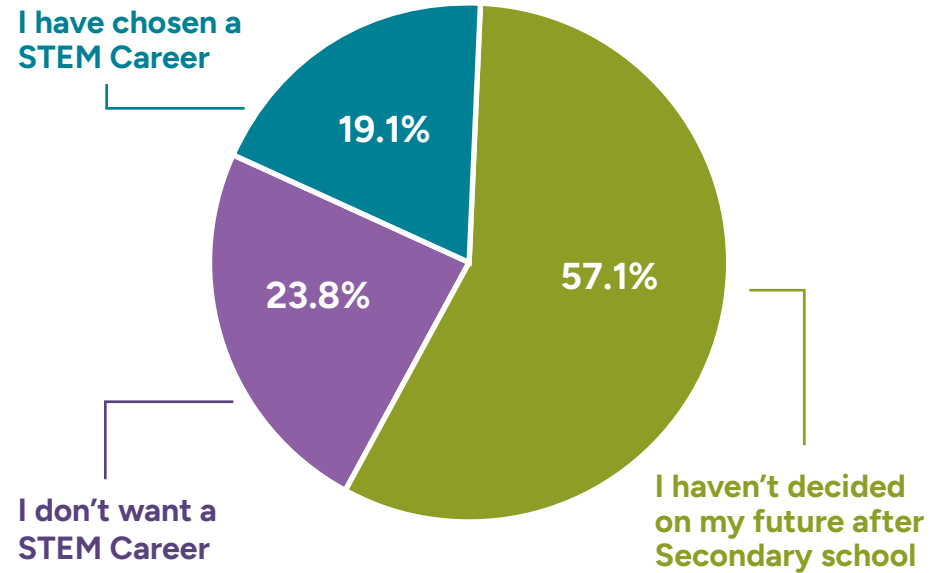
Q. "What do you most want to see in a STEM workshop?"

Total was 357 pupils aged 15-18 (Select 3 of seven)



Which sentence accurately describes you? (pick one).

Total was 648 pupils aged 15-18 years



The survey of senior phase pupils led UHI Inverness to identify these eight features which underpin the design of the workshops:

1. Apprentices had to be involved in the content creation and delivery of the workshops, as pupils had identified that they would prefer to get their STEM careers information from apprentices. Having apprentices deliver the workshops would also enable informal discussions about apprenticeships to dispel negative opinions and encourage positive views of STEM careers.
2. New technology and experiences had to feature prominently in provision with areas of high tech such as embedded systems and renewables being something that pupils could experience.

