STEM

**Strategy for Education and Training in Scotland
Second Annual Report**

March 2020

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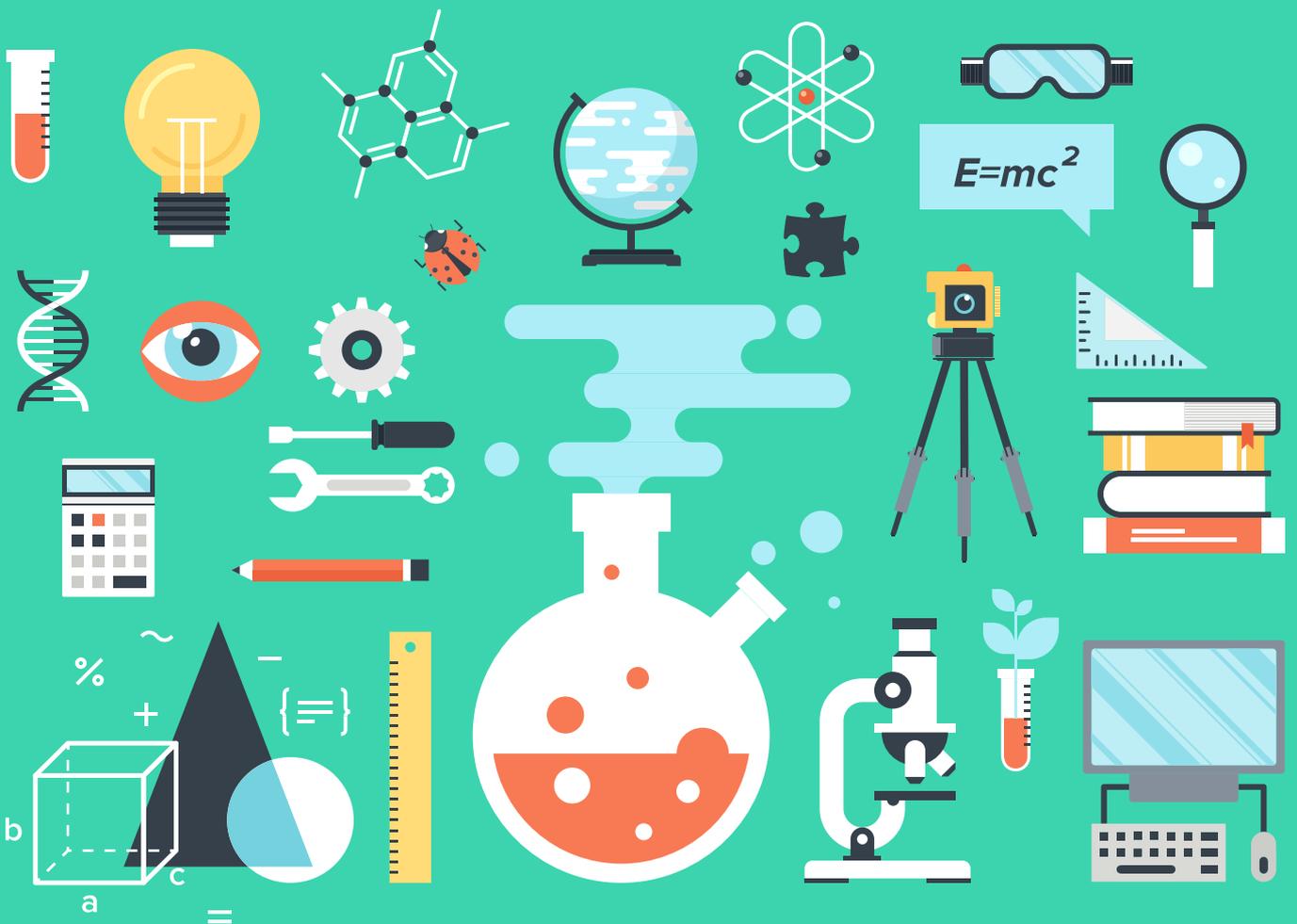
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Ministerial Foreword

Ambition, innovation and the sciences are embedded in Scotland's heritage and culture and are integral to Scotland's future success. Science, Technology, Engineering and Mathematics – STEM – have never been more relevant than they are today as we face a global climate emergency, and the uncertain future arising from the UK's exit from the European Union.

Our Programme for Government for 2019-20 highlights both these challenges, setting out the next steps on Scotland's journey to net zero emissions, including the development of a Climate Emergency Skills Action Plan. Our landmark Climate Change Act raises Scotland's ambitions and ensures that we are leading the world in the response. STEM will be vital in researching, developing and delivering new approaches to tackle the global climate emergency. Knowledge and awareness of STEM will also be critical in enabling people to engage with the climate change debate and to make informed decisions about the actions that they will take.

The 26th United Nations Climate Change Conference (COP26) in Glasgow later this year provides an opportunity to showcase Scotland's excellence in STEM and the link to tackling climate change. Scotland's Year of Coast and Waters in 2020 also offers opportunities to drive STEM engagement in areas such as biodiversity, sustainability and climate.
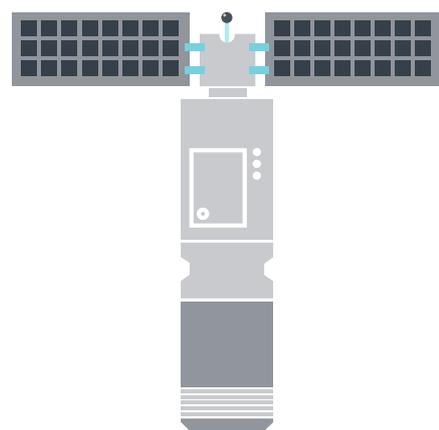
STEM skills are key drivers of innovation and growth and the basis for Scotland's global reputation for excellence in the sciences that we must maintain and develop in the years to come. We want to position Scotland as a leader in the intelligent application of technologies in the Fourth Industrial Revolution, including robotics, artificial intelligence, quantum technology and biotechnology which will transform all sectors of the Scottish economy. This creates huge opportunities for economic growth and social benefit for the people of Scotland and, developing STEM skills in Scotland's workforce will support our ambitions in Scotland's Future Skills Action Plan.

To maximise the benefit Scotland can derive from these opportunities, we need to continually develop and grow our STEM expertise, and particularly our digital skills base. We need to make sure that our approach is inclusive, and ensure there is equality of access and opportunity to study STEM and pursue STEM jobs and careers. We need to continue to attract and retain people from under-represented groups, such as women and girls, and those from deprived communities, into STEM.

For all these reasons our STEM Education and Training Strategy, now in its third year, is supporting people of all ages to develop their STEM skills and to broaden understanding of the applications of STEM in wider society. The Strategy is making progress in delivering excellence in learning and teaching, providing equity of access to STEM education, instilling inspiration and creating connections between education and employers.

Business and employers are integral to the successful delivery of the STEM Strategy. By providing examples and experience of STEM in the workplace they can inspire current and future scientists, engineers, mathematicians and innovators, and secure the talent pipeline into their industries. We will continue to work with them to build and grow active partnerships with our schools, colleges and universities and provide apprenticeship opportunities. I encourage all employers, and particularly those in climate and energy related industries, to engage with our education and training system and help to build the STEM skills necessary to meet the future needs of our economy and our society.

In the second year of our STEM Education and Training Strategy, there has been good progress in driving forward improvements in STEM learning and teaching in early learning settings, schools, colleges and universities, science centres and festivals, and in community learning and development settings. This report sets out in detail how this is being achieved. For many of the actions, particularly those targeted at the early years, it will take time and patience to see the long-term impacts. I look forward to seeing these improvements start to emerge in the third year of delivery and beyond – helping us to grow Scotland's reputation as a STEM Nation and a climate change leader.

Richard Lochhead

Richard Lochhead MSP
Minister for Further Education, Higher Education and Science
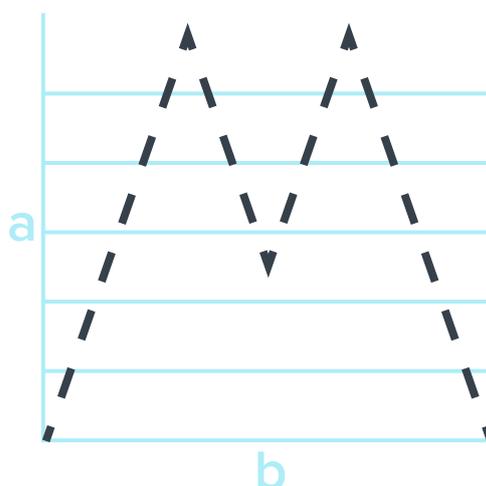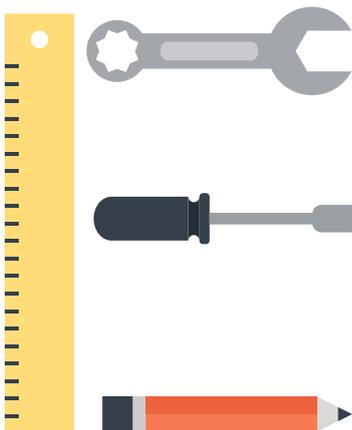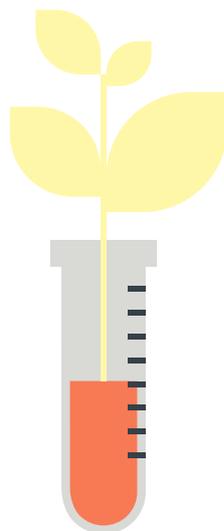
Introduction

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This is the second annual report on progress with the STEM Education and Training Strategy and it shows how we have built on progress in the first year to start to deliver benefits for educators and learners.

The Strategy identifies four key challenges for STEM education and training in Scotland:

- We need to ensure children, young people and adults are encouraged to develop an interest in, and enthusiasm for, STEM that is reinforced throughout their lives.

- We need to ensure our education system has the right number of practitioners, including teachers with the appropriate STEM capability, delivering excellent learning and teaching.

- We need to ensure that our education and training system is equipping people with the skills that employers need and that it has the flexibility to respond to the changes in labour market demand and the globalised economic context.

- We need to tackle the gender imbalances and other inequities that exist across STEM education and training including in relation to race, disability, deprivation and geography. These are unfair and undermine our ability to deliver inclusive economic growth in Scotland.
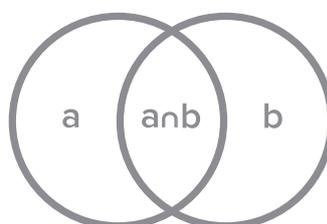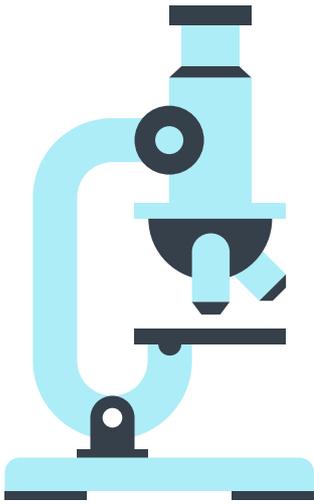
Addressing these, the Strategy sets out a vision for everyone in Scotland to be encouraged and supported to develop their STEM skills throughout their lives. It has four key aims:

- 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;

- to **inspire** children, young people and adults to study STEM and to continue their studies to obtain more specialist skills; and

- to close **equity** gaps in participation and attainment in STEM so that everyone has the opportunity to fulfil their potential and contribute to Scotland's economic prosperity;
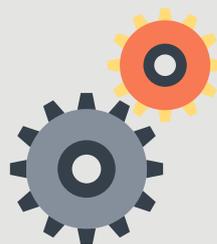
- to **connect** the STEM education and training offer with labour market need – both now and in the future – to support improved productivity and inclusive economic growth.
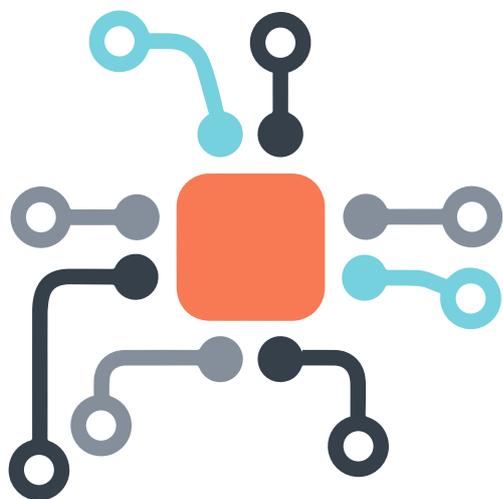
In the First Annual Report, published in February 2019, we highlighted how the STEM Strategy links to other strategic priorities of the Scottish Government. We provide an update on this and other activity below.

In 2019, the Scottish Parliament's Education and Skills Committee undertook an Inquiry into STEM education in the early years from age 3 to 7. The Scottish Government welcomed their input and has responded to their recommendations. The Committee provided an analysis of the challenges to be addressed and highlighted the need for a long-term, sustained and systemic approach, particularly in tackling inequity.

The early years are a crucial stage as they provide a foundation for STEM skills and are where interest in STEM can start because of children's natural curiosity and inventiveness. Recognising this, there is a strong focus on actions that target the early years and primary schools in the Strategy. It is worth noting, though, that the scope of the Strategy is broader and is designed to bring opportunities and changes for all ages across the education and training landscape – ensuring that young people are developing the necessary skills and that we are also reskilling our adult population to meet the needs of our evolving workplaces.

This year we are delivering a significant expansion in the entitlement to funded early learning and childcare from 600 to 1,140 hours a year. This is a universal offer for all three and four-year-olds and for eligible two-year-olds. The focus within the offer of providing high quality experiences for our youngest learners is an opportunity to enhance early learning in STEM skills, and will help to tackle inequity and inequality at an early stage.

The focus on numeracy as one of three key areas within Scottish education reinforces the aims of the STEM Strategy as mathematics and numeracy are part of, and underpin, STEM knowledge and skills. The refreshed curriculum narrative for education in early years and schools, published in September 2019, emphasises the purpose of the curriculum as helping children and young people gain the knowledge, skills and attributes they need for life in the 21st century. It therefore provides a firm basis for teaching and learning in STEM across all stages of early learning and school education. Our focus on closing the deprivation-related attainment gap in education also contributes to tackling inequity gaps in STEM which lead to occupational segregation and disadvantage in later life.

June 2019 saw the launch of the new Learning for Sustainability Action Plan. STEM links strongly to Learning for Sustainability. This is a cross-curricular approach to learning which enables young people to explore sustainability across a number of subjects. As part of their STEM learning, young people may learn about greenhouse gases in the sciences and calculate carbon emissions in mathematics. Learning about these important environmental issues is crucial if our next generation is to develop the skills, knowledge and values to lead sustainable lives.

STEM is integral to the Developing the Young Workforce Programme (DYW), Scotland's youth employment strategy. The fifth annual report was published in December 2019. The DYW programme supports delivery of the STEM Strategy in several areas, particularly those linked to raising awareness of the world of work and building partnerships across the different sectors of education and with employers. We continue to ensure that close connections are made between DYW and the STEM Strategy so that they are mutually supportive of one another. For example, key performance indicators relating to STEM are now guiding the work of the 21 DYW Employer Groups.

The 15-24 Learner Journey Review, published in May 2018, sets out a series of recommendations designed to create smoother learner journeys for young people. This programme of work aims to develop stronger advice and support for young people with the goal of allowing young people to make more informed choices regarding their futures. Young people now have a greater range of choices in the Senior Phase including National Qualifications, Foundation Apprenticeships and Youth Awards to demonstrate their achievements before progressing to further learning, at college or university, or to work. This means that young people now have a diverse range of pathways for STEM study and into STEM careers and will be better informed about the choices they make.

The Scottish Government funded Science Skills Academy (SSA) operating in the Highland region is now mid-way through its implementation. An exciting demonstration project, it is effectively testing the ability to deliver a consistent and high quality STEM experience across the whole region, through enhanced infrastructure and staffing provision. So far the SSA has established two Newton Rooms (in Thurso and Fort William), and is due to open its third room in Dingwall in Spring 2020. Planning is underway for Skye and Inverness to complete the five areas. Targeting Primary 6, Primary 7, Secondary 1 and Secondary 2 pupils in the Highland region, the project delivers a full day's inspirational STEM activity. Operating in partnership with regional and national stakeholders, it also acts as a catalyst and co-ordinator for other STEM provision being delivered in the region. To date, almost 3500 pupils have attended the Newton Rooms. By the end of 2022, it is hoped to be fully operational and delivering to 10,000 pupils annually.
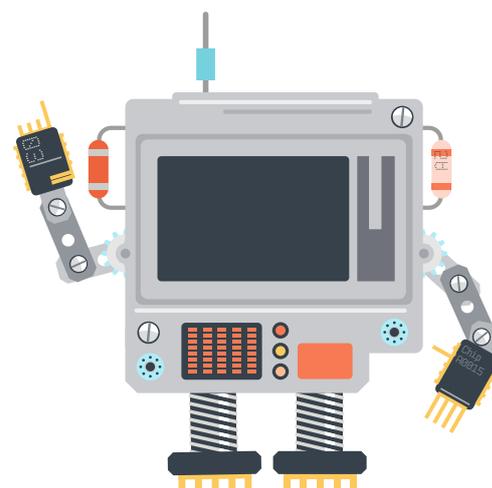
The college sector has a vital role to play in supporting the successful delivery of the Strategy. As a provider of STEM courses, colleges are a key partner in building a strong base of STEM skills and knowledge. STEM activity carried out by colleges working with schools, often under the auspices of the Regional STEM Hubs, means they are well placed to meet the aims and aspirations of the STEM Strategy. Colleges are connecting their STEM education and training offer with labour market need – both now and in the future – to support improved productivity and inclusive economic growth.

Our universities, working at the cutting edge of research and innovation, are also acting to forge improved links between their education and training offers and changing labour market needs. This is exemplified by the Digital Skills Partnership, a ScotlandIS initiative, supported by Skills Development Scotland and the Scottish Funding Council. This initiative brings together industry, colleges and universities to build industry-relevant curriculum materials and empower students with exposure to up-to-date working practices. Scotland's universities enhance the development of STEM through their innovation agenda, by contributing to research pools and knowledge-transfer partnerships, and through world-leading research.

Colleges and universities are working jointly on the Construction Scotland Innovation Centre (CSIC), one of eight industry-led and demand-driven Innovation Centres supported by the Scottish Funding Council, Scottish Enterprise, Highlands & Islands Enterprise and the Scottish university and college sector. CSIC assists industry and key procurement players to build strong collaborative projects to tackle construction industry challenges, stimulate growth and create new jobs.

The proportion of STEM employers in Scotland reporting at least one skills shortage vacancy[1] (7.7%) was higher than for all employers in Scotland (6%) in 2017. The ratio of male to female employees in STEM businesses is also highly skewed, particularly if medical and related businesses are not included in the analysis. Scotland's Future Skills Action Plan, published in September 2019, sets out what action the Scottish Government intends to take to address skills gaps and shortages in our workforce. We will also publish our Climate Emergency Skills Action Plan in September 2020. This will set out how we will begin to deliver the skills, including critical STEM skills, to support our transition to a Net Zero Economy.

Scotland's Careers Strategy: Moving Forward was published in February 2020. The new strategy, drafted in collaboration with the sector, brings together all those who deliver career services in Scotland to ensure people can access the support they need to take advantage of job and career opportunities in the labour market, including STEM opportunities.

The actions in the STEM Strategy on tackling gender imbalances in STEM will help to address occupational segregation and closing the gender pay gap. This contributes to the Government's Gender Pay Gap Action Plan that was published in March 2019. It identified a series of actions to reduce gender pay gaps across Scotland as part of the Scottish Government's inclusive growth vision. A Year One update charting progress on actions in the Gender Pay Gap Action Plan is expected to be published in Spring 2020.

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1 Vacancies which are reported to be hard-to-fill because applicants lack relevant skills, qualifications or experience: https://www.gov.uk/government/collections/uk-employer-skills-survey-2017

The STEM Strategy and its impacts will also be considered as part of the wider work of the Deputy First Minister's Task Force on Gender Equality in Education and Learning. This has been set up as a direct response to one of the Year One recommendations from the First Minister's National Advisory Council on Women and Girls, and met for the first time in February 2020

Science Centres and Festivals, and the community learning and development sector, continue to play a valuable role in engaging young people and the wider public in STEM activity and learning. Transport subsidies are provided to enable school trips to take place, and outreach activity allows engagement in more remote areas. This work is key in engaging people in STEM, allowing an understanding of the relevance of STEM to everyday lives as well as generating an enthusiasm and interest in developing skills in these critical areas.

In 2020, the year that sees Scotland host the 26th United Nations Climate Change Conference, celebrate a Year of Coasts and Waters, and which the United Nations has designated the International Year of Plant Health, we are reminded of the breadth and diversity of STEM. These events provide key opportunities to demonstrate the relevance of STEM to our learning and our lives and to capture the interest of our learners and the wider community.

This report fulfils Ministers' commitment to annual public reporting on progress, setting out the great work underway in Scotland to achieve our vision and develop STEM capability across the learning, training and skills landscape. We recognise, that there are no quick fixes. For many of the actions, particularly those targeted at the early years, it will take time to realise the long-term benefits. As we take forward activity, we will continue to take a joined-up approach across all our partners.

