STEM Education and Training Strategy Annual Report

Purpose

1. This paper:

   - provides an update for the Curriculum and Assessment Board on progress towards delivering actions in the Science Technology Engineering and Mathematics (STEM) Education and Training Strategy (and provides a **draft** of the strategy's first Annual Report for information); and
   - asks members to consider how their respective organisations can maximise the contribution each makes in supporting the delivery of the strategy's Year 2 priorities and its longer-term actions and objectives.

Background

2. The Scottish Government's STEM education and training strategy was published in October 2017. It sets out a five year programme of action for improving STEM across all of education and training in Scotland.

3. A central aim of the strategy is 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. Clearly, effective curriculum planning and development and assessment of young people's progression in STEM are important enablers in achieving this aim. In addition, strategy has three other inter-related, key aims:

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

4. The strategy is organised around these themes - excellence, equity, inspiration and connection - and has all STEM related education and training in scope, from the early years, through to schools, college, university and apprenticeship provision, community learning and development and public science engagement. The following are some the activities being taken that are most relevant from the Board's perspective:

   - ensuring appropriate numbers of STEM practitioners through the Teaching Makes People Campaign, new routes into teaching and STEM Bursaries;
   - providing high quality resources to support professional learning and allow delivery of inspirational, high-quality STEM teaching;

- providing ongoing support for improvements to STEM learning through SSERC, the National Numeracy and Mathematics Hub, the Digital Skills Programme, the Scottish Attainment Challenge and the RAISE programme;
- recruiting a network of STEM specialist advisors within Education Scotland to support learning and teaching and raise STEM attainment;
- encouraging more girls and young women to study STEM subjects through expansion and embedding of the Improving Gender Balance project supported with the recruitment of Gender Balance and Equalities officers within Education Scotland;
- supporting ELC settings to promote positive engagement with STEM and tackle gender stereotypes;
- supporting STEM Ambassadors and establishing a Young STEM Leaders programme to stimulate inspiration in STEM; and,
- introducing new STEM Awards for ELC settings, schools and CLD settings to promote, recognise and build on activities in these sectors

5. We would expect these measures, acting together, to address some of the concerns that have been raised about the choice and availability of STEM qualifications in the senior phase. The strategy states that we expect to see increases in the proportion of people undertaking STEM-related learning, engagement and study over its five year lifetime and a number of the KPIs are tracking aspects of this broad outcome (pages 19 to 25 below).

Year 1 Progress

6. The first Annual Report is currently being prepared. A draft of the report is included at Annex A for reference but not wider dissemination. Pages 4 to 6 of Annex A provide a high level summary of progress in the first year of implementation against the actions within the Strategy, and sets out the priorities for year 2 with further details in subsequent sections. More detailed progress information is tracked and shared with the key governance groups that are in place for the strategy – an Implementation Group, an External Advisory Group and an Equality Sub-group.

7. The focus of the first year has been to initiate actions and establish active partnerships to ensure the Strategy actions are being taken forward in a collaborative and cohesive way. In year 2, we expect to see more delivery on the ground. For example, we expect to see greater collaboration between schools and colleges as a result of the college-led STEM Hubs and regional STEM strategies. We expect this will lead to more STEM professional learning opportunities for practitioners, alongside new STEM CLPL commissioned by Education Scotland and on STEM in the early years. More improvement support for STEM learning will be on offer from the new STEM advisers who will work at Regional Improvement Collaborative level and the new team of dedicated Gender Balance and Equalities officers being put in place in Education Scotland. The new Young STEM leaders programme will start to be trialled, creating new opportunities for young people to become STEM mentors for their peers and for younger age groups.

8. It is intended that the report will publish in early February. We are still awaiting updates to some of the statistical data in the report. As such, there will be some updates to be made to this version of the report, but we believe that the key messages and majority of the text will remain largely unchanged.

9. Alongside the report, we are currently considering publishing more detailed data tables on the Key Performance Indicators (KPIs).   Relevant data is summarised in Annex B of the report. This will be updated in the final version with new information that is becoming available this month.