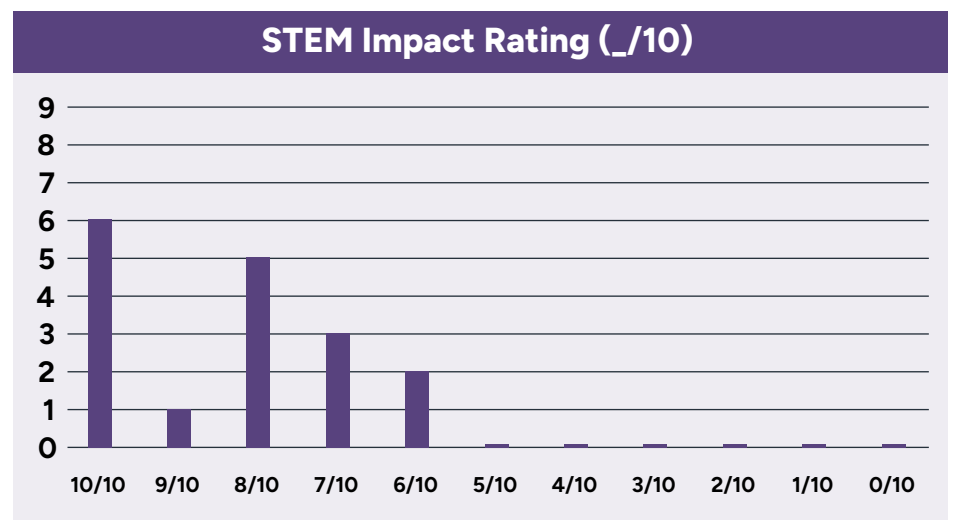
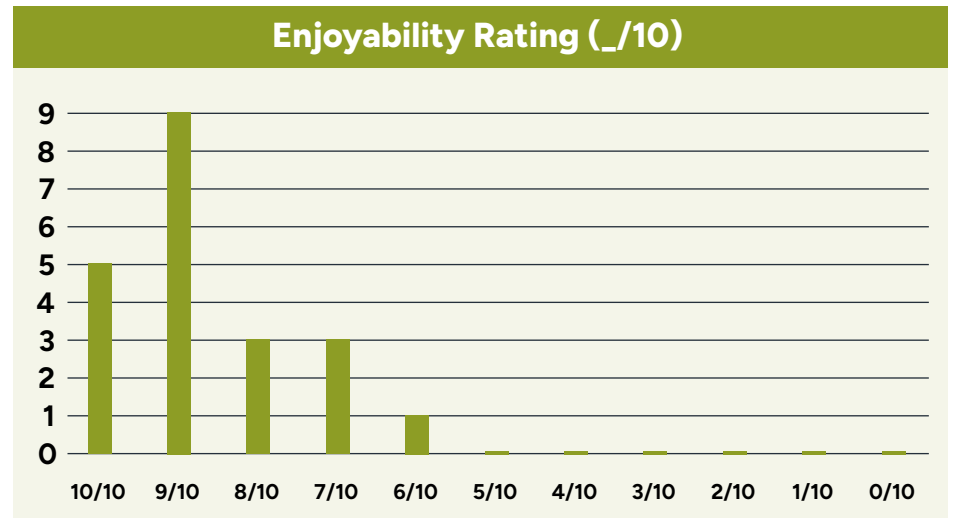
1. Mathematics had to be included in a fresh and dynamic way, with activities which naturally had maths included to augment practical skills. This includes Cost/Benefit Analysis, Electronic Equations, Programming, etc..
2. Visits to STEM adjacent businesses/organisations to diversify workshops and in-class engagement would be a great way of increasing enthusiasm with pupil groups.
3. Businesses had to be included in the development and provision stages as pupils want to hear about local industry to help them decide what type of work/careers are exciting to them.
4. Any workshop plan must be in person and during school hours to maximise the enjoyment of potential STEM activities.
5. Ensure that rural areas are not disadvantaged in accessing the workshops. Therefore, removing barriers to transport and improving inclusion in activities is paramount.
6. A key point was that in most survey answers, most replies were neutral, highlighting that there was a general apathy towards engaging beyond school and for planning for the future. Thus, any project plan must have re-engaging pupils as a priority and a mission statement.

UHI Inverness developed four, interactive workshops to be delivered by local female apprentices and reflecting the businesses of local STEM employers.

The 4 workshops were:

- Science: Fermentation and Chemistry (Diageo)
- Technology: Renewables and Sustainability- electricity and hydrogen cells (Opportunity Cromarty Firth)

- Engineering: Embedded Systems and Electronics, (Inspired by Lifescan)
- Maths: Bridge Construction and the maths of Mechanical Engineering (West Fraser & Strathspey)



Selection of comments from pupils following the workshops

"I liked the problem solving part of the task, I would like to do it more in school :-)"

"I had a fantastic experience this afternoon, with activities such as educating myself about getting a deeper grasp with electronics"

"It's interesting and useful to understand how electricity works and how it will evolve"

"Talking about interesting things, like the experiments, how they relate to problems and the environment."

"I am considering this area of STEM"

"I enjoyed the creativity you need for this workshop"

"Building the traffic light system was so awesome"

These comments and evaluation scores show that the workshop content, through using real world examples, such as cleaning up oil spills, aligned with the values of young women, engaged them and positively impacted their views of the importance of STEM subjects and careers.

UHI Inverness have demonstrated how to address some of the major barriers at the beginning of the pipeline identified in [Structural Barriers to STEM engagement, 2022](#): "Tackling confidence and negative perceptions, particularly through transition to senior phase, and particularly for girls, is also important. The research has identified that there are lower levels of confidence and engagement, as well as a lower incidence of positive views of STEM subjects" (p 38). Furthermore, "The visibility of STEM to learners should be increased, and consideration should be given to the best ways that learners can be 'hooked' into STEM through the BGE* phase. This could include an increase in making more use of real-world STEM examples – perhaps demonstrating the application of

STEM to societal challenges" (p 45).

The work of UHI Inverness aligns with the Career Review recommendation that there should be dedicated curriculum time for experiential work-related learning in all settings. UHI Inverness show that through careful design that is gender-sensitive more young women could be encouraged to consider a range of STEM careers. One opportunity to gain experiential learning in many secondary schools is to undertake a Foundation Apprenticeship (FA). Foundation Apprenticeships offer school pupils the opportunity to gain a qualification (at SCQF 4-6) through a blend of academic and employer-led work-based learning. They are designed to enhance and expand learning opportunities for S3-S6 pupils.