Our STEM Strategy Implementation Group, External Advisory Group and Equality Sub-Group bring together key delivery partners and stakeholders to ensure that relevant links are made and provide oversight and challenge of activity.

Development of the £65 million National Manufacturing Institute Scotland (NMIS) is also connecting STEM provision with labour market need. NMIS will be an industry-led international centre of manufacturing expertise which aims to inspire and attract a diverse talent pool to work in the sector. NMIS includes a Manufacturing Skills Academy where 30 Industry Doctorate projects demonstrate industry investing in longer term skills and research capability. Each project is co-sponsored by at least one university and one industry partner with the programme spread across eight Scottish universities and 12 industry sectors, 40% of which are with small and medium sized companies. Separately, a series of digital and technical skills webinars and TeachMeets have been delivered to college and university lecturers with around 30 skills ambassadors recruited to provide a peer network able to offer all those teaching young people advice around current industry trends and needs.
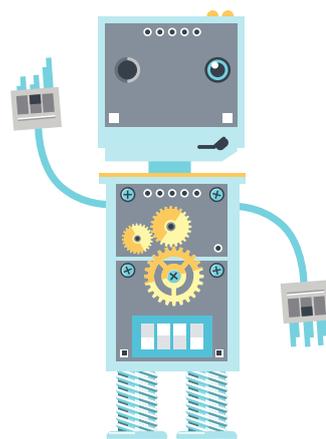
Progress towards Outcomes

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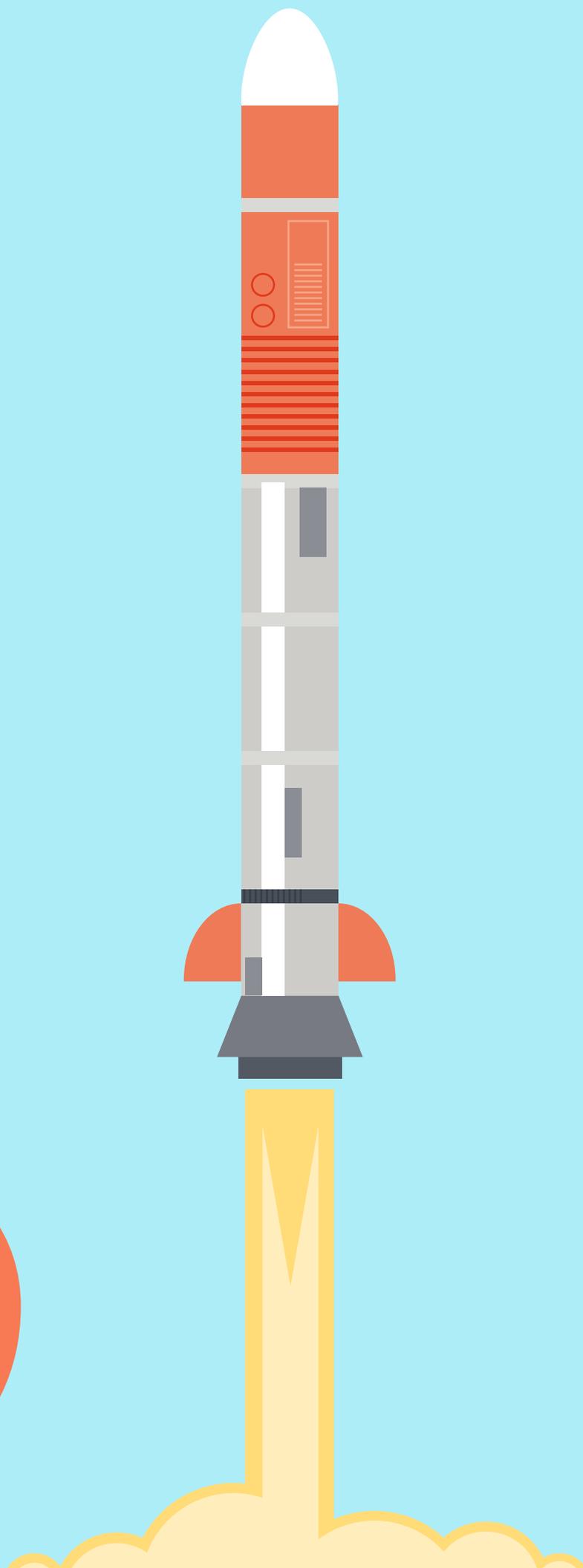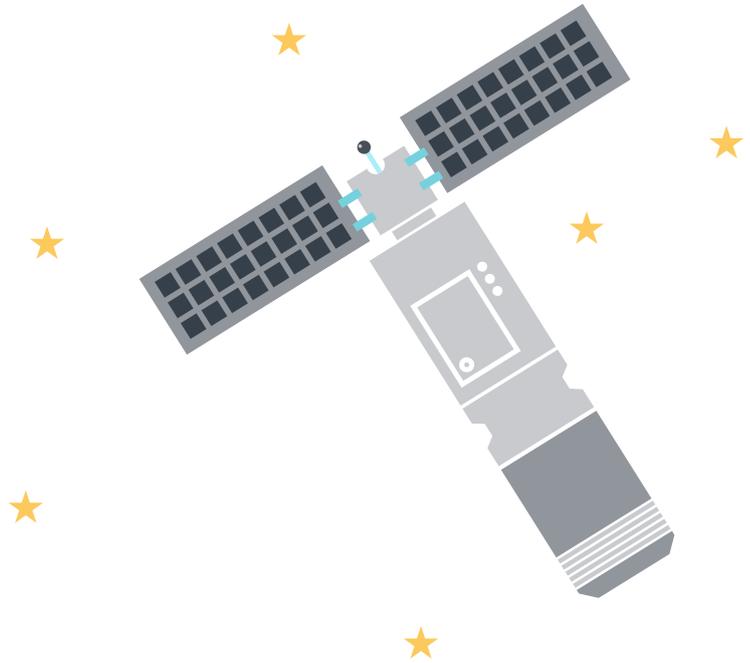
The Strategy identifies a number of key outcomes we expect to see by 2022. These are:

- increases in the proportion of people undertaking STEM-related learning, engagement, study and training across all sectors including in school-level qualifications and awards, and participation in apprenticeship programmes **(Excellence and Inspiration)**;

- increased practitioner confidence in supporting STEM learning in the early years, primary years and in Community Learning and Development (CLD) settings and increased practitioner engagement in STEM professional learning opportunities **(Excellence)**;

- significant reductions in the equity gaps in participation and achievement in STEM learning, engagement, study, courses and training across all sectors in relation to gender, deprivation, rurality, race, disability and for care leavers **(Equity)**;

- increased numbers of people who understand the benefits and value of STEM for themselves, their families and their communities **(Inspiration)**;

- increased collaboration between schools, colleges, universities and employers **(Connection)**; and

- increased employment in STEM-related occupations and employers are more satisfied with the STEM skills and capability of the people they employ from schools, colleges, universities and from apprenticeship programmes **(Connection)**.

In its second year, delivery partners have been building on infrastructure and resources put in place in year one to drive forward delivery of the aims and actions of the Strategy. Key activities and achievements in year two have been:

- An online professional learning module was produced for the early learning and childcare sector and teachers working within the early level in primary school in January 2020. The module promotes child-led and play-based approaches to early learning in STEM and tackles gender bias in learning.

- Refreshed national early years practice guidance – 'Realising the Ambition: Being Me' was published in February 2020. This resource sets out how to facilitate playful interactions and experiences in outdoor and indoor spaces that stimulate children's curiosity in the world around them.

- We have awarded a further 111 STEM Bursaries to encourage career changers into STEM teaching in shortage subject areas.

- Education Scotland has awarded a total of £1.9 million of STEM professional learning grants in financial year 2019-20, supporting 162 projects.

- Eight STEM Advisers are in place and are working within Education Scotland's regional teams to support schools to deliver quality STEM learning. There are also eight Numeracy and Mathematics Officers and eight Digital Officers in the regional teams.

- Six Improving Gender Balance and Equalities (IGBE) Officers are also embedded within Education Scotland's regional teams. Up to December 2019, the officers engaged directly with 50 school clusters, and had over 2,200 engagements with practitioners.

- We are continuing to support SSERC to up-skill teachers and technicians, providing £865,000 in 2019-20.

- SSERC delivered their pilot of the Young STEM Leader programme across 72 centres in school and community settings to support young people to inspire each other to get involved in STEM.

- Colleges are continuing to develop the 13 regional STEM Hubs to strengthen collaboration between partners including universities, science centres and employers.

- We are providing funding of £2.625 million across Scotland's four science centres in 2019-20. Science centre support includes a school transport subsidy and a community subsidy to enable engagement with a greater diversity of people.

- In 2019-20, funding of up to £250,000 is available to support science festivals taking place across Scotland between August 2019 and June 2020.

- In 2019-20 we are providing funding of £100,000 to support Generation Science and Young Engineers and Science Clubs that support young people's STEM learning at schools throughout the country.

- A national engagement campaign 'Aye for Ideas' was launched in June 2019 with the purpose of inspiring and engaging people of all ages and backgrounds with STEM. The campaign will run for life of STEM Strategy and will be monitored to review social media and wider impact.

- Over 80 early learning and childcare settings and schools piloted the new STEM Awards and a celebration event is being held in March 2020 to recognise their progress and achievements.

- Education Scotland are developing an online directory of STEM inspiration activities to help co-ordinate the way STEM partners engage with schools. The directory will be available during 2020.

- The first annual community learning and development (CLD) STEM conference, What's STEM Got to Do with It, was held at Glasgow Science Centre in February 2019.

The following chapters provide more detail on each of these and other activity under the Strategy in year two.

As we enter the third year of implementation of the Strategy, we will expect to see an increased momentum and level of activity, for example, through the impact of the STEM professional learning grants and the work of the new Education Scotland teams that have been put in place. The high level of engagement with the STEM Nation Award pilot and the Young STEM Leader Programme will bring new opportunities and energy that will further raise the engagement and profile of STEM.

In year three, we will:

- Continue to deepen engagement with schools and other partners regionally through Education Scotland's STEM Advisors and IGBE Officers.

- Continue the Enhancing Professional Learning in STEM Grants Programme informed by the findings from the Annual STEM Practitioner Survey and STEM data gathering exercise.

- Roll out the Young STEM Leaders programme so that it is available nationally.

- Continue to build on the STEM Nation Award pilot.

- Finalise and pilot a self-evaluation framework for Improving Gender Balance in early learning and childcare settings and schools.

- Publish the STEM Nutshell Guide on the Parentzone Scotland website.

- Launch the Idea No. 59 innovation exhibition to inspire young people to think about STEM careers in the future.

Key Performance Indicators (KPIs) measure progress against the aims and key outcomes of the Strategy. These indicators are long-term targets, reflecting the ambitions and five-year lifespan of the programme from 2017 to 2022. We are keeping the KPIs under review to make sure that they are still relevant. This year, we have updated the KPIs as a result of new analysis.

We have linked activities to the KPIs throughout the report and the full indicators and summary data are set out in Annex B. Tables showing the full background data for the KPIs are being published separately on the Scottish Government website.
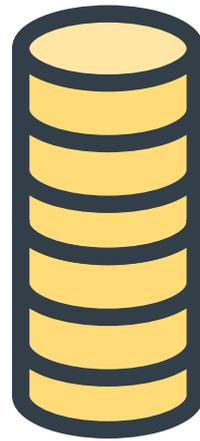
2019-20
£1.9m
supporting 162 projects

Funding for the Enhancing Professional Learning in STEM Grants in **2019-20 totalled £1.9m, supporting 162 projects**.
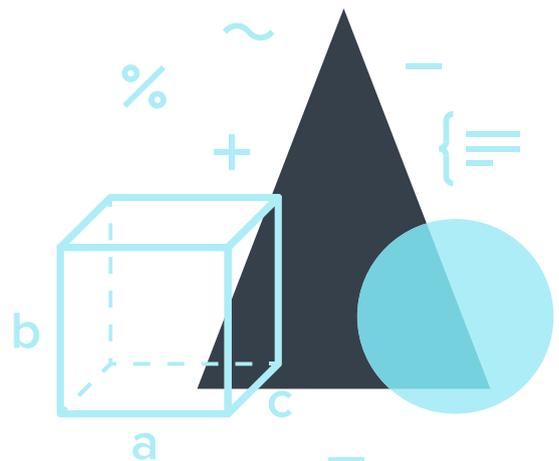
We are also gathering anecdotal and other evidence of progress through evaluation and monitoring of activity under the Strategy so that we can ensure our actions are delivering change and make any changes to our approach if necessary.

For example, SSERC has conducted an external evaluation of their Primary Cluster programme which covers all local authorities and which is based on empowering science and technology mentors in participating local authorities. 85% of the 430 mentors indicated an increased level of confidence for teaching science and technology, and 91% indicated an increased level of enthusiasm for science and technology. The programme now moves into phase 2 of delivery.

This programme complements the work of the Raising Aspirations in Science Education (RAiSE) which also received a very positive evaluation in April 2019, with 71% of teachers involved in the programme reporting an increase in their confidence in relation to the pedagogy of science and 76% in relation to the content of science. A national invitation to join the programme has now been extended to all local authorities, with fourteen authorities benefitting from the programme to date. A further four authorities are scheduled to join in 2020.

An external evaluation of the impact of Education Scotland's activity under the Strategy will start this year. This impact study will shape the direction of interventions and regional and national activity, including the STEM Grants programme and improving gender balance activity, through to the conclusion of the STEM Strategy in 2023.
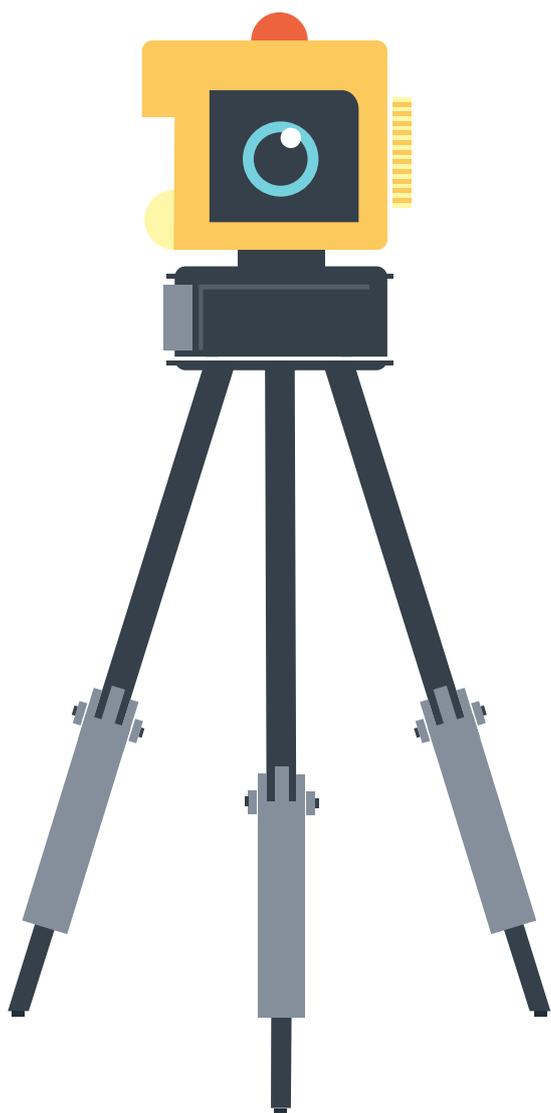
#Equity

#STEMHubs

#Connection

#ScienceCentres

#YoungSTEMLeaders

#STEMAmbassadors

#EarlyLearning

#Deprivation

#Numeracy

#Technology

#CLPL

#Clusters

#Employers

#DYW

#STEMnation

#Excellence

#Mathematics

#Science

#Universities

#Rural

#Colleges

#ClimateChange

#GenderBalance

#STEMAwards

#OutdoorLearning

#Apprenticeships

#ScienceFestivals

#InterdisciplinaryLearning

#Inspiration

#LearningforSustainability

#Schools

#Equality

#CLD

#Engineering
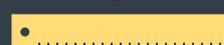
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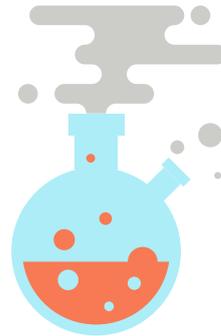
Excellence

To ensure that STEM education and training helps people develop the STEM skills and knowledge they need, we are promoting **Excellence** in STEM by:

- improving the supply of STEM talent into the profession

- improving STEM learning and teaching and delivering enhanced professional learning

- prioritising STEM in the expansion of apprenticeships

- maintaining our research excellence in our universities

As result of the actions under this theme, by 2022 we expect to see:

- Increases in the proportion of people undertaking STEM-related learning, engagement, study and training across all sectors including in school-level qualifications and awards and participation in apprenticeship programmes. (KPI I)

- Increased practitioner confidence in STEM learning in the early years, primary years and in CLD settings, and increased practitioner engagement in STEM professional learning opportunities. (KPI II)

This section provides an overview of progress against individual actions under the Excellence theme.

Improving the supply of STEM talent to the teaching profession

To encourage STEM career changers into teaching, 111 STEM Bursaries of up to £20,000 were awarded in the 2019-20 academic year (compared to 107 in 2018-19). These bursaries are targeted at secondary teaching in shortage STEM subjects – mathematics, physics, computing, chemistry, home economics and technical education.

Chemistry	Computing Science	Home Economics	Maths	Physics	Technical Education
47	25	9	68	31	38

218 STEM Bursaries awarded in 2018-19 and 2019-20

380
2015-16

510
2016-17 and 2017-18

595
2018-19

STEM Teacher Training entrants increased from **380 in 2015-16 to 510 in 2016-17 and 2017-18 to 595 in 2018-19.** (KPI I a)
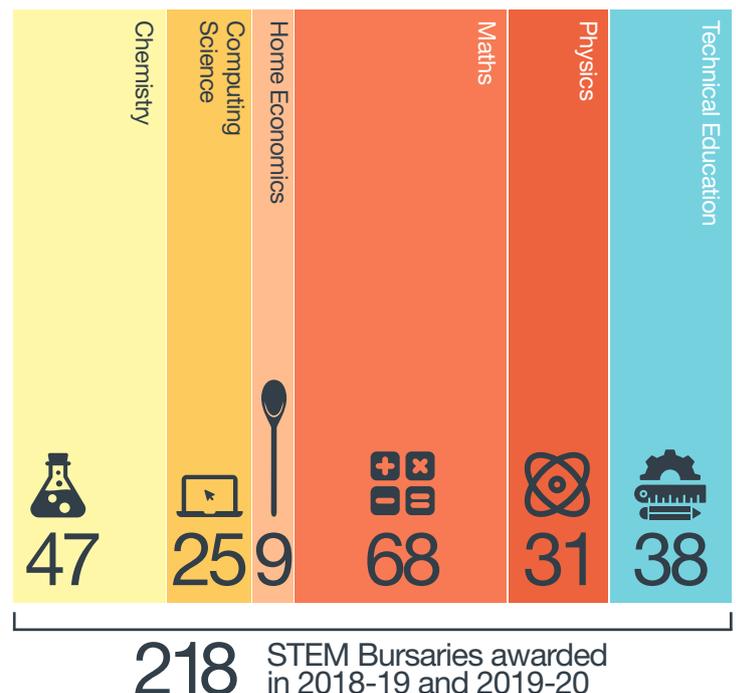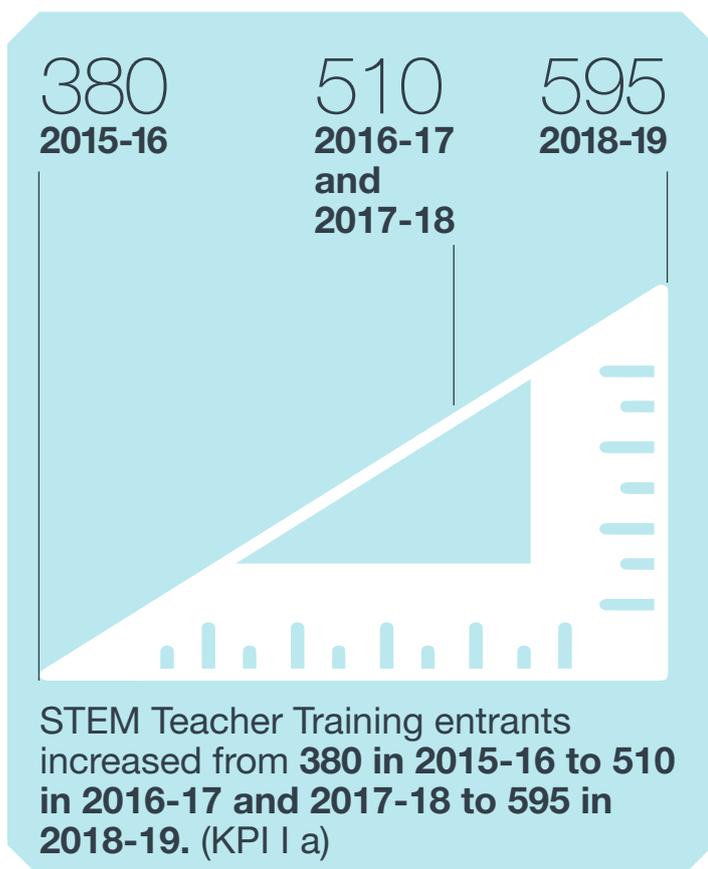
Alternative routes into teaching for graduates have been available from 2017 and were introduced to help address recruitment challenges for teachers in priority subjects as well as in the remote and rural areas of Scotland. These innovative and ambitious programmes have all been professionally accredited by the General Teaching Council for Scotland (GTCS) and are structured to ensure the professional standards of teaching in Scotland are maintained. Depending on the programme, they do this in a number of ways by:

• Qualifying new teachers more quickly in the priority STEM subjects by combining post-graduate education with the teacher probation year and in some cases offering financial support to participants during their time on their programme;

• Providing targeted help for former teachers looking to return to the profession;

• Developing teachers able to work across the entire primary curriculum as well as enabling them to develop a specialism across a range of subjects that includes Primary Science, Numeracy and Environmental Science;

• Targeting career changers to meet the demand for primary and secondary teachers in rural areas of Scotland; and

• Developing teachers able to work in both primary and secondary schools.