Year 2 Priorities and Next Steps

10. The priorities for Year 2 of the strategy are to maintain momentum within existing activity and drive forward actions that are yet to commence.   In particular:

-   New Regional STEM Advisors will work with key partners to support practitioners through the Regional Improvement Collaboratives, helping to co-ordinate STEM regionally.
-   We will promote and raise awareness of the links between outdoor learning and STEM subjects in the early learning and childcare sector, including the production of an online module.
-   The newly-appointed Gender Balance and Equalities Officers will deliver gender training to schools and teachers and develop a gender champion network and a gender kitemark to grow and spread best practice.
-   A national STEM engagement campaign will be launched and implemented.
-   New STEM Awards will be introduced with an initial focus on early learning and childcare and schools, to recognise and build on activities in these sectors.
-   We will hold the first annual community learning and development STEM conference to showcase inspirational lifelong learning STEM practice
-   An online directory of quality assured STEM inspiration activities for schools will be developed.
-   We will develop a comprehensive careers strategy for the all-age careers service in colleges and universities.
-   Education Scotland will undertake a national thematic inspection of numeracy and mathematics as part of a range of national thematic inspections during 2018/19.

11. The STEM Strategy has a five year lifetime and many of its actions and commitments will be long term and take time to show results in terms of the Key Performance indicators. Successful delivery of the actions set out above and of the strategy moreover will be best achieved through effective collaborative action by all partners and the board is asked to consider how it and its individual members' organisations can contribute to the particular priorities for Year 2 and support the longer-term actions and objectives of the STEM Strategy.

Conclusion

12. The Board is asked to:

a) note the progress over the first year in delivering the STEM strategy and the current draft of the STEM strategy annual report, in particular the measures to:

- address STEM teacher shortages in the secondary sector;
- maintain existing investment in STEM learning through our support for the Scottish Schools Education Research Centre (SSERC), the RAISE primary science programme and the Digital Schools programme;
- enhance improvement support for STEM learning in early years, school and CLD contexts, including a dedicated resource for improving equality and equity of outcomes in STEM; and
- inspire more young people for STEM through the new Young STEM leaders programme.

b) consider the priorities for year two (paragraph 9 above and also set out on page 5 of Annex A), all of which have relevance for the work of CAB, and for members to consider how their respective organisations can be best support those priorities and the longer-term actions and objectives of the STEM Strategy.

c) highlight any additional activities from a curriculum development and assessment perspective that could further support the aims of the STEM strategy.

Science, Technology Engineering and Mathematics (STEM) Strategy for Education and Training in Scotland Annual Report – Year 1

Contents

1.   Ministerial Foreword

Science and innovation are embedded in Scotland's heritage and culture. They are playing an ever-increasing role in Scotland's future within our increasingly globalised and complex world. A world in which we aspire to be the inventor and manufacturer of the innovations that shape our future. A world in which we create the new knowledge and innovations, ensure economic benefit for all and build prosperity and well-being for the people of Scotland. To achieve this we need to develop and grow Scotland's expertise in the inter-related fields of Science, Technology, Engineering and Mathematics – STEM.

The current pace of technological change across the world is unprecedented - it is transforming the way we work, conduct business, buy goods and communicate with one another. The opportunities for those that lead these changes are substantial but to reap the benefits we must both develop our people so that they can gain employment in the fast-growing and well-paid specialist STEM sectors and ensure that everyone is able to develop the STEM skills needed across all types of employment and careers. At the same time, STEM learning opens doors to understanding and enjoyment of the world around us and builds the broader STEM literacy we all need in life.

Central to our ambition is to increase diversity, ensuring equality of access and opportunity to study STEM and attract people from under-represented groups, such as women and girls, and those from deprived communities, into STEM-related careers.

The Science, Technology, Engineering and Mathematics (STEM): Education and Training Strategy for Scotland was published on 26 October 2017. It sets out a vision for everyone in Scotland to be encouraged and supported to develop their STEM skills throughout their lives. Giving everyone the confidence and capability they need in STEM will drive inclusive economic growth and unlock the opportunities

for all of Scotland to flourish and thrive and compete on a global platform. The Strategy has a five year lifetime, up to 2022, and sets out an ambitious and comprehensive plan to drive forward improvements in STEM across all education and training in Scotland, for all ages.