FAs offer pupils multiple progression routes on completion, including Modern and Graduate Apprenticeships, college, university, or other employment. Each year more young women undertake STEM FAs. (FA report 2023)


Partners were keen to continue post-project. The UHI Inverness partnership will be rolling out a series of STEM projects across the whole Highland, Argyll, Moray and Island regions. They are seeking to expand the student mentorship programme to include more students by providing STEM Ambassador training and setting up a dedicated STEM location on campus to support training, deployment, and workshops.

The equipment used to deliver the workshops e.g., the renewable generation kit was highly regarded and, with the support of SDS, will be rolled out across the region. SDS Inverness' digital hub has since received further requests for class and wider STEM engagements after the completion of the project (such as the Girls Do Science event), with UHI Inverness and SDS Inverness planning to continue collaborations into 2023/24.

2. Ensuring access to workshops in rural areas

The Structural Barriers to STEM engagement, 2022 report identified a number of priorities to address barriers in relation to resources, "A lack of STEM teaching resources (e.g. classroom kit, laboratory equipment and other) is constraining STEM teaching. An additional barrier is the limited availability of flexible spaces within schools for IDL" (5.26 p 40). The report acknowledges that whilst there is a shortage of teachers of computer science and mathematics nationally it is more severe in rural areas (3.56, p 15). The report recommends that "Better links to college resources are also required to bolster STEM resources available to schools".

In rural areas this approach would necessitate significant travel. To enable pupils to access these hands-on, high-quality, work-related learning experiences in the future funding for coach travel is essential. UHI Inverness will be speaking to Highland Council and HiTrans to explore ways to support subsidised or provided transport for the future STEM Equity cohorts.



"A lack of STEM teaching resources (e.g. classroom kit, laboratory equipment and other) is constraining STEM teaching. An additional barrier is the limited availability of flexible spaces within schools for IDL"

Structural Barriers to STEM engagement, 2022
(Section 5.26. P40).

3

Using the Learning and Outputs



The projects demonstrated effective approaches to: -

- address negative perceptions of STEM subjects, careers, and pathways.
- embed LMI and careers information in the curriculum.
- address the “leaky pipeline” and encouraging development of more “female friendly” workplace culture by employers.
- embed employer input across the pipeline.

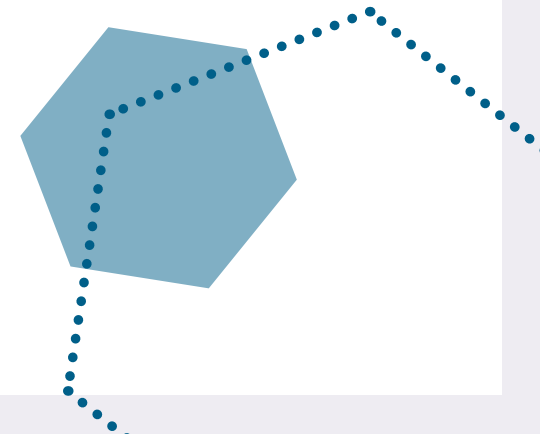
Most importantly, these SDS funded projects have developed and tested approaches and resources which could be used to implement key recommendations related to the participation of women in STEM in several recent publications:

- [Gender Pay Action Plan, \(2021 update\).](#)
- STEM Education and Training Strategy, refresh
- [Structural Barriers to STEM engagement, 2022:](#)
- [Scottish Apprenticeship Advisory Board’s Gender Commission report](#)
- [The Career Review recommendations, 2022](#)
- [Tapping All Our Talents review of 2018](#)
- [Women in the Scottish STEM Landscape.](#)

3.1 Addressing negative perceptions of STEM

Whilst these projects focussed on young women in the senior phase, they have shown how to make STEM subjects more engaging for all pupils by designing and delivering STEM education that is rooted in the real world, collaborative, interdisciplinary, hands-on, and fun.

The projects have demonstrated several effective ways to engage young women in STEM which positively impacted their perceptions of STEM subjects, careers and the apprenticeship pathway. The projects coincided with the disruption to education and lockdowns of the COVID-19 pandemic and the lead organisations had to adjust their delivery plans accordingly. Consequently, we have been unable to discover if these attitudinal changes did lead to the young women making applications to STEM education, employment and/or training.