There were 799 starts on these programmes during academic year 2017-18 and 2018-19.

In 2019 the Scottish Government worked with the GTCS and each of the Initial Teacher Education (ITE) institutions involved in the delivery of alternative routes to undertake an interim evaluation of their impact. The findings show the new routes are:

• Attracting individuals from diverse academic and professional backgrounds to access the teaching profession, particularly career changers;

• Contributing towards the number of ITE students going into the priority STEM subjects;

• Developing the professional competence of existing teaching staff through the mentoring support being given to students; and

• Supporting the qualification of teachers with masters degrees that are able to teach across both primary and secondary school settings.

The GTCS Memorandum on Entry Requirements to Programmes of ITE in Scotland was revised in 2019, following public consultation. This now encourages universities to expect at least one SCQF Level 5 qualification in a science subject for entry to ITE Primary programmes

Many of these actions are contributing to and are being measured against KPI I, which is tracking the number of students on Initial Teacher Education courses in STEM subjects. Targets are set for these courses for the subjects where there are shortages of teachers. These targets have been increasing each year. While targets have still been missed in the shortage subject areas, overall intakes for the STEM secondary teacher training courses are increasing with 595 starts in STEM subjects in 2018-19 compared to 510 in 2016-17 and 2017-18 and 380 in 2015-16 (the baseline year).

Improving STEM learning and teaching and delivering enhanced professional learning

Since the last STEM Strategy Annual Report, Education Scotland's Inspectors have carried out a review of current practice in numeracy and mathematics. Their findings were published in the Multiplying Skills, Adding Value Report in December 2019. In the aspects for development, the report emphasises that primary schools in particular should further explore the potential for STEM and Developing the Young Workforce activity to add value to learning in mathematics and numeracy. It also recommended that secondary schools need to further develop the use and application of numeracy skills across subject areas using a school-wide approach.

Education Scotland's National Improvement Hub continues to provide a 'one stop shop' access to a wide range of STEM learning resources for practitioners. This includes a wealth of professional learning related to numeracy and mathematics.

Education Scotland has also awarded around £2m in grants to allow for groups of practitioners to take the lead in developing their own professional learning in STEM areas. Regional and national partners are also being funded to increase their capacity to provide professional learning.

£187,000 of grants were awarded to 24 projects through Round 1 of the Enhancing Professional Learning in STEM grants programme in financial year 2018-19. An additional £572,000 was made available to continue 20 of these projects in financial year 2019-20 to allow them to extend the reach and development of these programmes. In addition, £1.376 million of funding was shared across 140 new projects in financial year 2019-20. These new projects are expected to directly benefit an estimated 722 establishments and 13,847 practitioners across early years, community learning practitioners, teachers and school technicians. Where relevant, outputs will be shared online so that a greater number of practitioners can benefit.

From 2019-20, the funding for the grants incorporated the National Numeracy and Mathematics Hub funding, and a significant proportion of the successful projects are supporting mathematics and numeracy.

Much of the activity being supported through the grants is also interdisciplinary in nature, reflecting the fact that working across disciplines is an essential competence in the world of work, and individual subjects are rarely used in isolation.

Skills Development Scotland and Education Scotland are developing STEM 'lesson inserts' to help teachers relate learning and skills in the class to real-life situations and careers. Further work has been undertaken to update and extend the resources available to careers advisers and practitioners about STEM workplaces and careers.
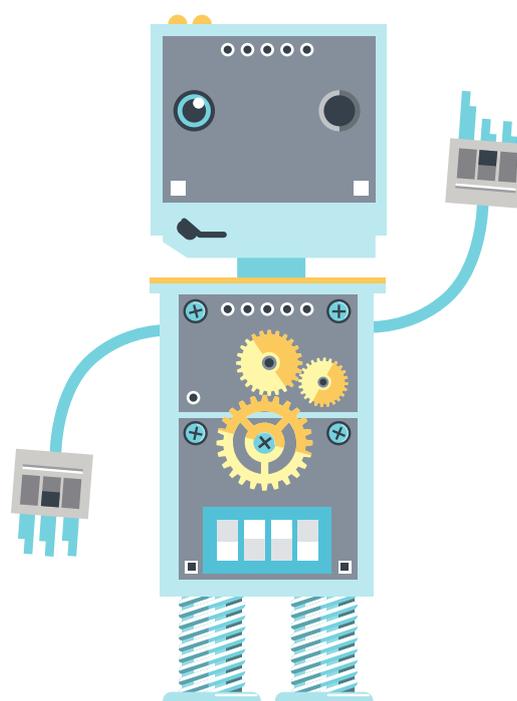
Enhancing Professional Learning in STEM Grants

#Excellence #CLPL #Connection

The grants programme is supporting a wide range of activity across Scotland benefitting practitioners in new ways and helping to address some of the challenges practitioners face in accessing high-quality professional learning that meets their needs. Examples of funded projects include:

- Abercorn Secondary in Glasgow has built an active network of ASN practitioners to promote collegiate working. The network will create opportunities for staff from a variety of local authorities to share practice and professional learning in relation to STEM in Additional Support Need (ASN) settings.

- Our Dynamic Earth in Edinburgh has put Creative Science, one of its most popular science courses, onto an online platform so it can be accessed by a much wider range of practitioners across Scotland.

- Comhairle nan Eilean Siar is developing a programme of virtual professional learning for primary practitioners working in remote island schools that can be delivered in class, in English or Gaelic.

- Early learning and childcare practitioners in South Lanarkshire are benefitting from a significant programme of professional learning promoting Froebelian pedagogy, and how it can be used to support delivery of STEM learning.

- Community learning and development practitioners in Midlothian, East Lothian and Edinburgh are now accessing a wide range of STEM professional learning opportunities to help them bring STEM to all communities.

- The Scottish Childminding Association is working in partnership with SSERC to develop a bespoke professional learning course in science, mathematics and numeracy to build understanding of STEM practice in childminding settings.

- Mathematics teachers in East Lothian are receiving funding to access professional learning to build their skills in the use of manipulatives to improve pedagogy, promote a love of mathematics and to raise attainment.

- The Safer Internet Centre will equip 180 practitioners across Scotland with up-to-date knowledge, key skills and resources for working with and supporting the digital citizens of the future.

To see the full list of Round 2 grants being supported please visit:
https://education.gov.scot/improvement/learning-resources/a-summary-of-stem-resources/

A STEM online professional learning module for the early learning sector has been developed with the University of the West of Scotland and launched in January 2020. It aims to help early learning practitioners develop an understanding of using inspiring, child-led and play-based approaches to STEM learning in a range of environments, in an inclusive and easily accessible way. It will play an important role in upskilling staff and building their confidence in these areas, as part of the significant recruitment underway to support the expansion of early learning and childcare. This resource will be available to all practitioners through the Online National Directory of early learning and childcare professional learning, including to those in the private, voluntary and independent sectors.

The outdoors provides lots of opportunities to incorporate STEM into early learning, using the natural world to help develop curiosity and science skills. The new National Standards for Early Learning and Childcare require children to be outdoors every day as part of their funded hours. Practical Guidance for creating high quality outdoor experiences – Out to Play – was published in December 2018. Dedicated support to improve and increase outdoor learning has been provided to eight local authorities by Inspiring Scotland through a funded programme of practical advice and expertise focussed on regularly accessing greenspace, registering high quality outdoor spaces and building confidence amongst practitioners in delivering outdoors.

Practice in supporting the development of STEM skills in early learning and childcare will also be strengthened by the publication of the refreshed national practice resource 'Realising the Ambition'. This resource, which was published in February 2020, sets out how to provide playful environments that stimulate children's curiosity in the world around them.

The Scottish Funding Council has built up a baseline of existing STEM engagement and inspiration activity through its work with the Regional STEM Hubs, and the more advanced STEM Hubs are now organising professional learning activities hosted by colleges and drawing on experience across the sector. New College Lanarkshire and Forth Valley College also received funding from the STEM grants programme to develop new approaches to college-led professional learning in STEM.

We have continued to support SSERC with £865,000 provided in financial year 2019-20 for its programme of professional learning for teachers, which is expanding to include more provision on digital learning and support for all early learning and childcare practitioners. The SSERC Primary Cluster Programme is designed to equip teachers with the knowledge and skills to become STEM mentors. Mentors provide and lead STEM activities within their cluster by sharing experiences and good practice and offering support and guidance to their colleagues. In addition, in 2018-19 SSERC continued to offer a range of courses to the secondary sector, with almost 1,500 secondary teachers attending one or more of their professional learning programmes.

We have also continued to fund the Raising Aspirations in Science Education (RAiSE) programme in partnership with The Wood Foundation to support improvements in primary science and STEM practice. Following a positive evaluation, the RAiSE programme is being offered to all local authorities on a rolling basis and has now engaged with 14 authorities since it started. Authorities who have completed their two year participation are being supported to make this work sustainable. Six out of the eight pilot authorities have retained or, in some cases, expanded the role of Primary Science Development Officer to further develop practitioner confidence in teaching science and STEM in primary schools.

Learning for Sustainability continues to be a focus for many STEM programmes supported regionally. In the West, Keep Scotland Beautiful, the West Partnership and Education Scotland are collaborating with the local authorities in the Improvement Collaborative to support the Upstream Battle Programme. This large-scale citizen science programme is engaging schools and communities along the River Clyde to tackle marine plastic pollution. This included a cross-authority "STEM the Flow" event where learners were encouraged to develop innovative STEM approaches to reducing marine plastic pollution.

Through the RAiSE Programme activity in Angus, practitioners are being given the opportunity to work with Zero Waste Scotland to develop their understanding of the circular economy and how it can be embedded in the curriculum. By learning how we can make things to be made again, practitioners are developing their understanding of how we can minimise our impact on the environment, re-purpose our natural resources and tackle climate change.

Education Scotland's network of eight Regional STEM Advisors are embedded within their regional teams. They have worked closely together to support a wide range of improvement activities on a regional basis including:

- Working with Regional Improvement Collaborative and local authority leads to develop regional STEM plans;

- Targeted professional learning support to establishments and school clusters;

- Visiting establishments to develop case studies and share effective approaches;

- Working with collaborative lead officers to launch STEM-related practitioner networks at local authority or regional level;

- Professional learning sessions on local authority in-service days with science and mathematics practitioners;

- Supporting professional dialogue at head teacher events or with newly qualified teachers;

- Working with the Attainment Advisors in Education Scotland's Regional Teams to explore ways of using STEM to help raise attainment and close the attainment gap;

- Supporting regional approaches to collaborative practitioner enquiry for science and technologies practitioners; and

- Running regional conferences to improve pedagogy and raise attainment in STEM-related disciplines.

The STEM Advisors are supported in their work in specialist areas working alongside the eight Numeracy and Mathematics Officers and eight Digital Officers.

When invited by local authorities, the STEM Advisors are also delivering professional learning to local authorities and providing strategic advice and guidance on climate change and Learning for Sustainability.

They are also helping to connect the activity being supported through the STEM grants with the work of the college STEM Hubs, DYW Regional Groups, universities, science centres and festivals, industry and STEM Ambassadors. From 1 August to 31 December 2019, the Regional STEM Advisors had a total of 339 STEM engagements, with 366 distinct educational settings and 1,328 attendees.

Education Scotland also continues to provide tailored support to local authorities to improve digital skills and computing learning in schools through the their Digital Skills team. This has included hosting national Technologies networks for all local authorities to come together, and social media campaigns throughout the year linked to national events including Hour of Code, Internet Safety Day, Digital Learning Week and Cyber Week. Skills Development Scotland is also promoting digital learning through their Discover Cyber Programme.

With sponsorship support from BCS and Microsoft, the University of the Highlands and Islands is offering online professional development support for teachers through degree modules in database and computing systems and coding and web technologies. The two training modules will help primary and secondary teachers develop the general knowledge and skills required to deliver the computing curriculum up to SCQF Level 3. The programme will run from February to December 2020.

The Learning Estate Strategy and the first 11 schools to benefit from the new £1 billion Learning Estate Investment Programme were announced in September 2019. Excellent spaces for STEM learning are important for delivery of enhanced learning and teaching, and an emphasis on this is made within the Learning Estate Strategy.

Each of the above actions will complement each other and contribute to achieving the target against KPI II to increase practitioner confidence in STEM learning which is being measured through cumulative hours of STEM professional learning. In 2019 Education Scotland sought more granular responses in their practitioner survey. The results relating to practitioner confidence highlighted the variability in confidence across sectors and aspects of STEM as can be seen in the separately published KPI data tables. This information will be used to inform targeting of activity as we move forward. Overall, findings showed that practitioners accessed an average of 16.1 hours learning between 1 August 2018 and 31 July 2019. In addition, the 49 STEM providers that responded to Education Scotland's provider survey collectively provided 128,171 cumulative hours of STEM professional learning in that period.

Prioritising STEM in the expansion of apprenticeships

In 2018-19 the apprenticeship starts target of 28,000 was achieved – in keeping with the Scottish Government's ambition towards 30,000 new apprenticeship starts by 2020-21. From 2018-19, Graduate Apprenticeship starts were included in the apprenticeship total and contribute towards the Scottish Government's commitment.

Foundation Apprenticeships have expanded considerably in recent years. They provide senior phase learners (S5 and S6) with access to structured work-based learning qualifications to industry-recognised standards at SCQF Level 6 (the same level as a Higher). Foundation Apprenticeships have been designed and developed with industry and the SQA, and are aligned to key sectors of the economy with current skills shortages and projected future jobs growth. The Foundation Apprenticeship is delivered through partnerships between schools, a local college or learning provider and local employers.

The number of STEM Foundation Apprenticeship frameworks has increased from four in Cohort 1 (2016-2018) to six in Cohort 2 (2017-2019) and seven in Cohort 3 (2018-2020). The development of additional frameworks and the expansion of Foundation Apprenticeship delivery has seen the number of learners starting STEM Foundation Apprenticeship Frameworks increase from 161 in Cohort 1 to 552 in Cohort 2 and 722 in Cohort 3. There has been further significant growth of the STEM FAs in 2019.
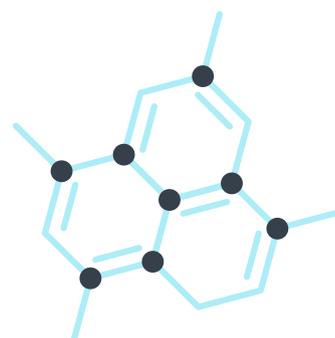
Modern Apprenticeship training offers individuals in paid employment the opportunity to develop and learn new skills from SCQF Level 5 to up to Level 12 which includes technical, professional levels and training to support upskilling new and existing staff. STEM is included within the Modern Apprenticeships funding priorities. For the financial year 2018-19, 41% (10,900) of the Modern Apprenticeships starts were in STEM frameworks. Of these, 65% of all STEM starts were aged 16 to 24 and 79% of STEM starts were at SCQF Level 6 and above. As at 31 March 2019 there were 37,765 Modern Apprenticeships in training. Of these, 57% (21,500) of Modern Apprenticeships in training were in STEM frameworks and of these, 79% were aged 16-24 and 88% were at SCQF Level 6 and above.

The Graduate Apprenticeship provides work-based learning opportunities to new or existing employees, through a degree programme offering high level academic and work-based learning. These programmes are designed to enable employees to study up to degree level (Bachelors or Masters/SCQF Level 10 or 11) while spending the majority of their time in the workplace. They have been created in partnership with industry and the further and higher education sector. The apprenticeships combine academic knowledge with skills development to enable participants to become more effective and productive in the workplace.

At the end of 2018, 14 of Scotland's universities and colleges were delivering Graduate Apprenticeships in subject areas covering sectors including ICT/Digital, Cyber Security, Data Science, Civil Engineering, Engineering, Construction and Business. Ten of the fourteen Graduate Apprenticeship frameworks developed for delivery in academic year 2019-20 are STEM. Skills Development Scotland published the Graduate Apprenticeships: Early Activity and Progress Report in August 2019, which reported that there were 921 starts on Graduate Apprenticeships in 2018-19, of which 607 were on STEM frameworks (583 of these were STEM Graduate Apprenticeship starts at SCQF Level 9 and above).

This work is being measured against KPI I c and KPI I d around provision of apprenticeship opportunities which, as above, is showing positive progress. From next year onwards, we will also look to report on completion rates for Foundation Apprenticeships.

Maintaining excellence in STEM research and building links with Industry

The Glasgow Science Centre with the support of Scottish Government, the Scottish Funding Council, the Innovation Centres and others, has developed an innovation themed exhibition to inspire school children to think about STEM careers. Idea No. 59 opens in March 2020 and is an educational platform designed to nurture critical future skills. It aims to grow the next generation of engineers and innovators by creating a physical space for extended engagement with schools, communities and families.

A Can Do Innovation Summit was held in November 2019 and involved over 800 attendees. This was co-designed in consultation with sector specialists and included interactive workshops and an innovation showcase to help businesses maximise their potential by adopting new technologies and business cultures.

$$E=mc^2$$

161
**Cohort 1
(2016-2018)**

552
**Cohort 2
(2017-2019)**

722
**Cohort 3
(2018-2020)**

NEW

NEW

NEW

Number of STEM Foundation
Apprenticeships new starts
increased from **161 in Cohort
1** to **552 in Cohort 2** and to
722 in Cohort 3. (KPI I c)

57%
21,500
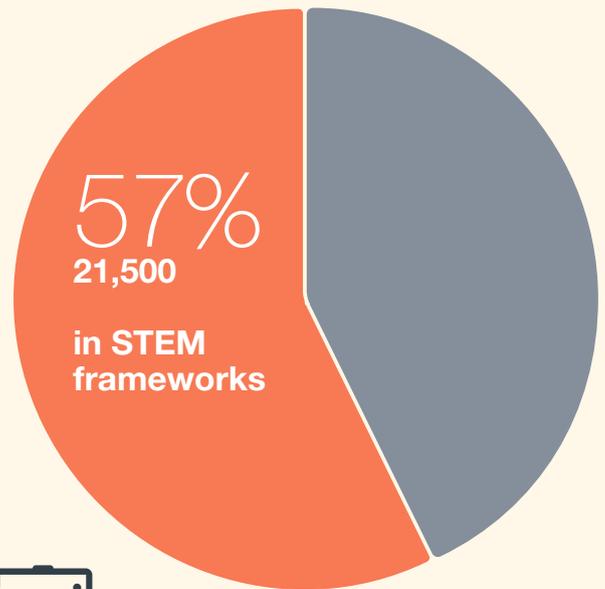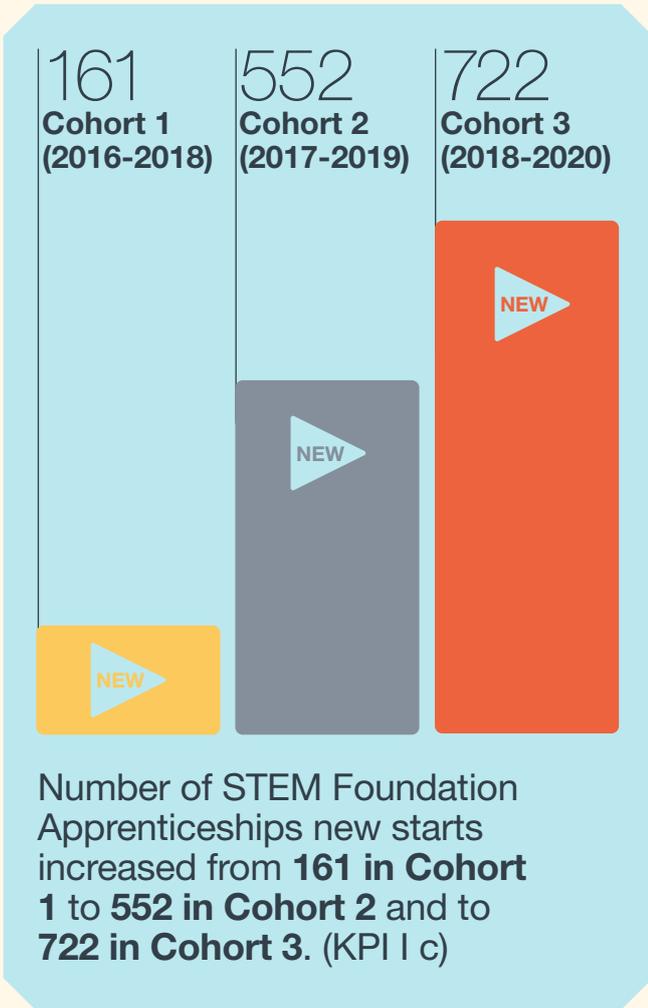
**in STEM
frameworks**

37,765 **MA's in training**

As at 31 March 2019 there were
**37,765 Modern Apprenticeships
in training**. Of these, **57% (21,500)
were in STEM frameworks.**
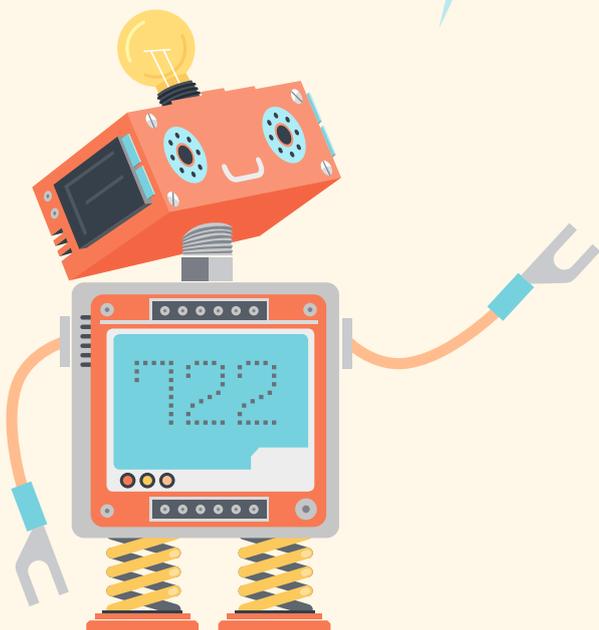
Work-based Learning – Foundation Apprenticeship in Civil Engineering

#Excellence #Apprenticeships #Colleges #Employers

Time in school, in college and at her work placement at a busy construction site provided the perfect solution for a Falkirk Foundation Apprentice.