The scope of the Strategy is focussed on education and training so as to improve the medium to long-term position. However, the Government recognises that many STEM employers are experiencing skills shortages now. The new strategic plan of the Enterprise and Skills Board and our Programme for Government commitment to a Future Skills Strategy as well as our investment in the City Deals are aimed at addressing these challenges now. We will ensure close co-ordination between these and our STEM education and training strategy as they develop.

Much progress has been made in this first year to initiate actions and establish active partnerships to ensure the Strategy actions are being taken forward in a collaborative and cohesive way. This is a five-year strategy and demonstration of improvements on the ground will take time to work through. In the second year of implementation of the strategy, we expect to start to see some of these improvements being felt in early learning settings, schools, colleges and universities, the science and engagement sector and in Community Learning and Development (CLD) settings, with the strategy gathering pace by year 3. We will keep the strategy under review but we are confident that, through its actions, we will achieve our vision.

2.   Introduction

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

The STEM Strategy connects with and links to a number of other priorities of the Scottish Government.

Numeracy is one of three priorities within Scottish Education, creating a significant focus on numeracy across all education settings, which is reinforced by the aims of the STEM Strategy.

The Developing the Young Workforce Programme (DYW)[*1] is supporting improvements across early years settings, primary and secondary schools in all curriculum areas, helping to ensure young people have the skills they need for employment. DYW also supports a focus on STEM and the principles of DYW are embedded in the STEM Strategy. STEM work-based pathways and opportunities for children and young people (3-18) form an important part of the STEM Strategy, ensuring young people have the skills, knowledge and capability required to adapt and thrive in the fast-paced changing world and economy. Many of the actions in the STEM Strategy are part of the DYW programme and there is close alignment between the two. The STEM Strategy also connects with and supports the aims of the Learner Journey Review[*2].

The STEM Strategy also links and connects with other programmes and strategies within Government that are focussed on fair work and on meeting STEM skills shortages in the immediate future, including in the current workforce. These are our work on a Future Skills Action Plan[*3], the National Retraining Partnership[*4], the Flexible Workforce Development Fund[*5], the strategic plan of the Enterprise and Skills Board[*6], our investments in City Deals[*7], the Fair Work Action Plan[*8], and the Disability Employment Action Plan[*9]. The Government's Gender Pay Gap Action Plan[*10] is due to be published early in 2019. It will identify a series of actions to reduce gender pay gaps across Scotland as part of the Scottish Government's inclusive growth vision. The actions in the STEM strategy on tackling gender imbalances in STEM will make a significant contribution to closing the gender pay gap. Within the Scottish Government and across the different delivery bodies and partners involved, we are actively making links across all of these programmes to ensure that such work is taken forward on a complementary basis to maximise the outcomes and to succeed on our ambitions for STEM in Scotland.

This annual report fulfils Ministers' commitment to 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.

3.   Progress towards Outcomes 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 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 first year, the focus of delivery partners has mainly been to put infrastructure and resources in place to underpin, facilitate and drive forward delivery of the aims and actions of the Strategy. Key achievements have been:

- We have awarded 107 STEM Bursaries to encourage STEM career changes into teaching and have developed new routes into STEM teaching for graduates.
- Maths Week Scotland and school holiday maths challenges have been established as an annual event to raise the profile of numeracy and maths and promote the value, relevance and joy of the subject. Schools in every local authority and many early learning and childcare settings in Scotland took part in the second annual Maths Week Scotland in September 2018 with events for children, families and adults right across the country.
- Education Scotland has developed and published a self-evaluation framework to allow early learning and childcare providers and schools to evaluate and improve their STEM learning and teaching. The framework encourages

- providers and schools to collaborate with one another and work with external partners to improve STEM learning experiences for young people.
- A new team of Gender Balance and Equalities Officers has being appointed to extend and embed the approaches of the successful Improving Gender Balance project across all schools in Scotland.
- Education Scotland has commissioned new STEM-related professional learning resources for early years and community learning practitioners, teachers and school technicians.
- We have initiated a new Young STEM Leaders programme to stimulate and strengthen the development, inspiration and mentoring of children and young people in STEM by children and young people.
- Science centres and festivals are working with the community learning and development sector to expand their reach into deprived communities.
- Colleges have been working on regional STEM strategies and leading the development of regional STEM Hubs to strengthen collaboration between partners including universities, science centres and employers.