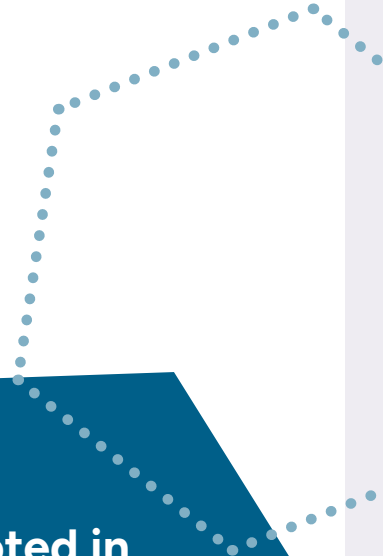


3.2 Employer involvement is essential

The Careers Review highlights the key role of industry in the Career Collaborative in delivering sectoral career plans to ensure Scotland has the workforce needed now and for the future, stating that what is needed is shared employer ownership of the career system.

All the projects included employers of STEM apprentices in their steering groups, ensuring that employers could contribute to the design of aspects of the projects.

- Both WiSTEM and UHI Inverness involved employers in design and delivery of key aspects of their projects. Employer involvement ensured that the workshops in school delivered by UHI Inverness and the use of role models by all projects delivered on a fundamental recommendation of the Structural Barriers to STEM engagement, 2022), report namely that STEM education "...is rooted in the real world, and of direct relevance not only for their future career choices, but accurately represents STEM-related enterprises and other sectors of the economy as well as its importance in terms of the transition to net zero and learning for sustainability." (5.4, p36)



"STEM education is rooted in the real world, and of direct relevance not only for their future career choices, but accurately represents STEM-related enterprises and other sectors of the economy as well as its importance in terms of the transition to net zero and learning for sustainability."

Structural Barriers to STEM engagement, 2022
(Section 5.4. P36).

3.3 Mapping the project learning to key policy and strategy asks

The table on page 34 shows the recommendations from key reports alongside the actions developed and tested by the projects to address the barriers in the STEM pipeline. Adoption by the Careers Services Collaborative of the project activities and resources could enable significant progress in implementing recommendations of the SAAB Gender Commission, the Careers Review and the STEM structural barriers report across Scotland.

To support nationwide implementation of concerted action and to build and maintain pipelines, three strategic actions are required:

1. National support for pipeline development co-ordinators for each Local Authority.

A barrier for the projects was accessing senior phase pupils and those in BGE at the right time. A pre-requisite to developing sustainable pipelines is space in the timetable for these activities at the right time for taking forward into applications for STEM roles or education courses.

A co-ordinator role or relinment of current resources to link local key stakeholders and schools would be ideal and existing structures such as DYW groups, or the thirteen Regional STEM Partnerships, or a combination of these and using the expertise of Education Scotland and Improving gender balance and equality team and other key stakeholders could be a mechanism to overcome this.

2. Strategic change to senior phase of secondary schooling.

Greater flexibility in timetabling to introduce more interdisciplinary learning and greater partnership working which includes local STEM employers and colleges is required. This structural change would require changes to the focus on assessment of pupils in senior phase, to see more STEM activity in school improvement plans and to the recruitment and on-going professional learning of teachers. Such change will not be straightforward as the Structural Barriers to STEM engagement, 2022 report states a multi-faceted approach is required due to the interdependencies involved. (Section 5, pp 36-41)

3. Transport in rural areas.

If equity is to be achieved, funding or provision of transport in rural areas is essential to allow pupils to attend during school hours. Rural areas often have smaller schools and these frequently have more restricted opportunities than schools in urban settings. There are generally no nearby science centres.