The Falkirk 16-year-old wasn't sure if she was ready to leave Graeme High School or stay on.

Foundation Apprenticeships give young people in S5 and S6 the opportunity to gain work experience and a nationally recognised qualification, at the same level as a Higher, alongside their other subjects.

"I felt I was ready to leave school, but I also felt that I was not ready to do that. The idea of two half days at college really appealed to me and I think it helped that I know a few people who are doing Foundation Apprenticeships," said the civil engineering Foundation Apprentice.

She said: "I'm working with construction company Laing O'Rourke on its St James Centre site in Edinburgh three days a week and still going to college. This means I will get the Foundation Apprenticeship, but I am also getting the experience of being at work and it feels like a proper job."

"I've found college is so good too and really interesting. It has opened my eyes to the possibilities of what my job could be in the future."

The Forth Valley College School Partnership Support Officer said:

"Foundation Apprenticeships are an excellent route into the workforce and provide a great foundation on which young people can build a broad skillset, whilst also gaining qualifications and workplace experience.

"Forth Valley College is working closely with local employers to give young people a greater range of qualifications and experience which develop the skills for their future careers and prepares young people for the world of work."

Other case studies demonstrating the variety of Foundation Apprenticeships, Modern Apprenticeships and Graduate Apprenticeships in different subject areas can be found at: https://www.skillsdevelopmentscotland.co.uk/news-events/#case-studies

5

Equity

To address inequity and inequality of opportunity and access to STEM that contributes to occupational segregation in the workplace and inequality in society, we will promote **Equity** by:

- tackling inequity in STEM learning and careers

- improving participation in STEM further and higher education courses and apprenticeships

- increasing access to public science engagement events

As a result of the actions under this theme by 2022, we expect to see:

- Significant reductions in the equity gaps in participation and achievement in STEM learning, engagement, study, courses and training across all sectors in relation to gender, deprivation, rurality, race, disability and for care leavers. (KPI III)

This section provides an overview of progress against individual actions under the Equity theme. While there has been an initial focus on gender, the Strategy aims to ensure equity of access across all of the protected characteristics, and equity and equality are also being considered across all the actions under the Strategy.

Tackling Inequity in STEM learning and careers

The team of six Improving Gender Balance and Equalities (IGBE) officers is now established in Education Scotland. These officers are working with schools and early learning and childcare (ELC) settings on a regional basis to expand and embed the approaches developed in the Improving Gender Balance pilot. The pilot programme was instigated by Skills Development Scotland and the Institute of Physics, and it developed practical ways to address gender bias and stereotyping and tackle inequity in learning.

The IGBE officers have been working to build their networks through speaking at events, visiting ELC settings, schools and clusters and rolling out their training offer. For the period to December 2019, the IGBE officers engaged directly with 50 school clusters, and had over 2,200 engagements with practitioners. A new blended programme of professional development has also been developed and is being trialled before being extended nationally in 2020-21.

STEM in rural schools

Sgoil Breascleit

#Equity #Rural #Primary #Digital

Bun Sgoil Breascleit is a predominately Gaelic school on the west coast of the Isle of Lewis with two classes and 25 children. The school has embedded STEM and coding over a number of years, and make the most of their beautiful surroundings and local community for STEM learning. Although being a small, remote island school, they have made excellent links with STEM industries and demonstrate a global outlook with their work. They have won many national awards for their work, being named SCDI Young Engineers and Science Club of 2019 for the Highlands and Islands.

Aviemore Early Years and Childcare

#Equity #Rural #EarlyYears #OutdoorLearning

Aviemore early years and childcare is set within the Cairngorm National Park. The establishment applied for an Enhancing Professional Learning in STEM Grant from the Scottish Government and were awarded £3,000 to develop STEM in the outdoors for early level practitioners. Two child development officers attended STEM in the outdoors training and are now cascading this training for early level staff across the associated school group. They are also delivering training to parents to encourage them to look at STEM in the outdoors with their own children.

Dunoon Cluster (Cowal)

#Equity #Rural #Clusters #IDL #Gender

Dunoon Grammar hosted a Cowal STEM event for ten of their associated primary schools, where the primary seven pupils took part in nine workshops based on a Mission to Mars. This included testing different materials for heat shields, using virtual reality to explore the red planet and coding robots to explore bumpy terrain. The primary pupils were assisted by volunteer pupils from the secondary school, as well as teachers and staff. There was very high engagement from pupils with 98% of boys and 89% of girls reporting an increase in their knowledge of science, 76% of boys and 88% of girls reporting an increase in technology, 82.5% of boys and 77% of girls reporting an increase in engineering, and 69% of boys and 56% of girls reporting an increase in maths.

STEM in rural schools

Working4U

#Equity #Deprivation #STEMAmbassadors

Working4U is a partnership developed by West Dunbartonshire Council, initially aimed at helping families and pupils from Balloch Primary in the lowest deprivation category.

The project involved six families meeting on a weekly basis after school for two hours. During this time they undertook a STEM activity and then subsequently learned how to prepare a meal from scratch, using basic ingredients. Each STEM activity directly relating to the subsequent cooking topic. For example, sustainable fishing for the fish week, photosynthesis and the growth of plants for the vegetarian week. The sessions finished with the families sharing their meal together.

The Council approached Science Connects, the STEM Ambassador hub for the west of Scotland, with a request to support this six week STEM project. The hub provided two STEM Ambassadors to support this project. Evaluation of this approach to sourcing, cooking and sharing food was very positive and West Dunbartonshire Council are looking to expand the initiative. In response to this, Science Connects are now running training sessions on the activities so that additional ambassadors can support more schools.

Different approaches are also being used to increase capacity for raising awareness and supporting practitioners, including local networking events 'IGBE Meets' for practitioners to share ideas. Many local authorities have included IGBE workshops in their teacher probationer programmes for 2019-20.

In 2020, a self-evaluation framework for Improving Gender Balance will be finalised and piloted with ELC settings and schools. These will support establishments to reflect on their strengths, and identify next steps.

Stakeholders and partners are helping to steer the programme, and external evaluation of the impact of this work has been commissioned which will guide the way the programme develops. The programme will also be informed from wider evidence gathered via the Regional STEM advisers, the college-led STEM Hubs and through the education inspection and review process.

Skills Development Scotland is supporting work in this area through sharing examples of good practice among their providers in challenging stereotypes, and ensuring their careers advisers are able to actively challenge gender assumptions about subject and career choice.

Young people and career changers are also being supported to access high value opportunities in Scotland's tech sector. Skills Development Scotland published Scotland's Digital Technologies Report in summer 2019, which identified that the sector supports almost 100,000 jobs in the Scottish economy. The number of people needed to support the tech industry continues to increase with more than 13,000 jobs available each year in Scotland.

Diversity in the tech sector continues to be a priority. Despite research revealing that the number of females joining the technology sector has risen from 18% to 23.4% in the last two years, there is still much to do. Skills Development Scotland facilitate the industry-led Tackling the Technology Gender Gap Together workstream which consists of partners from across education, public sector and government. Activities include a research programme, a network of female technology apprenticeship ambassadors, a mentoring and diversity resource for technology employers, and a coding badge for uniformed groups developed by Skills Development Scotland, Education Scotland and Girl Guiding Scotland.

Through the Digital Start Fund, Skills Development Scotland is also supporting individuals on low incomes to gain skills and jobs in growth areas such as data, cyber security and software.

These actions are contributing to KPI III which measures gender and deprivation gaps in STEM at school, college, university, in apprenticeships and in STEM engagement. Over the medium to long term we expect this action to lead to an improved gender balance in the STEM National Qualifications, STEM Awards and STEM learner pathways. We are measuring this through KPI III a on the attainment gap in STEM qualifications and KPI IIIb on gender balance in attainment in Physics and Computing at SCQF Level 6 (Higher Level). The attainment gap reduced from 36.8pp in 2015-16 to 34.4pp in 2018-19. Data for KPI III b does not yet show noticeable improvement for Physics but there is some improvement for Computing.

36.8pp
2015-16

SCQF
6

34.4pp
2018-19

The attainment gap in STEM qualifications at SCQF Level 6 or better reduced from 36.8pp in 2015-16 to 34.4pp in 2018-19 (KPI III a)

Higher education courses and apprenticeships

Each college and university has now produced a Gender Action Plan (GAP) outlining how they will advance equity and reduce gender disparities within STEM subject areas. A first progress report was published by the Scottish Funding Council in December 2017 with further reports in 2018 and 2019. This cycle has now changed to reporting every two years, with the next progress report due in 2021. The data provided in the accompanying Gender Action Plan Technical Report will, however, continue to be captured in the Scottish Funding Council's Widening Access Report, due to publish in Spring 2020.

The February 2019 progress report suggested some movement in engineering, particularly in the college sector. It also suggested some (slight) shifts in other subject imbalances in colleges. Imbalances in the university sector appear more stubborn. Against the background of the GAP's target to improve men's representation in the university sector, data for 2015-16 and 2016-17 suggest the position has worsened. This further highlights the need for a sectoral approach, led by the Scottish Funding Council, to tackle these issues.

The ambition of the GAP is that, by 2030, no college or university subject will have a gender imbalance greater than 75% of one gender.

The Scottish Funding Council's School Engagement Framework continues to result in a number of new delivery models for engagement between schools, colleges, universities and employers. This includes online, blended and on-campus approaches.

Skills Development Scotland has worked with Equate Scotland to provide mentoring support to female apprentices in STEM. As part of this project, Equate Scotland has developed an SQA accredited module for employers that will provide them with the knowledge and skills to establish their own in-house mentoring specifically aimed at women in STEM sectors. This module was successfully piloted during summer 2018 and has been delivered by West Lothian College on behalf of Skills Development Scotland and Equate Scotland.
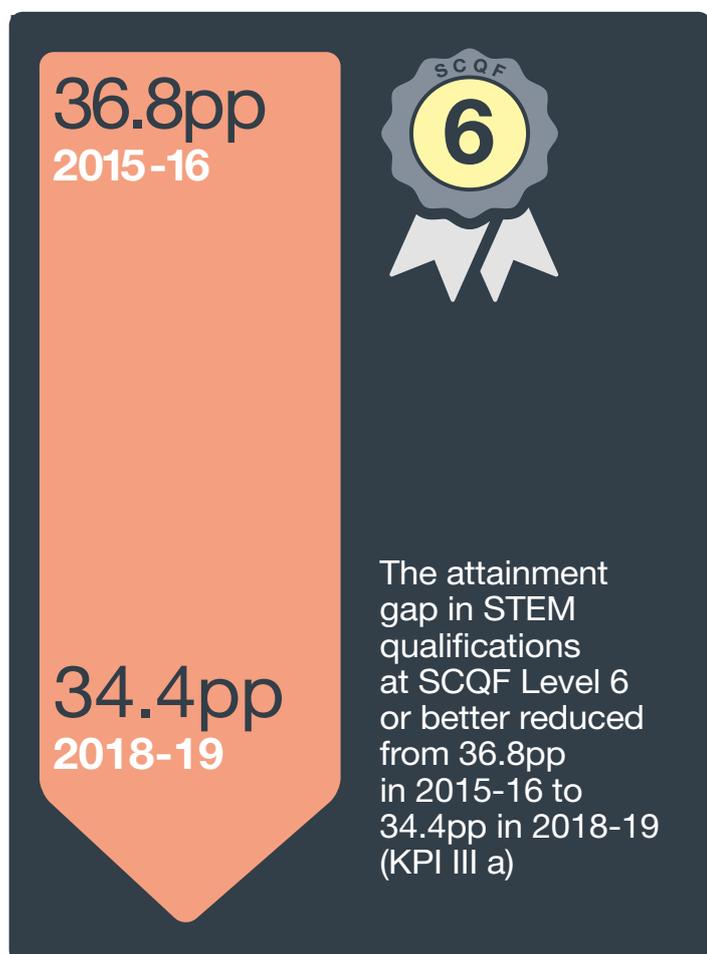
Skills Development Scotland's team of Equality Executives also continue to work at a local level with individual training providers and employers to support positive action. This includes working with providers and employers in STEM sectors to attract more women, for example by holding women-only information evenings or taster events, and actively targeting marketing and recruitment materials at female audiences across industries such as engineering, plumbing or oil and gas. This team also works closely with careers advisers and school staff to promote STEM industries to learners, specifically highlighting apprenticeships as a pathway into these sectors.

Skills Development Scotland has established a Gender Commission, in response to findings by the Scottish Apprenticeship Advisory Board. Members have been drawn from employers, education, trade union and parent/carer representatives. The Commission will develop recommendations and proposals that offer business-ready, practical solutions to what employers can do now, and in the future, to address any real or perceived barriers to improving gender diversity in their workforce. The Commission will run for 18 months and report in Spring 2021. Its work, along with Skills Development Scotland's other gender equality workstreams will be taken in to account as part of the wider considerations of the Deputy First Minister's Gender Equality in Education and Learning Taskforce.

Cohort 1
(2016-2018)

Cohort 2
(2017-2019)

Cohort 3
(2018-2020)

8.1%   13.1%   20.6%

The percentage of females starting in STEM-related Foundation Apprenticeships **increased** from **8.1% in Cohort 1** to **13.1% in Cohort 2** to **20.6% in Cohort 3**. (KPI III d)

These actions are contributing to KPI III to reduce the equity gaps in participation and achievement in STEM learning, engagement, study, courses and training, particularly KPI III c and d, and outcomes may take some time to become apparent. In Cohort 1 (2016-2018), 8.1% of STEM Foundation Apprenticeship starts were female. This increased to 13.1% in Cohort 2 (2017-2019) and 20.6% in Cohort 3 (2018-2020). We hope to see this positive progress continuing.
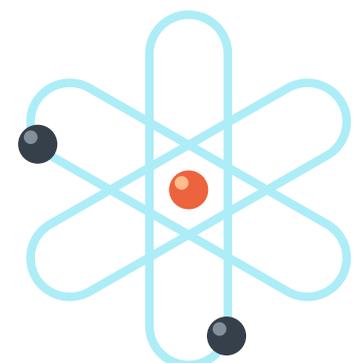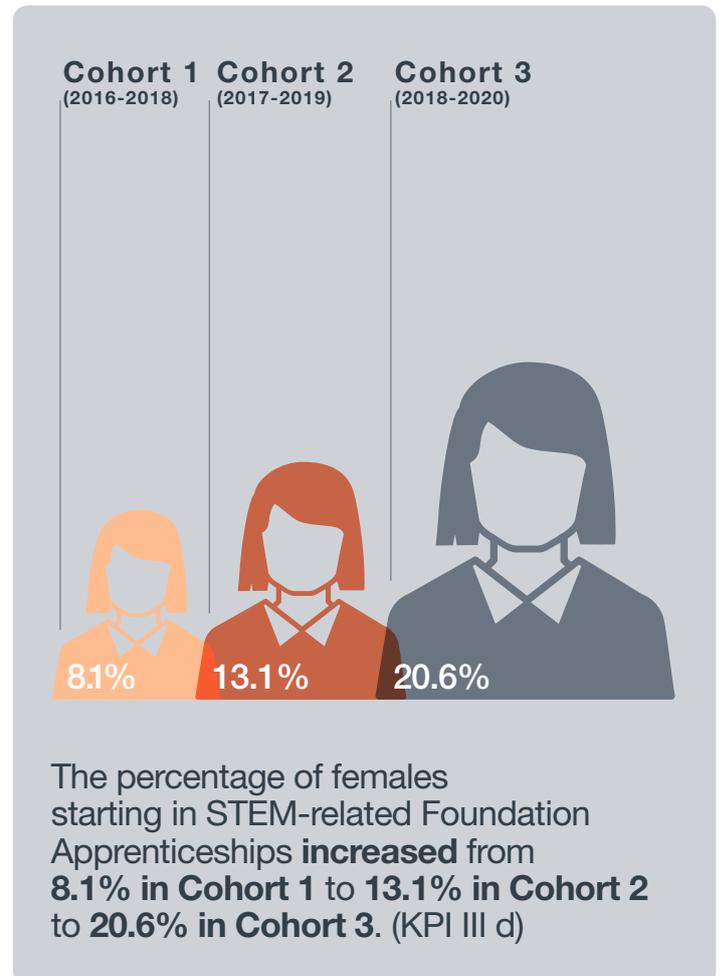
Increasing access to public science engagement events

An in-depth analysis of Science Centre funding in 2018 helped identify a focus for future funding to improve the offer to under-served communities such as those in more deprived and rural areas.

Funding of £2.65 million is provided to Scotland's four Science Centres to support them to encourage people of all ages to engage with STEM by presenting it in a fun, inspiring and educational way. In 2018-19 our Science Centre funding supported the delivery of science engagement experiences to around a million people. In the same year, 11,505 people from community groups across Scotland visited our Science Centres, exceeding the 10,000 target, and up from 8,604 in 2017-18 and 8,235 in 2016-17.

Funding of £250,000 was provided to support the delivery of 18 science festivals making STEM accessible to a public and schools audience of 200,000 with a particular focus on strengthening young people's interest and knowledge. The festivals provide an annual, local focus for activities and events, often in towns and cities that don't have a Science Centre. Following delivery of Operation Earth outreach to schools attending the Orkney Science Festival in September 2018, 100% of participants 'strongly agreed' or 'agreed' that "Dynamic Earth gave them an experience they couldn't get from somewhere else".

Education Scotland's STEM, IGBE and CLD officers are also helping to build stronger links with the science centres and festivals in their regions and help support community outreach activities.

These actions also contribute to KPI III, and are being specifically measured against KPI III e and f, where improvements have already been seen with an 11.9 percentage point increase in the proportion of schools from the most deprived quintile that receive a quality STEM engagement experience from funded Science Centres between 2017-18 and 2018-19. We have also exceeded our target of 10,000 for the number of members from community groups from the most deprived or rural areas participating in quality engagement with Science Centres, with 11,505 participants in 2018-19. The target for KPI III f has therefore been increased to 15,000 by 2022.

Most deprived quintile

Eligible
Schools

**2016-17
37.9%**

**2017-18
50.6%**

**2018-19
62.5%**

In 2018-19, 62.5% of eligible schools
in the most deprived quintile received
a quality STEM engagement experience
compared with **50.6% in 2017-18 and
37.9% in 2016-17.** (KPI III e)

Most
deprived
areas

Rural
areas

**Quality community group engagement
with Science Centres and Festivals**

2014-15 **7,364**

2017-18 **8,604**

2018-19 **11,505**

The number of members of community
groups from most deprived or rural
areas participating in quality
engagement with Science Centres
and Festivals **increased from 7,364
in 2014-15 to 8,604 in 2017-18 to
11,505 in 2018-19.** (KPI III f)

6

Inspiration

To help create a strong pipeline of STEM talent into the labour market and ensure that everyone develops STEM skills and knowledge we will promote **Inspiration** for STEM by:

- Creating positive STEM role models, mentors and coaches

- Promoting the opportunities and benefits of STEM learning and careers

- Recognising and celebrating success

As a result of the actions under this theme, by 2022, we expect to see:

- Increases in the proportion of people undertaking STEM-related learning, engagement, study and training across all sectors including in school-level qualifications and awards and participation in apprenticeship programmes. (KPI I)

- Increased numbers of people who understand the benefits and value of STEM for themselves, their families and their communities. (KPI IV)

This section provides an overview of progress on individual actions under the Inspiration theme.