We have also set up an Implementation Group, chaired by the Minister for Further Education, Higher Education and Science to provide direction and oversight of delivery. This Group includes the key delivery bodies responsible for implementing the Strategy An External Advisory Group is making sure that the delivery reflects expert advice from a range of stakeholders. In addition, an Equalities sub-group has been formed to provide support and challenge around this key element, looking across each of the actions in the Strategy. The remit and membership of the Implementation Group and minutes of meetings are published on the Scottish Government website[*11]. Overall, these oversight arrangements will ensure that we can monitor and challenge progress across the actions, adapting approaches where necessary in light of new data and information to achieve on our ambitions. The Implementation Group is responsible for providing shared leadership for delivery of the STEM Strategy actions and making sure that the STEM Strategy and related programmes are mutually supportive and reinforce one another.

The priorities for Year Two will be to maintain momentum within existing activity and drive forward actions that are yet to commence. In particular:

- New Regional STEM Advisors will work with key partners to support practitioners through the Regional Improvement Collaboratives, helping to co-ordinate STEM regionally.
- We will promote and raise awareness of the links between outdoor learning and STEM subjects in the early learning and childcare sector, including the production of an online module.
- The newly-appointed Gender Balance and Equalities Officers will deliver gender training to schools and teachers and develop a gender champion network and a gender kitemark to grow and spread best practice.
- A national STEM engagement campaign will be launched and implemented.
- New STEM Awards will be introduced with an initial focus on early learning and childcare and schools, to recognise and build on activities in these sectors.

- We will hold the first annual community learning and development STEM conference to showcase inspirational lifelong learning STEM practice
- An online directory of quality assured STEM inspiration activities for schools will be developed.
- We will develop a comprehensive careers strategy for the all-age careers service in colleges and universities.
- Education Scotland will undertake a national thematic inspection of numeracy and mathematics as part of a range of national thematic inspections during 2018/19.

The following chapters expand on the above progress, set out future plans and examine our priorities as we enter the second year of implementation.

Options for visual graphics/tabular data to be included here and following sections to be considered

The Strategy's actions are being tracked to facilitate review and assessment of progress. Key Performance Indicators (KPIs) have been identified to measure progress against the aims of the Strategy. These indicators (as set out in Annex B along with summary data for year 1) are long-term targets, reflecting the ambitions and five-year lifespan of the programme from 2017 to 2022.

Tables showing the full background data for the KPIs are being published separately on the Scottish Government website[1]

While some of the KPIs are closely linked to obvious specific actions within the Strategy and should see early results (for example, Initial Teacher Education intake targets), many of the KPIs will be dependent on a wide range of factors which the Strategy attempts to address across a number of actions and for which there are complex inter-relationships which could take some time to see results. For example, improving the gender balance in attainment in key STEM-related subjects will be dependent on a wide range of factors including early years activity, contextualised learning resources, Young STEM Leaders, etc. For this first year of implementation we were not expecting to see significant movements in the status of the KPIs because of the timing of data collection and because the focus of the first year has been on establishing programmes and partnerships and initiating actions.

In addition to the KPIs we are also collecting and monitoring other data about STEM education and training. Review of this data reaffirms that Strategy is focussed on the appropriate areas and actions where improvements are required. Further details are provided in Annex C

Infographics to be developed to appear throughout the report here to summarise the KPIs at Annex B and other key findings.

4. Excellence

We will promote Excellence 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; and
- 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)

Improving the supply of STEM talent to the teaching profession

107 STEM Bursaries of up to £20,000 were awarded to encourage STEM career changers into teaching in the 2018-19 academic year. These bursaries were targeted at secondary teaching in shortage STEM subjects - currently mathematics, physics, computing, chemistry and technical education. The subjects supported are being kept under review.