Addressing barriers to participation in STEM careers by women

Working collaboratively from school into the workplace

Barrier: Perceptions of STEM subjects and careers

Reports and recommendations	Project action to address barrier
<p>Structural Barriers report</p> <p>Recommendation 5.5: Countering the intention or desire amongst learners to drop STEM subjects should focus on enjoyment of and engagement with STEM subjects which will also require a significant gender aware approach depending on subject.</p> <p>Recommendation 5.7: Tackling confidence and negative perceptions, particularly through transition to senior phase, and particularly for girls, is also important.</p> <p>Recommendation 5.15: A new approach to BGE* is needed in S1-3: This requires a refresh of CfE* content and the subsequent assessment approach.</p> <p>Report suggests a priority should be to make use of more real-world examples and different approaches including IDL, project/ challenge based learning.</p> <p><u>STEM Education and Training Strategy, refresh</u></p> <p>Key aim: to inspire children, young people, and adults to study STEM and to continue their studies to obtain more specialist skills.</p>	<p>(All contribute to 5.15, others as indicated)</p> <p>UHI Inverness designed STEM sessions based on consultation with young women which participants found to be fun and engaging. (5.5) They also ensured female STEM Apprentices were trained to deliver the workshops and discuss their careers with local STEM employers. (5.7)</p> <p>WiSTEM demonstrated a different highly impactful approach to UHI Inverness where the girls created a marketing campaign for other girls on STEM careers and apprenticeships. The “hook” to interest the girls was marketing training but they also had to learn about STEM careers and pathways including apprenticeships delivered by female role models. This was also shown to be impactful on the young women’s own perceptions of STEM careers. (5.7)</p> <p>Both the UHI Inverness approach and WiSTEM could also be used in the BGE phase. Both UHI Inverness and WiSTEM used IDL and were challenge/project based. Both included local STEM employers. UHI Inverness focussed on real world issues that align with the values of girls and young people such as oil spills and renewable energy.</p>

Barrier: Lack of awareness of opportunities in STEM	
Reports and recommendations	Project action to address barrier
<p>Career Review</p> <p>Recommendation 4: There should be dedicated curriculum time for experiential work-related learning in all settings.</p>	<p>UHI Inverness demonstrated the appetite for “hands-on” opportunities amongst young people.</p> <p>To ensure equity activities have to be during the school day ideally embedded in the curriculum and with funded transport in rural areas.</p> <p>To address STEM skill shortages it is essential girls are encouraged to learn about STEM careers.</p>
<p>Structural Barriers report</p> <p>Recommendation 5.27: School guidance staff: As a result of struggling to keep pace with industry developments and changes within STEM subject areas, guidance staff need access to refreshed materials. They also need to be supported through stronger links with partner organisations...”</p> <p>The report tasks SDS and partners to build the capacity of school guidance staff with both LMI and training to tackle gender stereotyping and unconscious bias.</p> <p>STEM Education and Training Strategy, refresh</p> <p>Aim: to build the capacity of the education and training system to deliver excellent STEM learning so that employers have access to the workforce they need;</p>	<p>(All below contribute to 5.27 and the Aim of the STEM strategy)</p> <p>WiT, WiSTEM and UHI Inverness have all produced case studies and resources which are available to use on websites.</p> <p>WiSTEM in particular demonstrated that LMI can be delivered to staff and pupils through various subjects not just science and technology lessons.,</p> <p>Teaching staff were interested in the UHI Inverness lessons and that could be a way to build capacity and share equipment.</p> <p>Equate delivered inputs to employers in the WiT and WiSTEM projects.</p>

Barrier: Lack of awareness of opportunities in STEM	
Reports and recommendations	Project action to address barrier
<p>Gender Commission</p> <p>Recommendation Four. Curate and create sector-based workplace information.</p> <p>Industry and trade bodies should create content and engagement campaigns about gender diversity in employment, aimed at key and transitional stages, that can be shared with influencers, as well as online and through social media.</p> <p>Recommendation 7: Develop a localised approach.</p> <p>Scottish Government should engage directly with employers, trade unions and professional bodies to develop an improved localised approach to business and education engagement, with a focus on skills for the future (Industry 4.0) and gender diversity.</p> <p>STEM Education and Training Strategy, refresh</p> <p>Aim: to connect the STEM education and training offer with labour market need – both now and in the future – to support improved productivity and inclusive economic growth.</p>	<p>(All contribute to recommendations 4 and 7 and the STEM strategy Aim)</p> <p>WiT have created case studies available on their website and these are linked with Ada Scotland. These highlight routes into tech careers.</p> <p>WiSTEM have also created a careers information resource STEM careers on their Women in STEM website</p> <p>These could potentially be brought together in My World of Work creating one central starting point in Scotland.</p> <p>All three projects have demonstrated that in a locality there is an appetite amongst employers, training providers, trade bodies, FE and HE to work together to increase the supply of young women seeking STEM careers. In some cases DYW were also proactive supporters.</p> <p>What they have shown however is that an implementation plan is required in each local authority with a clear STEM focus that takes a gender aware approach, including some female only “hands-on” experience, and that if these pipelines are to be sustainable three key prerequisites are essential:</p> <ol style="list-style-type: none"> 1. Access to senior and BGE phase pupils for on-going coordinated inputs 2. Co-ordinators for these pipelines 3. Funding for transport to enable sharing of equipment, spaces and use of employer facilities