Creating positive STEM role models, mentors and coaches

Education Scotland is working with others to support early learning and childcare settings to engage positively with STEM and tackle gender stereotypes through parental and family engagement. An estimated 2,446 early learning and childcare practitioners will benefit from Round 2 of the STEM Grants programme in 2019-20 with early learning and childcare being identified as a priority sector for the grants. This was as a result of the findings from the 2018 Annual STEM Practitioner Survey which showed that early learning and childcare practitioners do not have the same access to professional learning that meets their needs as other sectors.

Similarly, the early learning and childcare sector is being supported through the activities of the Regional STEM Advisors and IGBE officers. Early learning and childcare settings are also involved in the pilot of the STEM Nation Award to help shape the development of this new programme to ensure it meets the needs of the early learning and childcare sector.

Parents and carers play a significant role in influencing decisions and supporting learning at home. Education Scotland's Parentzone Scotland website now contains more STEM and gender balance and equalities content to help parents talk to their children about STEM. The National Parent Forum of Scotland, in partnership with Skills Development Scotland, is due to publish a STEM Nutshell guide in Spring 2020 which will also promote understanding of STEM and gender balance.

As well as engaging with schools, STEM Ambassadors have been increasing their engagement with sectors that require more support, such as early learning and childcare, families and community learning and development. In the financial year 2019-20, there were 2,736 active STEM Ambassadors in Scotland, delivering 6,374 activities and volunteering over 51,450 hours. SSERC lead co-ordination of the STEM Ambassadors in Scotland, and have been piloting the use of 'Skype a STEM Expert' with two local authorities that have significant rurality issues as a means of increasing engagements with young people.

The new Young STEM Leader (YSL) programme, led by SSERC, was piloted in 72 centres from June 2019. Almost 500 Young STEM Leaders are delivering a range of STEM activities, events and interactions in their school, community or youth group to inspire other children and young people to take up STEM. As we approach the academic year 2020-21, the Young STEM Leader programme will be scaled up to increase centre participation. A Youth Steering Group has been actively involved in offering advice on the content of "activity packs" used by centres when delivering the programme. The University of Stirling is evaluating the impact and effectiveness of the programme.

These actions will contribute to progress being measured under both KPI I and KPI IV. However, it will take time for the programme to build momentum and start to see the impact on these KPIs. In the meantime, the monitoring and evaluation of the Young STEM Leader programme will guide the progress of this action, and we will review the activity above in light of the 2019 Young People in Scotland survey.

Promoting the opportunities and benefits of STEM learning and careers

Our national STEM engagement campaign, 'Aye for Ideas', was launched in June 2019 and campaign resources have been shared with key stakeholders. The aim of the campaign is to inspire people of all ages and backgrounds, with a particular focus on community network to engage with STEM, and improve the visibility and impact of the range of activities that take place annually across Scotland.

61% of respondents to the **2019 Young People in Scotland survey** said they had chosen or thought they would choose to study a STEM subject. (KPI IV a)

STEM Ambassadors – Putting the M in STEM

#Inspiration #STEMAmbassadors #CLPL #Mathematics #Numeracy

In August and early September 2019, Education Scotland worked in partnership with the STEM Ambassador Hubs and Maths Week Scotland to deliver a series of training sessions for STEM Ambassadors focussing on numeracy and mathematics. The development opportunity was well received with over 100 STEM Ambassadors signing up to attend sessions in Aberdeen, Ayr, Edinburgh and Glasgow. The sessions introduced ambassadors to the concept of science capital, provided an overview of the current Scottish curriculum and exemplified a range of hands-on activities that could be used to support schools and community groups. Attendees worked collaboratively to develop new ideas to showcase maths in careers such as geological research, chemical engineering and farming. Feedback from participants showed that as a direct result of these training sessions STEM ambassadors went on to deliver a FunMaths Roadshow to a Brownie group, another ambassador was successful in applying for funding to help them deliver a new maths-based activity and others felt more confident in delivering activities with an increased understanding of the curriculum. Planning for further sessions in a wider range of locations is underway for 2020.

Maths Week Scotland again took place in September 2019 to promote and encourage greater enthusiasm for and increase participation in mathematics through showcasing the application of mathematics in everyday life and work. Participation and activity continues to grow year-on-year with events in every local authority area involving over 100,000 people across Scotland. A funding partnership between the Scottish Government, the Edinburgh Mathematical Society and the Glasgow Mathematical Journal Trust issued £70,000 of Maths Week Scotland small grants to schools, communities, early years centres, parents councils, universities and third sector organisations to deliver a diverse range of events and activities promoting engagement with the relevance and joy of numeracy and mathematics.

Activities such as these are contributing to KPI Ib to increase the number of passes at SCQF Level 5 in Mathematics by 10% by 2022. SQA results in 2019 saw a 6.1% increase (from a 2017 baseline) with 29,873 passes at SCQF Level 5 in mathematics (Mathematics and Application of Mathematics combined). We hope to see this positive progress continuing with increasing recognition of the value of SCQF Level 5 Applications of Mathematics and the development of Higher Applications of Mathematics to offer a progression route.

In 2018-19, Skills Development Scotland's My World of Work Live (MyWoW Live!) programme expanded, with the aim of engaging more young people across Scotland. This programme offers a set of fun, interactive exhibits and activities that inspire young people, helping them to understand future careers and opportunities. Face-to-face delivery has expanded with regional delivery staff now in post and virtual delivery being piloted, extending the reach of the programme to more remote and rural locations. 14,046 young people participated in an inspiring activity with 90% saying their MyWoW Live! experience had increased their understanding of jobs and careers in science/technology. 94% of parents/carers said the MyWoW Live! activity was likely to increase their child's motivation to study STEM subjects and 88% of teachers said the activity increased their motivation and enthusiasm to teach STEM subjects.

Skills Development Scotland also works with industry to inspire young people about careers in cyber security. The Discover Cyber Careers programme streams online, live and interactive cyber security lessons into schools and in its third year, more than 45,000 pupils and teachers have enjoyed the programme.

Through the Skills Development Scotland Digital Champions network, careers staff are also being trained by industry through regular insight sessions to be confident in talking about the wide range of digital careers and learning pathways.
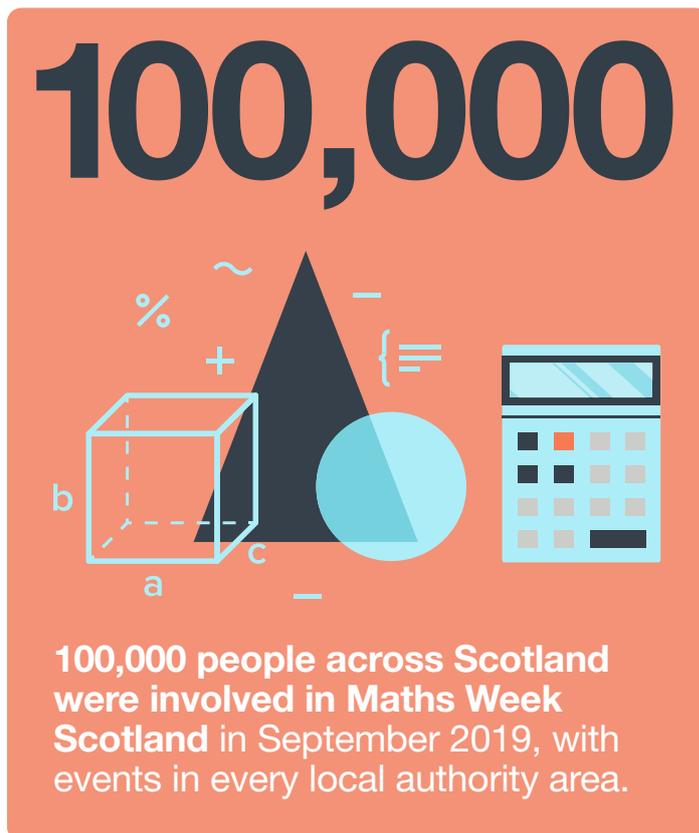
100,000

100,000 people across Scotland were involved in Maths Week Scotland in September 2019, with events in every local authority area.

Colleges and universities have been encouraged to promote higher levels of progression from school to further education and onward to higher education through their Outcome Agreements. Analysis of data by the Scottish Funding Council has shown a rise in the proportion of total activity allocated to STEM in colleges. Further analysis will focus on student success and retention in STEM subject areas.

The College Progress & Ambition Report has details on outcomes and targets for the college sector. The SFC's previous ambition for the proportion of credits delivered to learners enrolled on STEM courses in colleges was to increase from 24.8% in 2016-17 to 26.6% in 2018-19. This has been achieved ahead of schedule, with 27.7% of college credits being utilised for STEM courses in 2017-18. SFC aim to increase this to 28.5% in 2019-20.

The Student Awards Agency Scotland (SAAS) is also promoting awareness of the full range of funding streams available for taught postgraduate study, including STEM, at open days and through social media channels. In 2020, opportunities will be explored to highlight support to women.
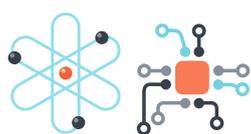
90%

In 2018-19, **14,046 young people participated** in an inspiring activity with **90% saying their My World of Work Live! experience had increased their understanding** of jobs and careers in science/technology.

In addition, the Scottish Apprenticeship Advisory Board (SAAB), and its short-life STEM working group, will develop a sample of case studies promoting the benefits of apprenticeship careers in STEM to key influencers of young people. The case studies will be shared by SAAB member organisations across agreed channels.

Each of these actions will contribute to progress being measured under KPI I and KPI IV, promoting both Excellence and Inspiration themes. Under KPI IV, results from the 2019 Young People in Scotland survey show a drop in the proportion of respondents who said they had or would choose to study STEM from 65% in 2017 to 61% in 2019. Although it may take time for the actions in the strategy to affect this KPI, we will review our activity on inspiring young people for STEM in light of these results.

Recognising and celebrating success

During 2019, Education Scotland piloted a new STEM Nation Award to encourage and support whole setting approaches to STEM. 82 school and early learning and childcare settings have been participating in the pilot. The award scheme celebrates and builds on achievements in five key areas: leadership, family and community learning, employability and partnership working, curriculum and learner pathways, and equity and equality in STEM. Participating establishments range from a very rural and remote primary school on the Isle of Islay to large secondary schools in central Scotland. The evidence of practice will be shared and made available more widely online.

The success of early learning and childcare settings and schools also continues to be celebrated annually through the Scottish Education Awards. The Early Learning and Childcare Innovation Awards, which were launched in 2018-19, have also provided an opportunity to celebrate good practice in supporting early STEM skills. One of the settings achieving this award in 2019 was Clober Nursery in East Dunbartonshire, which was commended for developing an outdoor play area where the children were able to grow food and take part in woodwork and other construction activities.

Education Scotland also held the first annual community learning and development STEM conference, What's STEM Got to Do with It, at the Glasgow Science Centre in February 2019 to showcase inspirational lifelong learning and STEM practice. Over 100 Community Learning and Development (CLD) managers and practitioners took part, with learning materials including short films from the day shared on the National Improvement Hub. It raised awareness of the important contribution that CLD makes to engaging young people, adult learners, families and communities in STEM-related learning.

Nine CLD-led programmes funded through STEM professional learning grants are engaging over 300 CLD practitioners (in local authorities, colleges and third sector organisations) in STEM professional learning. Education Scotland will continue to support the CLD sector to build STEM capacity.

Progress against these actions is being specifically measured against KPI I g around participation in STEM related Youth and Adult Awards, where we have seen an increase in the number of youth awards from 39,900 in 2016-17 (representing 43% of all youth awards in that year) to 45,787 in 2017-18 (representing 49% of awards) and 48,574 in 2018-19 (representing 42% of awards).

STEM Kits

#Inspiration # ClimateChange #CLPL

The MTa STEM kit was designed with the RAF to run fun and thought provoking activities. Each kit contains 24 tasks which develop STEM skills. Additionally, ESP has designed an activity to build a wind turbine. This activity coincided with the release of the NETFLIX biopic "The Boy Who Harnessed the Wind". The kits are suitable for both primary and secondary pupils and have also been used successfully for apprentice development and as a team building activity. Teacher training has been run via a number of colleges and the kits are rotated around colleges where they can be booked by local schools and demand has been high. The kits were show cased at the Scottish STEM Learning Festival and have been promoted by regional Developing the Young Workforce teams as a free STEM resource.

Dundee Science Centre
– engaging communities in science

#Inspiration #Connection #ScienceCentres #CLD

Building on the success of the Glasgow STEM conference, Dundee Science Centre delivered their first STEM in the Community session for community learning and development practitioners in September 2019. The session brought together a range of partners including DeafLinks, the Science Ceilidh and the University of Dundee to explore topics such as science capital, communication for all and using local community funds of knowledge to help shape and influence the curriculum for learners. Participants provided very positive feedback on the event and were keen to see the event repeated in 2020 with further input and sharing of practice from local community learning and development practitioners.
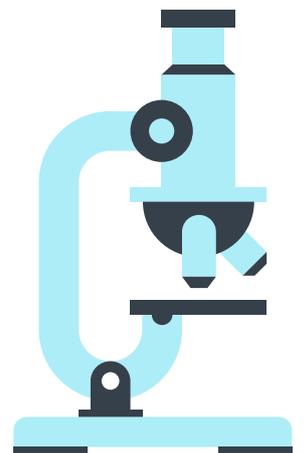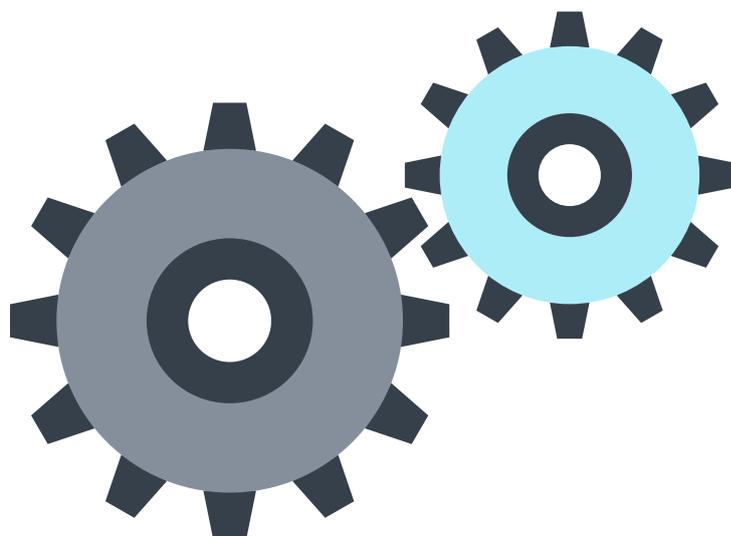
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Connection
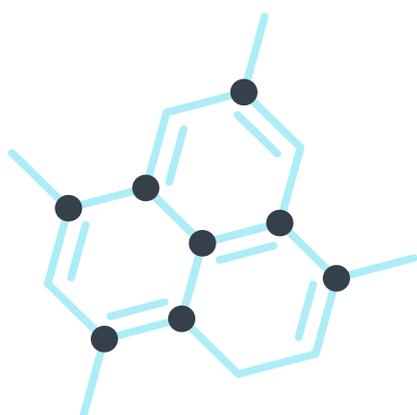
To ensure that STEM education and training helps people develop the skills and knowledge needed in the labour market we will promote **Connection** by:

- improving the support available to schools

- delivering up-to-date advice and information on STEM careers

- increasing the responsiveness of colleges, universities and the apprenticeship programmes to the needs of the economy

As a result of the actions in this section, by 2022, we expect to see:

- Increased collaboration between schools, colleges, universities and employers.
  (KPI V)

- Increased employment in STEM-related occupations and employers more satisfied with the STEM skills and capability of the people they employ from schools, colleges, universities and from apprenticeship programmes. (KPI VI)
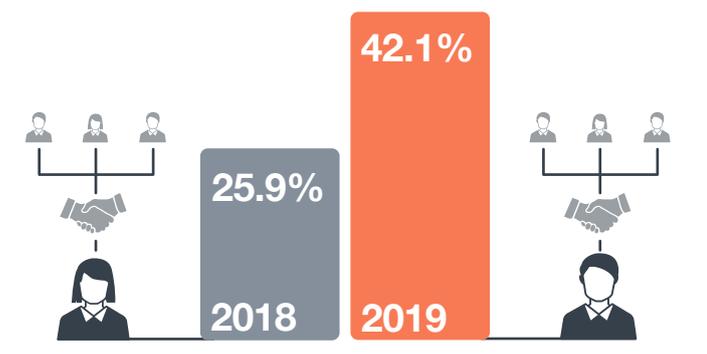
42.1%

25.9%

2018   **2019**

Of the 1,187 practitioners that responded to Education Scotland's 2019 Annual STEM Practitioner Survey, **42.1% said that their establishment had a STEM partner** from the private, public or third sector compared with **25.9% in 2018**. (KPI V a)

This section provides an overview of progress on individual actions under the Connection theme.

Improving the support available to schools and increasing responsiveness

The 21 Developing the Young Workforce Regional Groups continue to address local employers, skill and workforce needs by bringing schools and employers closer together, through establishing partnerships across a range of activity both within schools and on employers premises. Activities include employer visits, work experience, talks by employers and other workers. Learning about real-life situations in the workplace is being incorporated into the curriculum through schools and employers working together on either a regular or one-off basis. The Groups are also engaged in activity to address gender imbalance in occupations. In excess of 4,000 employer-education partnerships are in place across the country.

A key issue identified in our consultation on the Strategy, was the need for more co-ordination of activities and a better understanding of what kinds of activities had the most impact in terms of sustaining engagement and interest in STEM into the long term. Education Scotland has been developing an online directory of quality-assured STEM inspiration activities for schools by external partners to address this. The directory will become available during 2020.

Such activities include the Scottish Council for Development and Industry's Young Engineers and Science Clubs, and Generation Science, both of which are funded by Scottish Government. Their activities have been aligned with the aims of the Strategy, particularly around equality of opportunity in the context of gender, rurality and deprivation.

The college-led STEM Hub network established in the first year of the STEM Strategy also helps to increase awareness of STEM opportunities. More advanced STEM Hubs are now delivering professional learning and increased engagement activity, and colleges are now focused on building on this work further and will continue to work towards delivering further improved outcomes.

The above actions will contribute to both KPI V and KPI VI, but will be particularly measured against KPI V looking at employer engagement with education. New KPIs have been put in place for the Developing the Young Workforce Regional Groups, with some baseline information available for 2018-19. Provisional information indicates that in the first half of the current reporting year, the Regional Groups arranged opportunities for 78,910 young people to engage with employers, of which 19,850 were in STEM industrial sectors. This amounts to 25.3% of young people's engagement for the first half of the year. In addition, of the 1,187 practitioners that responded to Education Scotland's 2019 Annual STEM Practitioner Survey, 42.1% said that there establishment had a STEM partner from the private, public of third sector, a significant increase compared with 25.9% in 2018.

Colleges are engaging directly with schools on STEM in a range of ways. For example:

- The Greenpower Education Trust is a UK based charity which gets young people enthusiastic about STEM by challenging them to design, build and race an electric car. In West College Scotland, the project was aimed at young people who had effectively disengaged from school. The college environment provided a more positive atmosphere for these young people as barriers have been removed and a self-reliant competition element added.

- The IET FIRST® LEGO® League is a global science and technology challenge for teams of students, to encourage an interest in real world issues and develop key skills that are crucial for their future careers. In 2018-19, seven colleges hosted events, increasing to 10 colleges, with around 500 pupils competing across 62 teams in 2019-20 when ESP hosted the first ever Scottish Championships at Perth College UHI on 29 February 2020. The winners will have the opportunity to compete in the global finals in Detroit and two international events in Greece and Brazil.

- Subs in Schools is a new STEM learning programme designed with assistance from Fife College and project managed by ESP, with Education Scotland providing support to align the project with the Curriculum for Excellence. Students in year groups S1 to S3 have the opportunity to learn about complex engineering systems while building a remotely operated underwater vehicle.

Forth Valley College STEM Hub

#Connection #STEMHubs #CLPL #ClimateChange

The STEM grant funding provided by Education Scotland has allowed Forth Valley College's STEM outreach team to deliver exciting, hands-on STEM professional learning experiences to practitioners across the Forth Valley. This has been supported by the creation of a significant repository of online teaching and learning materials, aligned to Curriculum for Excellence. With a focus on environmental and sustainability issues, this is run as The Famous Four Save the Planet and is delivered two days a week throughout the academic year.

The team has also facilitated a number of Knowledge Exchange or 'Pick and Mix' events for practitioners from early learning and childcare settings and primary schools. The events feature a market stall showcasing the Technobox (electrical engineering for hire) and STEM in a bag experiments. The team also demonstrate the experiments from The Famous Four Save the Planet programme. The project recently won the College Development Network award for essential skills.

Building STEM capacity in Community Learning and Development

#Connection #CLD #Mathematics #Numeracy #CLPL

The following community learning and development programmes are being supported through Education Scotland's STEM Grants Fund.

- **Family learning:** Glasgow Clyde College in partnership with Glasgow Science Centre has developed a credit-rated SCQF Level Four Unit which helps parents and carers to become proficient in areas of mathematics and numeracy in order to support parent and carers to support their children in STEM topics. https://scqf.org.uk/news-blog/blogs/supporting-parents-supporting-children-numeracy-and-mathematics-level-1-scqf-level-4

- **Science centres:** Aberdeen Science Centre has developed closer partnerships with local authority CLD partners (Aberdeen and Aberdeenshire). The focus on increasing CLD practitioners' confidence around STEM, particularly family learning and adult learning.

- **Professional learning:** The Hi5 Award STEM Toolkit – developed by Youth Scotland – is a fantastic new programme supporting the engagement of young people in STEM activities that are fun and educational. https://www.youthscotland.org.uk/resources/hi5-award-stem-toolkit

Delivering up-to-date advice and information on STEM careers and increasing responsiveness to the needs of the STEM economy

Skills Development Scotland and Education Scotland continue to share and promote relevant information, updates and resources about the Careers Education Standard at national and local levels. Skills Development Scotland has also developed STEM-specific labour market information to complement wider resources for careers staff that equip them with knowledge of their local labour market. These materials will also be made available to practitioners through My World of Work.

The Scottish Funding Council has conducted an audit of colleges that currently hold STEM strategies, and identified where further work is needed. This will be evaluated as part of the Outcome Agreement process. Best practice in existing STEM strategies is also being identified through the STEM Hubs.
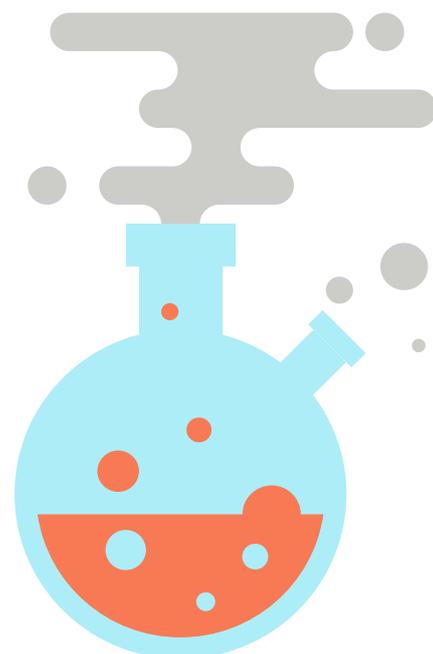
The Scottish Funding Council audit of STEM placements in higher education demonstrated a great breadth and variance of practice across the sector. However, with numerical data only available for STEM placements lasting ten weeks or over, the Scottish Funding Council will capture case studies of best practice in HE STEM placements in Outcome Agreements or STEM Hub reports. In the college sector, data has been provided in Outcome Agreement data tables and has seen positive increases over the last three years.

The new careers strategy published on 18 February 2020 set out the ambition for an approach to career support, employability and skills development that focuses on the needs of the individual first and foremost. The aim is for a system that builds on an individual's strengths and capabilities, and is more joined-up and enables everyone to fulfil their potential. Within the careers strategy, there is recognition that there is scope to do more employer engagement and co-ordinated activities with partners in primary, secondary, and vocational education, and with training providers and further and higher education institutions. By forging closer links with advisory services and industries, individuals will be able to consider the emerging employment opportunities, including STEM opportunities, that meets their needs as well as the needs of the economy.

The needs of industry are also being factored in to the demand statements for the Apprenticeships, on an evidence based approach, to ensure that provision meets the needs of the economy.

Each of the above actions will contribute to delivering against KPI VI around college learner placements with employers in STEM-related occupations and measured through KPI VI b around employment in STEM sectors. Progress has been seen in KPI VI a where college placements increased from 1,152 in 2015-16 to 2,223 in 2018-19. Data against KPI VI b showed that skills shortage vacancies as a proportion of all vacancies across STEM employers (24.2%) in 2017 were higher than amongst all employers (23.6%), although lower than all employers when health industries were excluded (22.8%). These KPIs will be monitored and activity adjusted accordingly if needed.
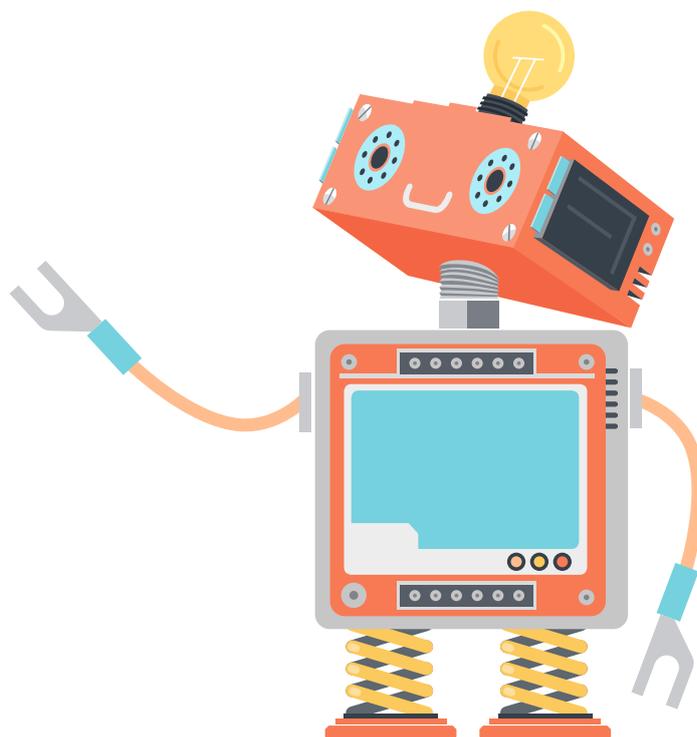
Life Sciences Sector – partnership case study

#Connection #CLPL #DYW #Employers

Life sciences is one of Scotland's most creative and innovative sectors; developing cutting edge solutions to major global issues in health, agriculture, energy and addressing climate change. With well over 30,000 people employed across Scotland, the life sciences sector has numerous potential career pathways for young people.

Skills Development Scotland, DYW Lanarkshire and East Dunbartonshire and Education Scotland have been collaborating to plan a series of professional learning opportunities for practitioners to engage with leading life sciences industry partners from global and new start-up companies. The first session in December 2019 included an on-site visit to TC BioPharm to gain a fuller appreciation of the scope and scale of the life sciences sector. The event also provided practitioners and industry professional with the opportunity to co-create classroom resources to support the curriculum.

These new partnerships are developing resources that will inspire young people; enthuse them about the potential in the life sciences sector and which will contextualise learning in STEM. Resources created are being shared nationally through GLOW to support all practitioners across Scotland.

A practitioner said:

“ The day was fantastic! Having the time to chat with representatives from industry was a real eye-opener for me. I did not realise how many firms are willing and excited about taking on school leavers. I am really excited about this because quite a lot of my pupils are school leavers who will not pursue further education but could still have a rewarding career in Life Sciences industries right here in Scotland! ”

An industry representative said:

“ It will be critical as the sector expands for companies within Life sciences to continually engage at an early stage with educational bodies and the public sector; raising awareness to grow and develop a skilled workforce. (TC Biopharm) ”

A follow up session is planned for this cohort before May with further regional events being planned to support practitioners teaching National Qualifications in STEM subjects (in particular Biology, Mathematics and Computing Science) to develop their understanding of the links from their subjects to this growth sector.

Annex A
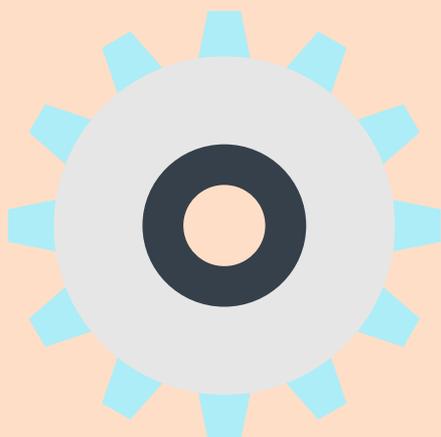
What is STEM?

In the STEM Strategy we take a broad view of what STEM is:

STEM stands for Science, Technology, Engineering and Mathematics. We include numeracy and digital skills within our definition of STEM. Both of these are vital to enable everyone to participate successfully in society as well as across all jobs, careers and occupations. STEM education and training seeks not only to develop expertise and capability in each individual field but also to develop the ability and skills to work across disciplines through interdisciplinary learning.

STEM education and training helps us acquire the following skills and capabilities:

- Growing our understanding and appreciation of the natural and physical world and the broader universe around us

- Interpreting and analysing data and information

- Research and critical enquiry – to develop and test ideas

- Problem solving and risk assessment

- Experimentation, exploration and discovery of new knowledge, ideas and products

- Collaboration and working across fields and disciplines

- Creativity and innovation – to develop new products and approaches

All of these are increasingly important to success in a changing and technologically-driven world. They are also important for helping us to develop as active citizens, making informed decisions for ourselves and for society.

We recognise, in particular, the importance of creativity and innovation for economic growth and the strong synergies that exist between STEM and creativity.

The separate parts of STEM are:

- **Science** enables us to develop our interest in, and understanding of, the living, material and physical world and develop the skills of collaboration, research, critical enquiry, experimentation, exploration and discovery.

- **Engineering** is the method of applying scientific and mathematical knowledge to human activity and **Technology** is what is produced through the application of scientific knowledge to human activity. Together these cover a wide range of fields including business, **computing science**, chemicals, food, textiles, craft, design, engineering, graphics and applied technologies including those relating to manufacturing, construction, transport, the built environment, biomedical, microbiological and food technology.

- All of STEM is underpinned by **Mathematics**, which includes numeracy, and equips us with the skills we need to interpret and analyse information, simplify and solve problems, assess risk and make informed decisions. Mathematics and numeracy develop essential skills and capabilities for life, participation in society and in all jobs, careers and occupations. As well as providing the foundations for STEM, the study and application of mathematics is a vast and critical discipline in itself with far-reaching implications and value.

- **Digital skills** play a huge and growing role in society and the economy as well as enabling the other STEM disciplines. Like mathematics, digital skills and digital literacy in particular are essential for participation in society and across the labour market. Digital skills embrace a spectrum of skills in the use and creation of digital material, from basic digital literacy, through data handling and quantitative

reasoning, problem solving and computational thinking, to the application of more specialist computing science knowledge and skills that are needed in data science, cyber security and coding. Within digital skills, as noted above, computing science is a separate discipline and subject.

However, it is often the interconnections between these separate parts that are important in life and in work.

This broad definition allows for different interpretations of data about STEM in education and training in what is, in practice, a complex set of inter-related disciplines and skills encompassing a very broad field of study. It is often more important to know about the differences that exist within STEM courses (for example, gender imbalances between courses) than it is to know what the total "amount" of STEM is. There are different options for defining STEM, dependent on the aspect under consideration i.e. education, the level of education or training, industry (businesses) or occupation (jobs).

For the purposes of reporting progress with the Strategy we have chosen to define STEM in different, but related, ways across the different sectors. Full details are available in our definitions paper, published separately. This builds on the earlier Evidence Base Report that was published alongside the Strategy. In summary:

- We have matched SQA qualifications and awards to the broad subject areas described above and included those qualifications and awards if at least half of the mandatory content can be related to these curricular areas and are generally organised or delivered in faculties and departments relating to these curricular areas. The teacher definition follows similar criteria.

- For college courses we have used the definition that is in use on the Outcome Agreements for the purposes of KPIs. We have also provided data on a wider range of STEM related college courses including medical and veterinary related areas of study because these have significant STEM content and lead onto STEM related jobs and careers.

- A similar approach has been taken when determining STEM courses at universities, based on the established Higher Education Statistics Agency (HESA) definitions.

- We have established a defined list of STEM related apprenticeship frameworks (FA, GA and MA) as set out in the definitions paper. These have been chosen because they relate to the subjects listed above and to STEM related jobs and careers.

- There is no one accepted definition of STEM in the labour market in use in Government. The main issue is that there are some labour market sectors that are very clearly STEM based e.g. Engineering and some that are not STEM based but include STEM related occupations in them e.g. an accountant in a business or a clinician working in health and social work. STEM skills are increasingly important across all sectors and roles and it is very hard to rule some sectors in and some out. We have taken an approach based on work by the UK Commission for Employment and Skills that looked in detail at the proportion of people in jobs and business with degree level qualifications. We have widened this out somewhat, drawing on some baseline research conducted in 2017 and published alongside the Strategy. Further details are in our STEM definition paper published alongside the first annual report.
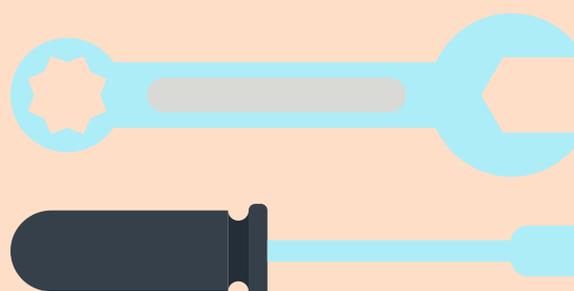
Annex B

Key Performance Indicators – Summary

Note

In December 2017, we published a set of Key Performance Indicators for the STEM Strategy. These KPIs were selected on the basis that they related most closely to the key changes that we want to see resulting from delivery of the actions set out in the Strategy and, where possible, to primarily reflect progress as a result of the actions that will be taken and not significantly influenced by other external factors such as demographic and general labour market changes. Where well established data sets existed, we set stretch aims for the targets. For others, some further data collection has been needed or they did not lend themselves to stretch aims. We reviewed the KPIs in 2019 in the light of additional data collections and analysis. This annex provides an update on the status of each of the KPIs. In some cases the data sets or the factors being measured have changed as a result of the review.

For a few of the KPIs, only baseline data is provided as further data is not yet available. As with the first Annual Report, it remains the case that the changes to the KPIs since the baseline may not be fully attributable to the Strategy actions as these were not underway during the full period that the data refers to, and/or are the product of decisions and activities that took place before the Strategy was in place. Time lags in availability of published data means that some of this information will refer back to a period when the Strategy actions were only just beginning to be implemented. Overall, it may be some time before the impact of the Strategy can be fully assessed. Details about underlying data for the indicators is published separately. In all cases we have used the most up to date published information to determine the baseline and the status of the KPI. Because they use different data collections, the actual baseline years vary because of timing differences between collection and publication of data and publication of this report. We will continue to monitor and evaluate individual actions and KPIs as new data becomes available to assess performance and determine if any changes in approach are required.

I. Increases in the proportion of people undertaking STEM related learning, engagement, study and training across all sectors including in school-level qualifications and awards, and participation in apprenticeship programmes. (Excellence and Inspiration)

I a. Meet Initial Teacher Education student intake targets for all STEM subjects.

Teacher Intake targets and entrants
(excl Home Economics)

Year	Entrants	Target
2015-16	380	541
2016-17	510	640
2017-18	510	805
2018-19	595	844

Data Source:
Higher Education Statistics Agency (HESA): Student data

■ Entrants   ■ Target
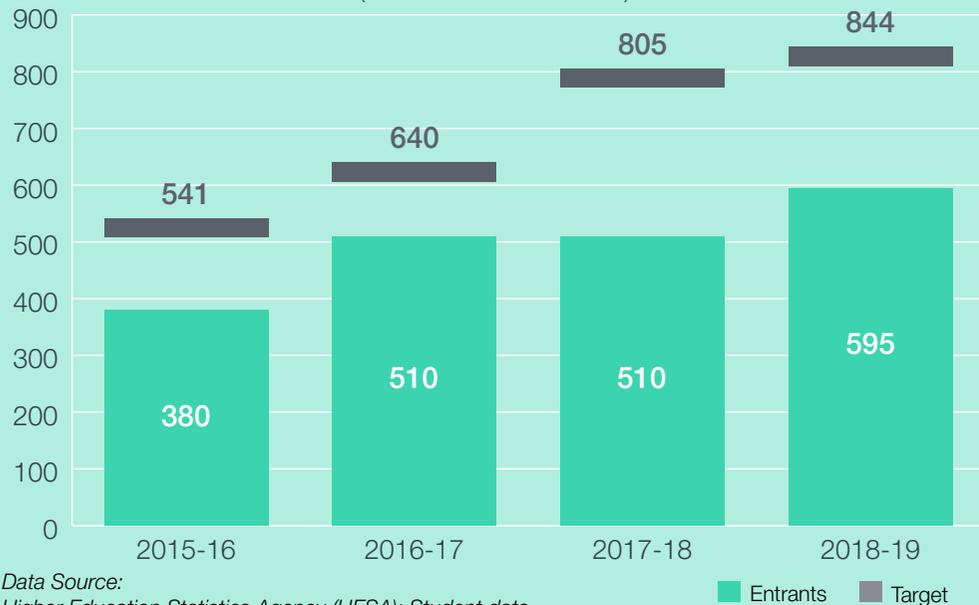
In order to address teacher shortages in certain STEM subjects, targets are set for the number of students to be taken onto initial teacher education courses in these subjects.

While the targets themselves have still been missed in most subject areas, overall, intakes for the STEM secondary teacher training courses have increased in 2018-19 to 595 entrants compared to 510 in 2016-17 and 2017-18 and 380 in 2015-16 (the baseline year).

In addition to the figures above, there were 85 entrants in Home Economics (which was added to the STEM Bursaries in 2019-20). Further information on entrants to Home Economics are provided in the KPI spreadsheet.

Alternative routes into teaching are helping towards achieving targets for individual secondary subjects and will continue to do so in 2020-21, along with STEM bursaries. The 'Teaching Makes People' recruitment campaign will continue to promote teaching as a career in all subjects.

I b. Increase the number of passes at SCQF level 5 in Mathematics by 10% by 2022.

Number of Passes in Mathematics SCQF Level 5, post-review (December) data

Data Source:
Scottish Qualifications Authority (SQA): National Qualifications data

We have taken the 2017 SQA results as the baseline year from which to measure any increase as this was the year the Strategy was implemented.

In 2019, there were 29,873 passes at SCQF level 5 in mathematics (Mathematics and Application of Mathematics combined). This is higher than the baseline and also higher than in 2014. These changes should be seen in the context of a falling cohort size with the S4-S6 cohort falling each year from 135,548 in 2014 to 126,067 in 2019 (figures from December 2019 pupil census). It is worth noting that some learners may be included twice in these figures if they have entered for both the Mathematics and Application of Mathematics Courses.

	2014	2015	2016	2017	2018	2019
No. of passes	28,849	24,676	27,515	28,166	28,336	29,873
Change	---	-14.5%	+11.5%	+2.4%	+0.6%	+5.4%

52.9% of passes in Mathematics at SCQF level 5 were by females. The trend since 2014 in the proportion of passes by females in the post-review data has been:

2014	2015	2016	2017	2018	2019
51.5%	51.4%	52.4%	52.4%	52.8%	52.9%

I c. Increase overall provision of Foundation Apprenticeship opportunities to 5,000 by 2019 and expand provision and Foundation Apprenticeship opportunities across all Scottish secondary schools.

Number of Foundation Apprenticeship starts that are STEM:

Cohort 1 (2016-2018): 161
Cohort 2 (2017-2019): 552
Cohort 3 (2018-2020): 722
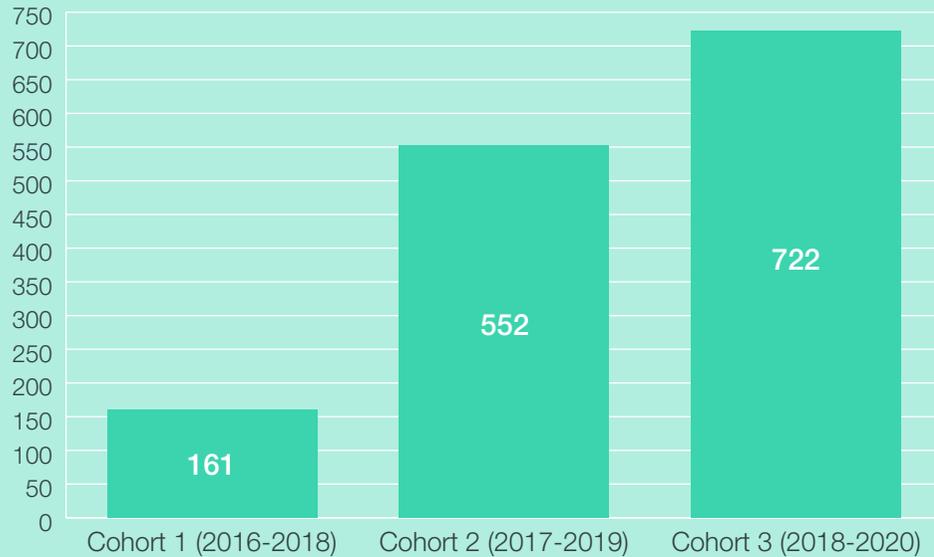
Data Source:
Skills Development Scotland (SDS): Foundation Apprenticeship statistics

Cohort 1 (2016-2018 delivery) of the Foundation Apprenticeships (FAs) is the first year of delivery after the initial pilot phase and is the baseline year. The overall number of starts in cohort 1 was 346 of which 161 were STEM starts (46.5%). In cohort 2 (2017-2019) this increased to 1,244 starts of which 552 were STEM starts (44.4%), and in cohort 3 (2018-2020) the total number of FA starts was 1,532 of which 722 were STEM starts (47.1%). This increase in starts might be expected whilst the programme is establishing. SDS have contracted for 5,000 opportunities in 2019-20. Further SDS statistics on FAs are expected to be published later in March 2020.