Barrier: Transitions into a STEM roles	
Reports and recommendations	Project action to address barrier
<p><u>Gender Commission</u></p> <p>Recommendation two: Promote and ensure gender diversity within the workplace.</p> <p>Employers should have proactive strategy in relation to improving gender diversity. This should include a focus on gender neutral language in all communications, a strategy for positive action in recruitment, and a focus on pay in line with the Scottish Government’s Gender Pay Action Plan, (2021 update).</p> <hr/> <p><u>Career Review</u></p> <p>Recommendation 6: Exposure to fair work.</p> <p>People should have a right to have a wide range of meaningful opportunities to experience work and understand what fair work is.</p>	<p>WiT and WiSTEM both partnered with Equate* to work with their employers and also in the case of WiT with women employees including Apprentices.</p> <p>The Equate training to employers was focused on inclusive recruitment approaches and inclusive workplaces. This included positive action and gender-neutral language. Due to timescales this strand could not be evaluated however there was anecdotal evidence that one WiSTEM employer on changing their vacancy advertisement had attracted more women applicants.</p> <p>The pipeline approach would be a way to encourage employers to undertake such training and review their recruitment and workplace practices however without a co-ordinator to facilitate this it will remain piecemeal.</p> <hr/> <p>WiT and WiSTEM both reported that there was feedback that employer attendees at training were overwhelmingly women and that it appears that it is largely women who are working for change to workplace culture.</p> <p>The projects have demonstrated that experience of STEM challenge-based workshops rooted in real world examples and hearing from female role models on their careers and the rewards can change perceptions of STEM careers and this will enable young women to consider if they wish to enter these careers of the future with better pay and career opportunities as opposed to more traditional career choices. And if they do that there are networks and support there to help them.</p>

Barrier: Transitions into a STEM roles	
Reports and recommendations	Project action to address barrier
<p>Tapping All Our Talents</p> <p>Recommendation 14: Recognising that single intervention does not work, industry should look to create sustainable and strategic partnerships on gender equality with schools, colleges and universities which provide both access to knowledge for teachers and pupils at the school level, and “theory into practice” opportunities for under-represented students through placements, work experiences or engagement events.”</p>	<p>All three projects demonstrated that many employers are keen to actively support this work. They joined the steering groups. The projects all used female role models to deliver directly to pupils as role models or delivering workshops.</p> <p>Employers undertook training delivered by Equate on inclusive recruitment and altered their approaches as a result. They released staff to participate in “Connect-Ups” (networking and mentoring). Many offer work experience and visits.</p> <p>The projects have shown though that a co-ordinator with access to secondary schools is required to sustain concerted action.</p>

Barrier: Male dominated workplace cultures	
Reports and recommendations	Project action to address barrier
<p>Gender Commission</p> <p>Recommendation One: Inclusive Workplace.</p> <p>Apprenticeship employers should work proactively to ensure that they have the right culture and conditions in place to create opportunities and give confidence to employees of all genders and backgrounds.</p>	<p>WiT Connect-Ups (networking activities or events, they bring women together through skills workshops and peer mentoring events.)</p> <p>For Modern and Graduate Apprenticeships, the Connect-Up approach and materials could be shared with STEM framework providers and then encourage them to implement.</p> <p>Providers and their employers could be encouraged to make use of the Equate training available not only on recruitment but on workplace culture and to offer training and support to their women employees.</p> <p>WiSTEM and WiT, as noted above, facilitated training on positive action, inclusive recruitment, and workplace culture. Through local pipelines there would be a way to encourage employers to undertake the training and make changes. It would contribute to creating the conditions to enable young women to move into and remain in STEM, moving up the career ladder should they wish to.</p>

4

Recommendations



The projects demonstrated there is scope across Scotland to further develop the approaches and resources from the projects to establish sustainable pipelines by taking a systemic approach to some of the national actions with locally tailored delivery. There are several national and local structures that could be used to take forward this pipeline approach and co-ordinate actions including the DYW groups and LEPs.

Two of the recommendations do require resourcing however new funding and structures would not necessarily be required as existing structures and resources could be used or adapted to deliver the four recommendations below.

1. **Develop a National Implementation Strategy**

For these pipelines to be established and flourish a national implementation approach is required with pipeline development co-ordinators for each Local Authority. People who can access senior phase pupils and those in BGE, and bring together local key stakeholders. Pipelines in different areas could focus on different specific STEM sectors in different locations depending on local employers.

There needs to be a clear direction from the Scottish Government and greater alignment of existing structures and resources to achieve the systemic change Scotland requires. Co-ordination would enable the delivery in every LA of a coherent programme that is of consistent high quality, involves STEM employers and which dovetails into the curriculum. It would ensure it is a programme of activity, not a one off, and pupils and their parents and carers would be supported by SDS Careers Advisers and guidance teachers to move forward their career aspirations into applications to Apprenticeships, further and Higher Education in STEM or employment in STEM.

In the north of Scotland, the Highlands and Islands Strategic STEM Partnership (HISP) exemplifies how STEM pipelines can be established through the co-ordination of a coherent programme of STEM activity and is shaped by local industry and labour market information.

HISP is chaired by UHI (Dean of the Science, Health and Environment Faculty) and has representatives from industry, skills development and educators to provide strategic coherence across eight local authorities fostering collaboration, knowledge exchange and leveraging of resources. The HISP connects national, regional, and local collaboration opportunities support regional economic growth.

UHI leads an innovative STEM Outreach Programme which supports a number of locally based Outreach Coordinators across the vast geographical region where rurality and accessibility are challenges. The outreach programme is delivered in schools working alongside teachers. They have created a range of inspiring experiences for early years and primary pupils to encourage an interest in STEM subjects, skills and future careers. This has been supported by industry partners who recognise the investment in workforce skills and future human capital starts early in the education journey. The programme supports the ambition of [Workforce North](#) and is aligned to the future skill needs of employers. The interdisciplinary "Discovery Kits" are provided free to schools and are available in English and Gaelic. The resources and learning plans are aligned to the Curriculum for Excellence. ([Outreach programme](#)).

2. Create co-ordinator roles

The projects have shown that stakeholders, especially local STEM employers, are keen to be involved and will devote significant resources to such activity. Co-ordinators must be assured of access to the BGE and senior phase pupils to ensure that this work continues.

This co-ordinated approach may mitigate the fear some employers have of taking positive action. More employers will be confident enough to participate and to make their opportunities available through Marketplace. Marketplace is an online SDS tool connecting schools and colleges with business, employers add their offers to the site, offers such as work experience, visits to premises, women-only open days.

Agencies working within schools could share the co-ordination role. SDS Careers Advisers are ideally placed to identify young women who might be interested in STEM careers. They also use LMI in their work with young people to deliver informed careers information, advice and guidance. Working collaboratively with school staff and DYW co-ordinators could provide a cohesive approach to bringing pupils and employers together, either within a school setting or in employer premises. The role of Experiential Career Learning in relation to Women in STEM, could be significant.

3. Establish a single National STEM Resource Bank

The STEM Education Strategy identified a need for a central, nationally available resource for pupils, teachers and parents that links STEM LMI and careers information to case studies, toolkits and teaching resources and opportunities. Education Scotland have begun this process creating an online resource STEM Nation providing valuable resources, professional learning, and STEM career information.

This should be expanded and developed by linking with My World of Work, Scotland's online careers information and advice service. This would enable access to all relevant resources in one place, a valuable step in ensuring existing resources are more widely used and available.

4. Create a fund for essential new equipment and transport in rural areas

To adopt these interdisciplinary learning workshops and project-based approaches it is essential to fund the purchase of workshop equipment which could be shared across a local authority and local college(s).

If there is to be equity, funding for transport in rural areas is essential, particularly if the spaces and resources of colleges are to be utilised. The UHI STEM Outreach Programme described above shares innovative kit across eight local authorities across a huge geographic area. It demonstrates this approach works.

5

Glossary



A quick guide to some of the key terms and organisations in this report.

Term in report	Definition
BGE – Broad General education and Curriculum for Excellence	<p>Curriculum for Excellence (CfE) – helps our children, aged 3-18, gain the knowledge, skills and attributes needed for life in the 21st century.</p> <p>It is divided into two phases:</p> <ul style="list-style-type: none"> • broad general education from age three until the end of S3 • senior phase takes place from S4 to S6 in schools and includes ages 16-18 out of school.
Close the Gap	<p>Close the Gap is Scotland’s expert policy advocacy organisation working on women’s labour market participation.</p> <p>Think Business, Think Equality self-assessment tool developed by Close the Gap for small and medium businesses and third sector organisations.</p>
Connect-Ups	<p>Networking activities or events, they bring women together through skills workshops and peer mentoring events. The Connect-Up sessions were developed using the “Participant Centred Planning Framework”</p> <p>(See WiT section)</p>

Term in report	Definition
ECITB	The Engineering Construction Industry Training Board. (ECITB) Training the engineering construction industry workforce.
Equate	<p>Equate Scotland is the national expert in gender equality throughout the STEM sectors.</p> <p>They support women by</p> <ul style="list-style-type: none"> • Delivering training and support for women at each stage of their careers. • Providing opportunities for women students to make valuable links with industry via their student network • Responding to, and proactively pushing for labour market and further and higher education policy that is gender competent and tackles the root causes of women's under-representation in STEM. <p>Equate also work with employers: -</p> <ul style="list-style-type: none"> • Delivering expert and bespoke training. • Offering consultancy to support employers in strategy development or simply helping employers understand where to start on pursuing gender equality. • Providing the only UK wide "women into STEM" job advertising platform and inclusive language check service.