From next year onwards we will revise this KPI to look at increasing the percentage of school leavers attaining STEM Foundation Apprenticeships. Information about attainment of STEM FAs is included in the detailed data published with this report.

I d. Increase the number of apprenticeship opportunities in STEM related subjects at SCQF Level 9 and above.

Number of Graduate Apprenticeship starts in STEM at SCQF 9+
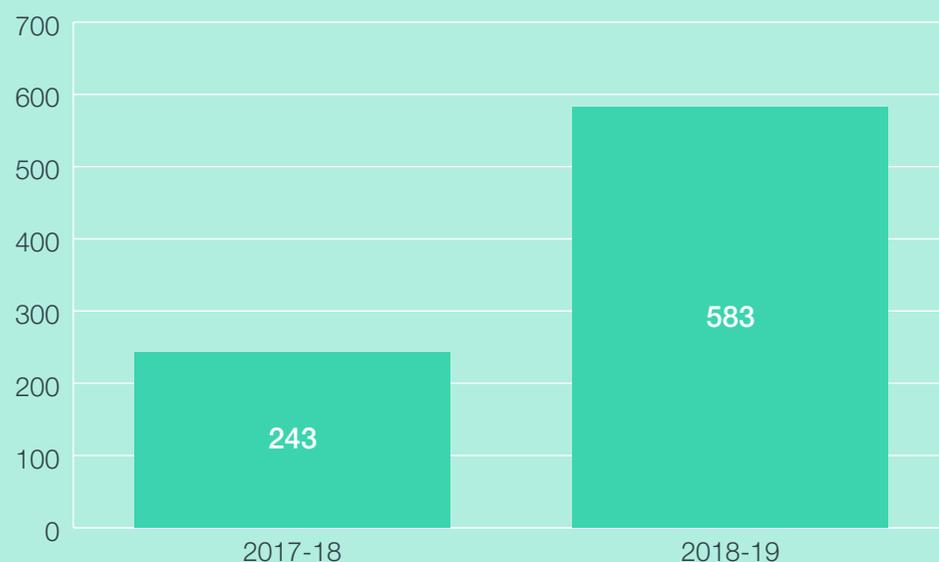
Data Source:
Skills Development Scotland (SDS): Graduate Apprenticeship statistics

The Graduate Apprenticeship (GA) programme is still relatively new. The first cohort began in September 2017, the second cohort in September 2018 and the third cohort in September 2019. The overall number of starts in 2017-18 was 278, all of which were STEM starts (243 at SCQF Level 9 and above). In 2018-19 the total number of GA starts was 921 of which 607 were STEM starts (583 at SCQF Level 9 and above).

In 2018-19, females represented 19.4% of starts in STEM GA subjects, up from 17.6% in 2017-18.

Higher level Modern Apprenticeships (MAs) are also available at SCQF Levels 9 (Technical Apprenticeships) and 10 and 11 (Professional Apprenticeships). These are not included in the figures but may be included in KPI I d in subsequent annual reports.

I e. Increase the proportion of those who successfully completed a recognised qualification at college in a STEM subject.

Proportion of successfully completed College enrolments that are STEM

40%

30%

20%

10%

0%

| 27.4% | 30.3% | 27.7% | 30.2% | 26.8% | 30.0% | 27.0% | 29.2% | 26.6% | 26.8% |

2014-15   2015-16   2016-17   2017-18   2018-19

■ Further Education   ■ Higher Education
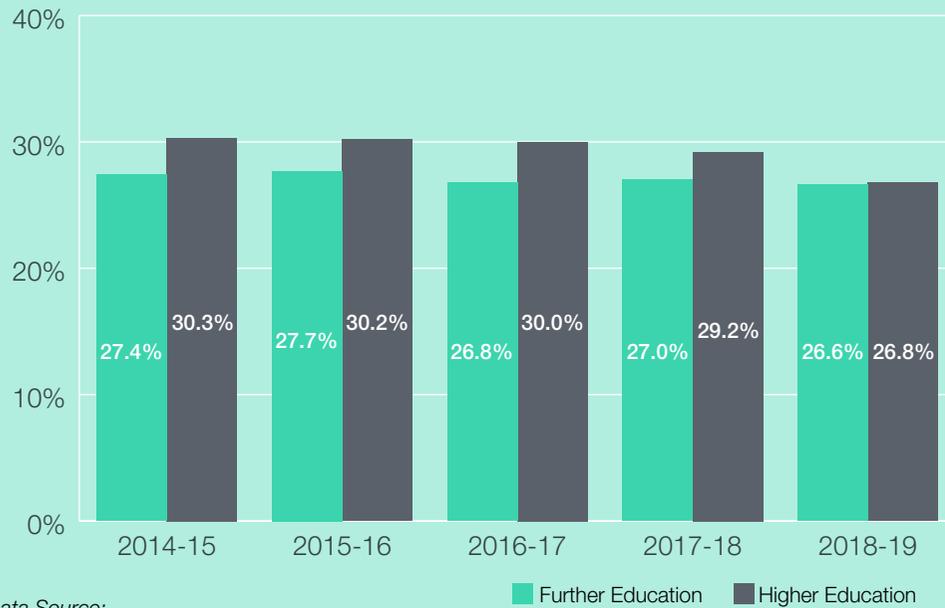
Data Source:
Scottish Funding Council (SFC): College FES data

For college courses at FE level, the proportion of successfully completed courses that were in STEM subjects was 27.4% in 2014-15, 27.7% in 2015-16, 26.8% in 2016-17, 27.0% in 2017-18 and 26.6% in 2018-19. For college courses at HE level, the proportion of successfully completed courses that were in STEM subjects was 30.3% in 2014-15, 30.2% in 2015-16, 30.0% in 2016-17, 29.2% in 2017-18 and 26.8% in 2018-19.

I f. Increase the proportion of Scottish Domiciled qualifiers on Full-time First Degree STEM courses.

Proportion of Scottish Domiciled qualifiers on Full-time First Degree that are STEM

	2015-16	2016-17	2017-18	2018-19
STEM	34.6%	35.4%	35.2%	34.7%
STEM + Medicine & Related	51.2%	52.5%	52.5%	51.7%

■ STEM ■ STEM + Medicine & Related
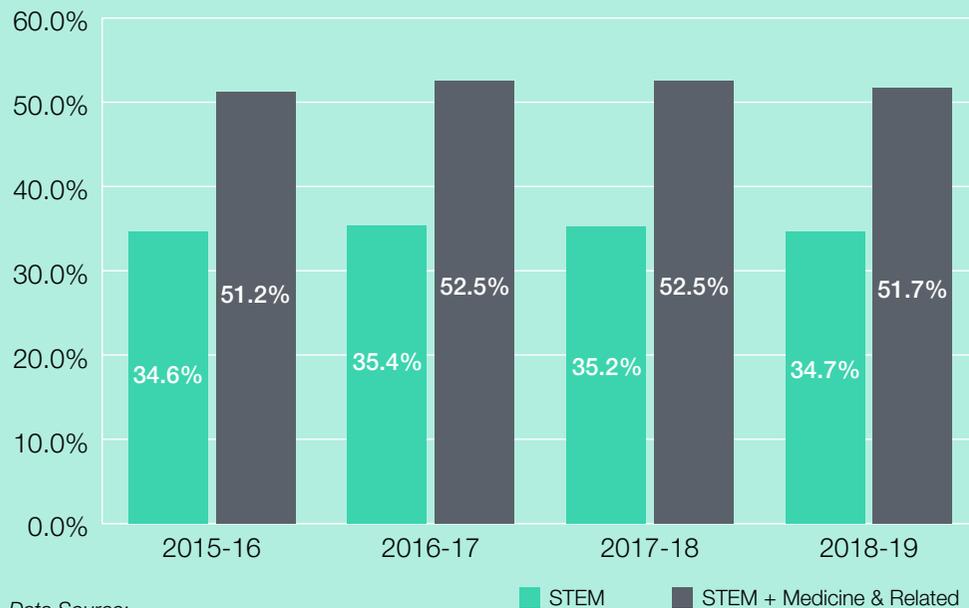
Data Source:
Higher Education Statistics Agency (HESA): Student data

2015-16 is the baseline year. The proportions of Scottish domiciled qualifiers on first time degree courses were similar across the four years: there has been decreases in the last two years but there is a slight increase overall since the baseline year. The proportions in 2015-16 were 34.6% (excluding medical courses) and 51.2% (including medical courses). In 2017-18 the proportions were 35.2 (excluding medical) and 52.5% (including medical). In 2018-19 the proportions were 34.7% (excluding medical) and 51.7% (including medical).

I g. Increase in the number of participants in STEM related Youth and Adult awards.

Number of Youth Awards that are STEM

Year	Value
2016-17	39,900
2017-18	45,787
2018-19	48,574
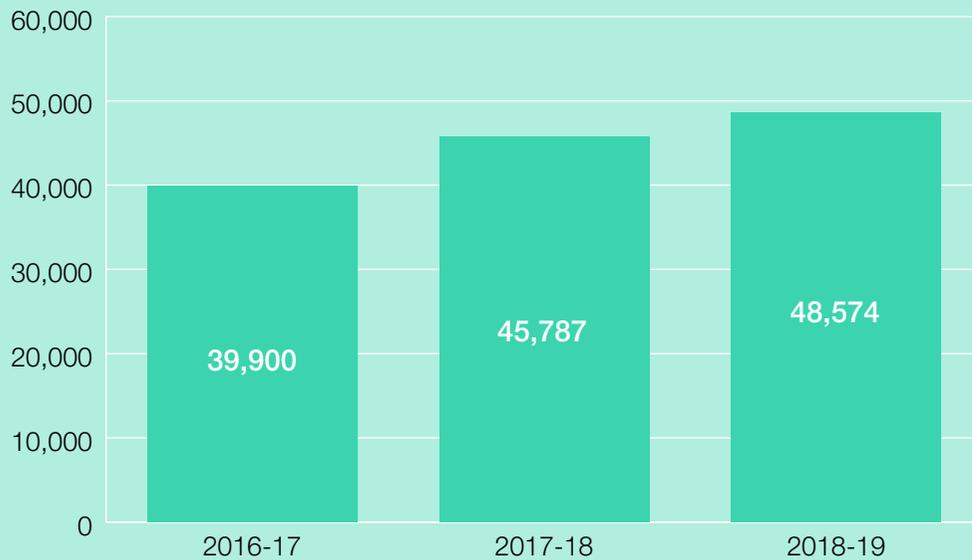
Data Source:
Education Scotland: Youth Awards & Adult Awards data collection

The national Awards Network includes most of the main providers of Youth Awards in Scotland (28 member organisations). They have provided the following baseline estimates figures of the number and percentage of youth awards with a STEM learning embedded within their core curriculum:

- 39,900 youth awards in 2016-17 (43% of all youth awards achieved in Scotland in that year).

- 45,787 in 2017-18, representing 49% of awards achieved.

- 48,574 in 2018-19, representing 42% of all 114,939 awards achieved.

The rise in total STEM related awards achieved in 2018-19 is largely attributable to continued growth in achievement of the John Muir Award and Archaeology Scotland's Heritage Hero Award programme. The percentage of the total of awards achieved with an identified STEM element is marginally down, at 42% – but this is a reflection of a broadening of the range of awards included in the Awards Network census rather than any diminution in interest in STEM.

Examples of Youth Awards included are: The Duke of Edinburgh's Award, The John Muir Award, Young Enterprise Awards, Outward Bound Trust awards, awards from uniformed organisations and the Cadets and SQA wider achievement awards.

Baseline information for Adult Awards is not yet available but overall numbers of participants are much lower (400 in 2016-17).

II. Increased practitioner confidence in STEM learning in the early years, primary years and in CLD settings and increased practitioner engagement in STEM professional learning opportunities. (Excellence)

II a. Increase the cumulative hours of STEM professional learning accessed by early learning and childcare practitioners, schools, college and CLD practitioners annually.

Cumulative hours of STEM professional learning
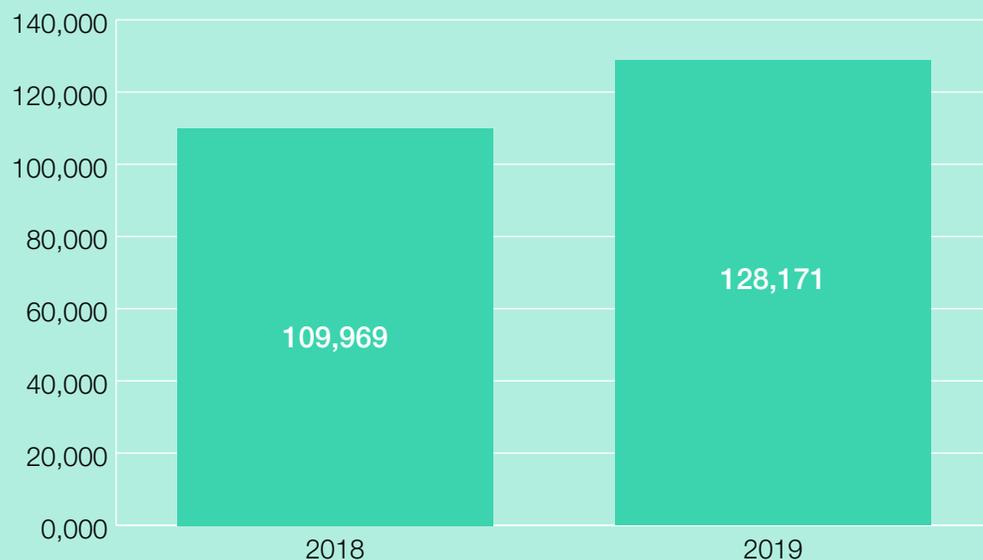
Data Source:
Education Scotland: Annual practitioner and STEM CLPL provider surveys

Education Scotland introduced new data gathering measures in 2017-18 to track provision of professional learning in STEM. In 2019, 49 STEM provider organisations responded to Education Scotland's data gathering exercise. Collectively, they provided 128,171 cumulative hours of STEM professional learning between 1 August 2018 and 31 July 2019. Some 30,505 practitioner engagements resulted from 2,132 professional learning sessions run by these providers over this period. This is in comparison to the total of 109,969 cumulative hours of STEM professional learning provided by the 44 providers that responded in 2018.

At the same time, practitioners from a range of sectors were invited to complete the Annual STEM Practitioner Survey 2019. There were a total of 1,187 responses to this survey from early learning and childcare, ASN, primary and secondary practitioners. The findings showed they accessed an average of 16.1 hours of STEM professional learning between 1 August 2018 and 31 July 2019, compared with 21.3 hours in 2018. The reasons for this decrease are not clear but Education Scotland's efforts to promote the survey to a much wider and more representative group of practitioners could be a contributing factor to this decrease. For example, there was an increase of 35% in the number of responses to the survey in 2019. Responses from early learning and childcare increased by 42%, with this sector accessing the lowest number of hours of STEM professional learning.

In 2018, an average of 63.4% of practitioners agreed or strongly agreed with the statement, 'I am confident in delivering STEM learning in my practice. In 2019, Education Scotland sought more granular responses to give an indication of the relative confidence levels across sectors and aspects of STEM. The results relating to practitioner confidence highlighted the variability in confidence across the sectors and disciplines. Details are provided in the separate KPI spreadsheet. This information will be used to inform targeting of activity as we move forward.

A separate STEM survey was also issued to community learning and development practitioners in 2019. In total there were 141 responses to this survey. Questions on professional learning hours and practitioner confidence were introduced for the first time in the 2019 survey. The findings showed that the respondents each accessed an average of 15.3 hours of STEM professional learning between 1 August 2018 and 31 July 2019.

III. Significant reductions in the equity gaps in participation and achievement in STEM learning, engagement, study, courses and training across all sectors in relation to gender, deprivation, rurality, race, disability and for care leavers. (Equity)

III a. Reduce the gap between the percentage of school leavers with 1 or more award in STEM subjects at SCQF level 6 or better from the least and most deprived SIMD quintiles to 31 percentage points by 2020 and to 25 percentage points by 2022.

Percentage of school leavers with 1 or more passes in STEM subjects at SCQF Level 6 or better by SIMD
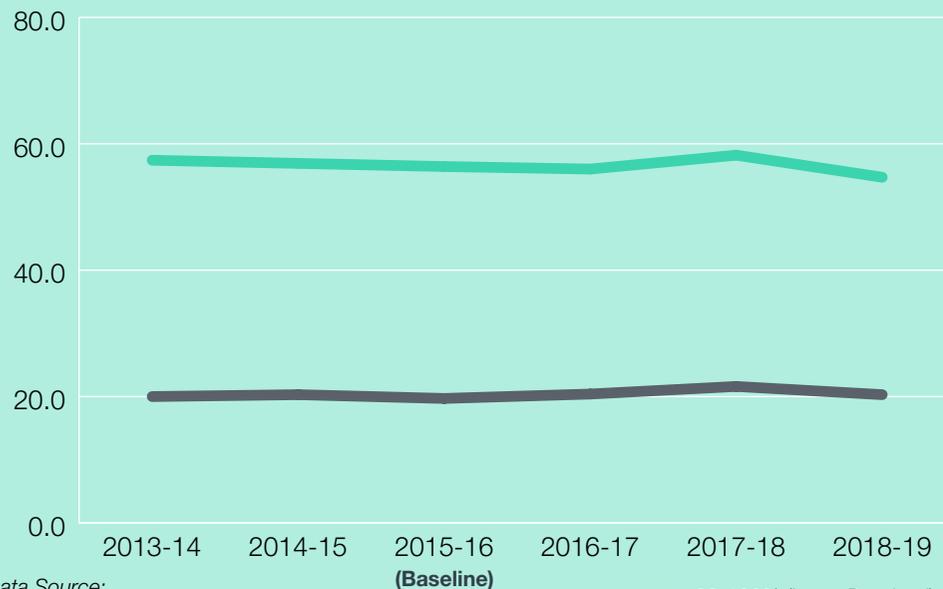
Data Source:
Scottish Government: Summary Statistics for attainment, leaver destinations and healthy living - school leaver attainment

— 80-100% (Least Deprived)
— 0-20% (Most Deprived)

2015-16 is the baseline year when the gap was 36.8 percentage points. Data from previous years show that the current value (a 34.4 percentage point gap) is smaller than the previous year when it was 36.6, and any year previous.

Between 2017-18 and 2018-19 there was a decrease in the proportion of school leavers with 1 or more STEM award at SCQF level 6 in the most deprived quintiles and least deprived quintiles. This led to the gap decreasing to 34.4 percentage points.

III b. Improve the gender balance in attainment in key STEM related subjects at SCQF level 6 by increasing the number of females passing Physics by 15% and Computing by 20%, by 2022

Number of Female passes at SCQF Level 6 Physics and Computing

Year	Total Computing	Total Physics
2014	670	2,262
2015	538	2,162
2016	604	2,021
2017 (Baseline)	617	1,899
2018	727	1,863
2019	759	1,867

Data Source:
Scottish Qualifications Authority (SQA):
National Qualifications data

■ Total Computing   ■ Total Physics
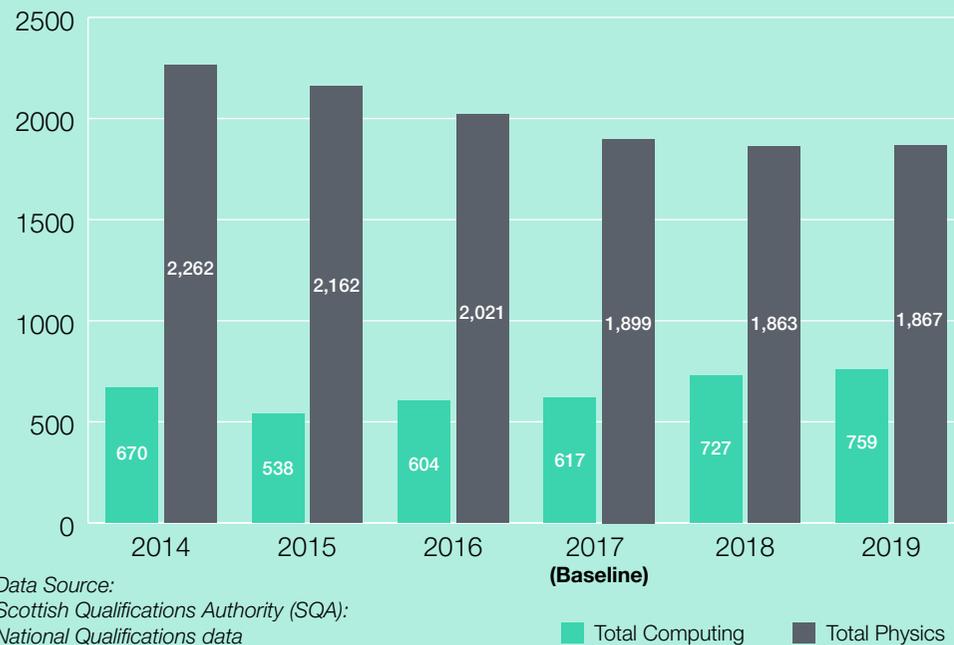
2017 SQA data is the baseline year. Prior to that, female passes in Physics had declined from 2,262 in 2014 to 1,899 in 2017 – with some variations across the years. Since 2017, they have remained broadly static, decreasing slightly in 2018, and increasing slightly in 2019. For computing, now including software development and cyber security, female passes declined from 670 in 2014 to 617 in 2017 – again, with variations from year to year – but have now increased for two years in a row to 759.