Term in report	Definition
Gender Pay Gap	<p>A gender pay gap is a calculation of the difference in the average earnings (excluding overtime) of the women and men in any given population. What we generally think of as “the gender pay gap” is the difference in the average hourly earnings of male and female full-time employees in the UK labour market as a whole.</p> <p>Close the Gap state: -</p> <ul style="list-style-type: none">• From 2020 to 2021, there has been a very slight narrowing of Scotland’s gender pay gap from 10.4% to 10.1%.• Women working full-time earn 6.6% less than their male counterparts, while part-time women earn on average 26.9% less than men working full-time. This illustrates the systemic undervaluation of ‘women’s work’ which continues to be concentrated in low-paid, part-time jobs.• The majority of part-time workers are women (75%) and just under half of employed women (41%) are working part-time, compared to 13% of men. In order to capture an accurate picture of women’s experiences of the labour market, it is important to include part-time workers in gender pay gap data and not rely on the full-time figure alone
Horizontal segregation	<p>Horizontal segregation is the under or over representation of men or women in occupations or sectors. For example, women dominate early years education roles and in health and social care occupations. Men dominate in engineering and construction sectors.</p>

Term in report	Definition
Imposter syndrome	<p>A psychological phenomenon where individuals cannot believe that their success is deserved or has been achieved on their own merit or efforts. They continuously doubt they are qualified enough for the job.</p> <p>This has been shown to especially affect women in STEM. (See Forbes article on KPMG study showing 75% of female executives have experienced imposter syndrome.)</p> <p>Imposter Syndrome occurs through complex interactions of cultural and environmental factors as people grow up and are socialised into societal norms in their early years.</p>
Labour Market Segregation	<p>The entrenched disproportionate over representation of men or women in some sectors or occupations. The UK labour market is characterised by both vertical and horizontal segregation.</p>
Leaky pipeline	<p>The continuous loss of women at consecutive career stages. In educational and career pathways.</p>
Positive Action	<p>Positive action is defined as voluntary and legal actions employers can take to alleviate disadvantage or underrepresentation experienced by those with protected characteristics. Government Equalities Office (2011) Equality Act 2010: What do I need to know? A quick start guide to using positive action in recruitment and promotion.</p> <p>https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85014/positive-action-recruitment.pdf</p>

Term in report	Definition
Scotland, Women and Technology, SWiT Scotland Women into Tech	SWiT purpose: “the promotion of gender equity by celebrating, championing and investing in women so everyone can benefit from a diverse and inclusive technology ecosystem” Their network is fully inclusive and open to all to join, if you are; 1) individual women already in tech or transitioning into the tech ecosystem, 2) An organisation who want to partner with SWiT to support our initiatives and drive for gender quality and inclusion in tech, 3) An educational body who are supporting the pipeline to increase the number of women in STEM
Senior phase	Curriculum for Excellence (CfE) – helps our children, aged 3-18, gain the knowledge, skills and attributes needed for life in the 21st century. It is divided into two phases: <ul style="list-style-type: none"> • broad general education from age three until the end of S3 • senior phase takes place from S4 to S6 in schools and includes ages 16-18 out of school.
STEM definition	STEM Education Strategy has a definition of STEM in the Annex, pages 32-34. There is no single agreed definition of STEM. In this report on STEM pipelines the focus is on ICT, Engineering and Construction and Including mathematics.

Term in report	Definition
Vertical segregation	Vertical segregation, commonly known as the 'glass ceiling', where women and men do different levels of work, with men dominating at senior levels, and women concentrated in low skill, low paid work;
Young People in Scotland survey	The Young People in Scotland research is a commissioned study which gathers insight from secondary school pupils aged 11-18 years. This valuable research aimed to collect insight from S1-S6 pupils across Scotland on their plans after school, preferred job sectors and key influencers on their career decisions.

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Our Partners



Scotland