III c. Improve the gender balance in STEM subjects studied at college and university.

Proportion of enrolments that are female
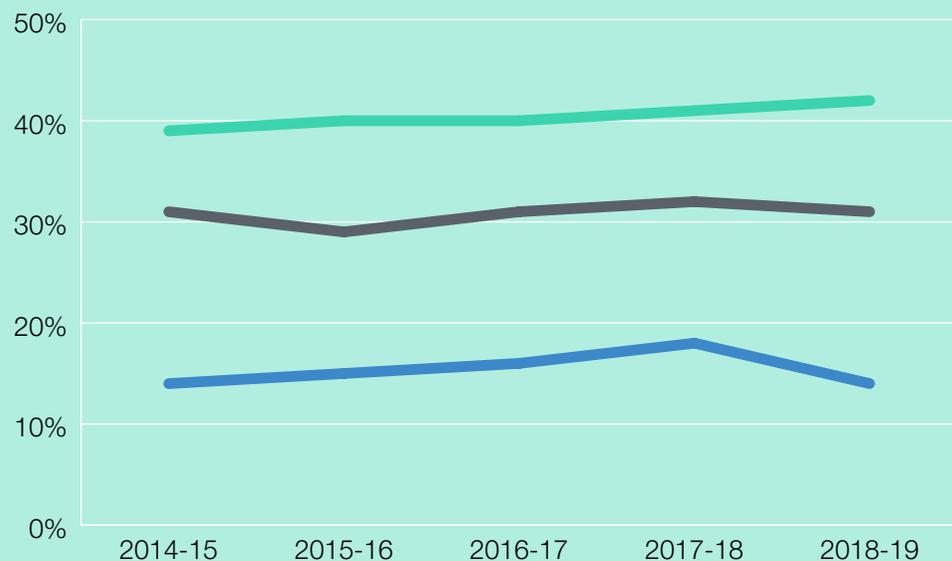
Data Source:
Higher Education Statistics Agency (HESA): Student data
Scottish Funding Council (SFC): College FES data

Legend: University — College FE — College HE

The percentage of female enrolments across STEM courses at universities has, in general been increasing marginally from 2014-15 to 2018-19. In 2018-19, it ranged from 67% for the biological sciences to 20% for Engineering and Technology and 21% for Computer Science. There were very slight increases in the proportion of female enrolments in engineering/technology and computer science between 2014-15 and 2018-19 but a slight decrease for mathematical sciences.

In the college sector, while there remains a lot to be done, progress has been encouraging. The percentage of female enrolments across STEM courses at HE level had been gradually increasing from 13.9% in 2014-15 to 17.8% in 2017-18, but fell to 13.9% in 2018-19. In 2018-19, they ranged from 53.8% for Business Management and Administration to 4.2% for Nautical Studies and 6.9% in Engineering. At FE level, over the five year period there has been an increase in the proportion of females taking STEM courses from 30.8% in 2014-15 to 31.3% in 2018-19. While figures are variable across the types of course, there are promising increases for Engineering with female enrolments increasing from 14.8% in 2014-15 to 24.0% in 2018-19.

III d. Increase gender balance in the uptake of STEM related Foundation Apprenticeship opportunities in the senior phase of school.

Percentage of STEM Foundation Apprenticeship new starts by gender

	Cohort 1 (2016-2018)a	Cohort 2 (2017-2019)	Cohort 3 (2018-2020)
Female	8.1%	13.1%	20.6%
Male	91.9%	86.9%	79.4%

■ Male ■ Female
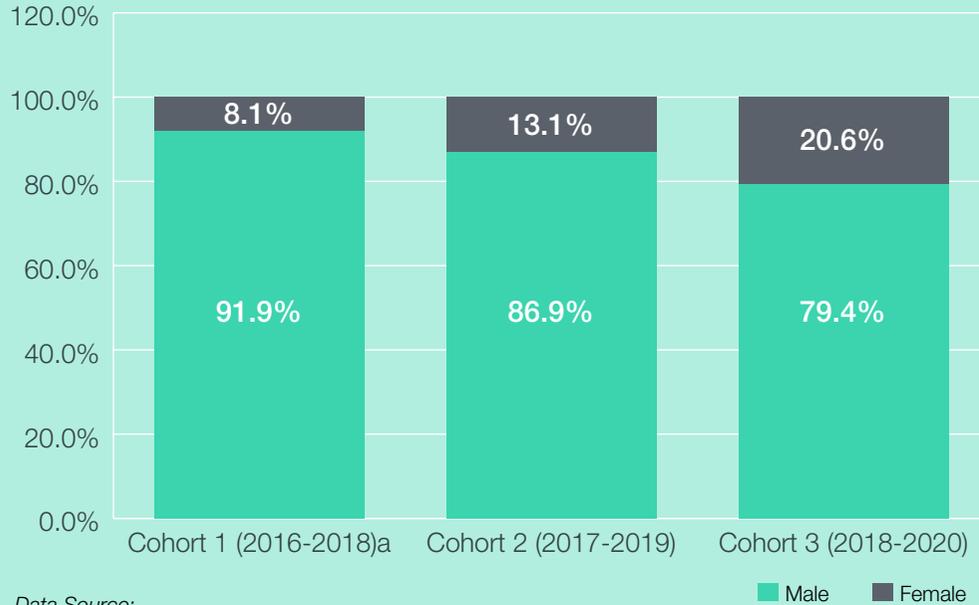
Data Source:
Skills Development Scotland (SDS): Annual Equality Action Plan report

Females represented 8.1% of starts in STEM Frameworks for cohort 1 (2016-18). This increased to 13.1% of starts in STEM frameworks in cohort 2 (2017-19) and 20.6% of starts in STEM Frameworks for cohort 3 (2018-20).

More females are choosing the social services frameworks and more males are focusing on engineering ('Civil Engineering' and 'Engineering' frameworks). However, the proportion of females participating in the male dominated frameworks has increased since cohort 2, so there has been some progress made.

III e. Increase the proportion of schools from most deprived quintile that receive a quality STEM engagement experience from funded Science Centres.

Percentage of schools in deprived areas who engage with Science centres
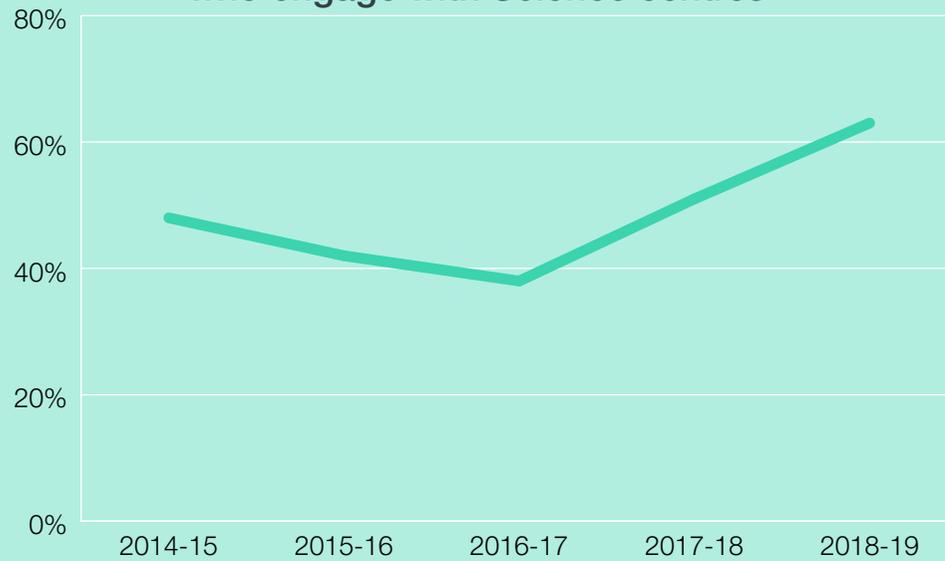
Data Source:
Science Centre quarterly and annual reports & Annual Science Festival reports to Scottish Government
Scottish Government: Summary Statistics for Schools in Scotland;
Scottish Government analysis of School contact and SIMD Data

Baseline taken as 37.9% in 2016-17, the year prior to the launch of the STEM Strategy and the first to use data from SIMD16.

The proportion in 2018-19 was 62.5% of eligible schools, which represents a large increase on previous figures. Changes in policy and bedding in of increased funding in 2016-17 could account for the majority of this. However, figures may also be affected by the re-configuration of SIMD data zones in 2016 and a slight decrease in the total number of eligible schools.

III f. Increase the number of members of community groups from the most deprived or rural areas participating in quality engagement with Science Centres and festivals to 15,000 by 2022.

Number of members of community groups from deprived areas participating with Science centres

Data Source:
Science Centre quarterly and annual reports & Annual Science Festival reports to Scottish Government

The baseline has been taken as 8,235 visits by members of eligible community groups in 2016-17, the year prior to the launch of the Strategy and the first year of increased subsidy. The trend since 2012-13, when the subsidy was initiated separately, has been for increasing numbers of participants as the Centres have developed relations with community groups in their areas. The subsidy was increased in 2016-17 with an increase of over 1,000 participants from the previous year. In 2017-18 the number of visits increased again to 8,604, and, in 2018-19, 11,505 people from community groups across Scotland visited our Science Centres, exceeding the 10,000 target. As such, we have increased this target to 15,000 by 2022.

IV. Increased numbers of people who understand the benefits and value of STEM for themselves, their families and their communities. (Inspiration)

IV a. Increase the proportion of young people who say they feel studying STEM is important for their future careers in the Young People in Scotland Survey.

Percentage of young people choosing to study a STEM subject and why

% chosen or thought they would choose to study a STEM subject
- 2017: 65%
- 2019: 61%

% of those chosen a STEM subject because they felt it was important to them and/or for their future career
- 2017: 52%
- 2019: 47%

% of those chosen a STEM subject because they enjoyed it
- 2017: 56%
- 2019: 54%

0 10 20 30 40 50 60 70

■ 2017   ■ 2019

Data Source:
Young People in Scotland Survey
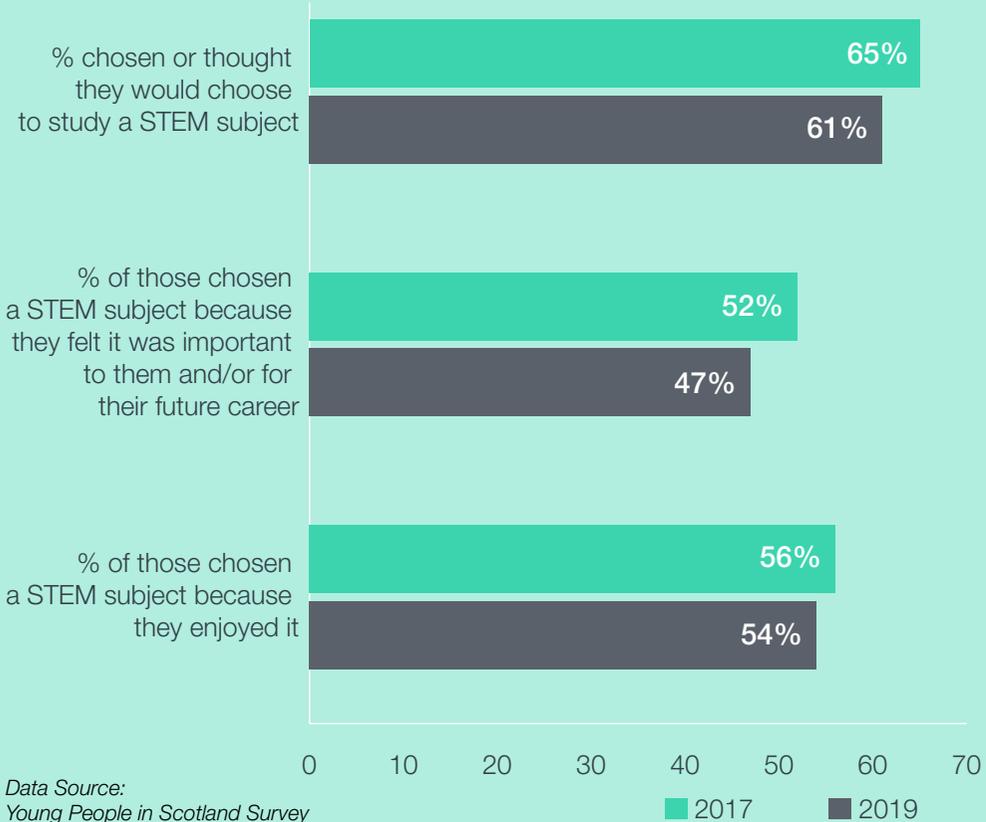
Results from the 2019 Young People in Scotland survey showed that the proportion of respondents who said they had or would choose to study STEM dropped from 65% in 2017 to 61% in 2019. Although it may take time for the actions in the strategy to affect this KPI, we will review our actions on inspiring young people for STEM in light of these results.

V. Increased collaboration between schools, colleges, universities and employers (Connection)

V a. Increase the number of employers engaged with education to support young people of all ages to understand STEM career opportunities and develop skills for work (including career advice, work inspiration, work experience placements, etc.)

Percentage of Practitioners who said their establishment has a STEM partner(s) from the private, public or third sector.

2018

■ Yes ■ No

2019

■ Yes ■ No

26%

74%

42%

58%
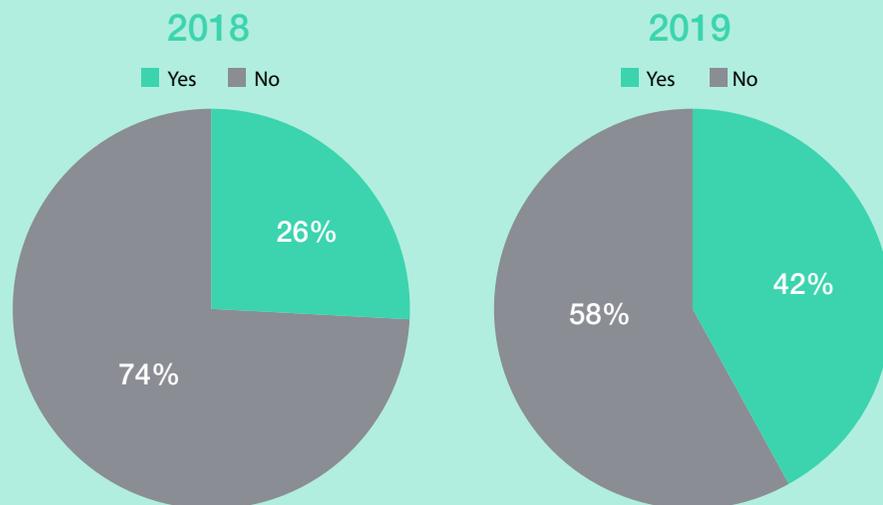
Data Source:
Education Scotland: Annual practitioner and STEM CLPL provider surveys
DYW Regional Group KPIs

Of the 1,187 early learning and childcare, primary, ASN and secondary practitioners that responded to Education Scotland's Annual STEM Practitioner Survey 2019, 42.1% said that their establishment has a STEM partner(s) from the private, public or third sector in the period from 1 August 2018 to 31 July 2019. This is a significant increase on the figure of 25.9% in the 2018 survey.

New KPIs have been put in place for the DYW regional groups that ask them to split their core activity (employer engagement) in to STEM and non-STEM. This activity is benchmarked for 2018-19 although the figures are only estimates and will not capture all employer-school activity and partnerships in the area. Some of the data now being collected will be available on a quarterly basis, but others only yearly.

Provisional information from the DYW Regional Groups indicates that, in the first half of the current reporting year:

- The Regional Groups arranged opportunities for 78,910 young people to engage with employers.

- Of those young people 19,850 of them involved engagements with employers from STEM industrial sectors.

- This amounts to 25.3% of young people's engagement in the first half of the year.

VI. Increased employment in STEM-related occupations and employers are more satisfied with the STEM skills and capability of the people they employ from schools, colleges, universities and from apprenticeship programmes. (Connection)

VI a. Increase the numbers of placements and internships with employers for college learners within STEM curricular areas.

Number of Enrolments to STEM courses at Scotland's Colleges with work experience elements

*Data Source:
Scottish Funding Council (SFC)*
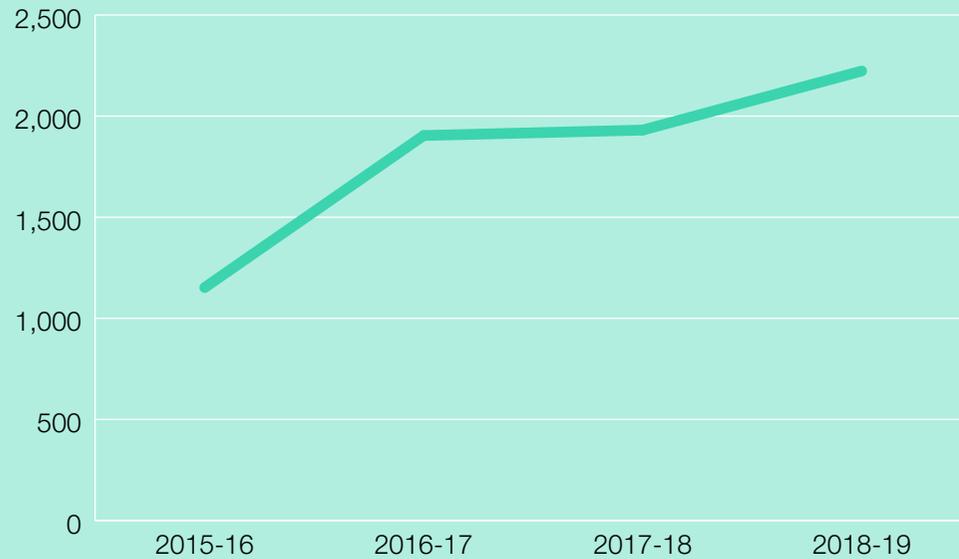
The Scottish Funding Council collects data from the college sector on student work placement opportunities, and the number of enrolments to STEM courses with work experience elements has been provided here. Figures have increased from 1,152 in 2015-16 to 2,223 in 2018-19.

VI b. Reduce the proportion of STEM employers in Scotland experiencing skills shortages.

Skills shortage vacancies as a proportion of all vacancies
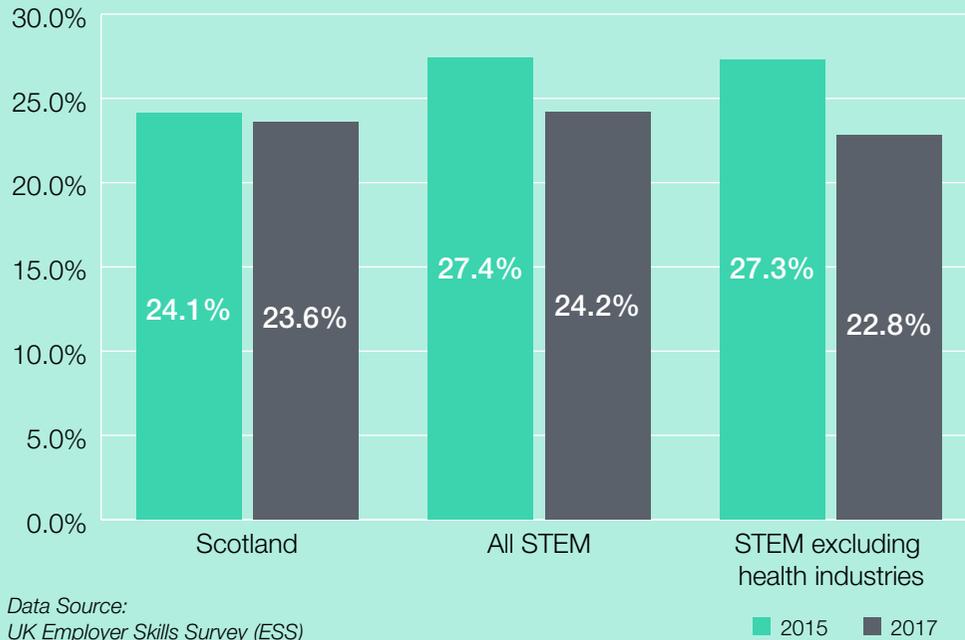
Scotland		All STEM		STEM excluding health industries	
24.1%	23.6%	27.4%	24.2%	27.3%	22.8%

Data Source:
UK Employer Skills Survey (ESS)

■ 2015 ■ 2017

The proportion of STEM employers in Scotland reporting at least one skills shortage vacancy was 6.4% in 2015 and 7.7% in 2017. This is higher than the rate for all employers in Scotland which was 6.0% in both 2015 and 2017. Skill shortage vacancies as a proportion of all vacancies amongst STEM employers was 27.4% in 2015 and 24.2% in 2017. This is higher than the rate for all employers in Scotland which was 24.1% in 2015 and 23.6% in 2017. However, amongst STEM industries with health industries excluded, skills shortage vacancies as a proportion of all vacancies was 22.8% in 2017 and this is lower than for all employers in Scotland.

Opportunities are being explored to further revise the measurement of this KPI through data on STEM employer attitudes on the preparedness of education leavers (EPS data).