New routes into teaching for graduates have been available from January 2018 and, in 2019, University of Dundee's new route will support 30-50 new STEM graduates into teaching.

Both these actions are contributing to and are being measured against KPI Ia on meeting Initial Teacher Education student intake targets. These targets have been increasing each year and, while targets have still been missed in some subject areas, overall intakes for the STEM secondary teacher training courses were significantly higher in 2016-17 compared to 2015-16.

Improving STEM learning and teaching and delivering enhanced professional learning

Education Scotland has published a self-evaluation framework for STEM learning to help schools and early learning providers improve STEM learning and teaching. A new STEM page on Education Scotland's National Improvement Hub[2] provides a 'one-stop shop' access to a wide range of STEM learning resources for practitioners. This includes access to the National Numeracy and Mathematics Hub which provides a wealth of professional learning specifically related to numeracy and mathematics. Work is underway to develop a coherent approach to STEM professional learning, and new STEM-related professional learning for early years and community learning practitioners, teachers and school technicians is being supported through the newly-established *Enhancing Professional Learning in STEM* grants programme. Developing these further will be a priority for the coming year.

We have continued to offer support to the Scottish Schools Education Research Centre (SSERC) in financial year 2018-19 for its programme of professional learning for teachers, which is expanding to include more provision on digital learning. We have also continued to fund the Raising Aspirations in Science Education (RAiSE) programme in partnership with The Wood Foundation. The programme, established to support improvements in primary science and STEM practice, is now engaging with its third tranche of authorities. We continue to provide tailored support to local authorities to improve digital skills and computing learning in schools.

Scottish Government are investing £1.6 M over four years (2014 to 2019) to support numeracy and maths professional development in local authorities. Building on this, in 2018/19, Education Scotland will undertake a national thematic inspection of numeracy and mathematics which will evaluate the quality of children's and young people's learning experiences and attainment in maths and share examples of good practice as part of their implementation of the Making Maths Count report recommendations.

A network of Regional STEM Advisors has been recruited to support learning and teaching in the 3-18 curriculum and raise STEM attainment. Their priority in the coming year will be to engage with regional teams including the RAiSE primary science leads, the college-led STEM Hubs and the Regional Improvement Collaboratives, and to work with the new Improving Gender Balance and Equalities team. Throughout 2019, the advisors will work with these key partners to support practitioners through the Regional Improvement Collaboratives, helping to co-ordinate STEM regionally.

We have provided funding to Inspiring Scotland to work with 8 local authorities to improve outdoor learning as part of the expansion of early learning and childcare. We will use the Regional Improvement Collaborative to share the learning from this project across the RIC areas across Scotland. By the end of 2018 a 'How to guide' on finding access to suitable outdoor areas and making the most of the opportunities that these offer to promote children's development will be produced. This will emphasise outdoor learning and STEM. In 2019 we will promote and raise awareness of the links between outdoor learning and STEM subjects in Early Learning and Childcare (ELC) sector.

During 2019, we will also put in place a contract to produce an online module on STEM accessible to all ELC staff. We will ensure this work is carried out in engagement with ELC sector. We will also explore how to collect feedback on the module to measure the success of the online training. We will ensure this Scottish Government funded and co-ordinated training, along with all other training options available to ELC staff, are easily accessible through our new Online National Directory of ELC training programmes.

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. Baseline data on this is currently being collected.

Prioritising STEM in the expansion of apprenticeships

Improving productivity through inclusive growth and quality jobs with greater alignment of investment in education and skills with industry needs are key drivers for the expansion of work based learning. Consequently, growth in the provision of apprenticeship frameworks, including STEM, reflect this need and this is reviewed annually. The number of STEM Foundation Apprenticeship (FA) frameworks has increased from 4 in 2016 to 6 in 2017. The development of additional frameworks and the expansion of FA delivery has seen the number of learners starting STEM FA Frameworks increase from 161 in 2016 to 552 in 2017.

Nine of the 13 new Graduate Apprenticeship (GA) frameworks developed for delivery in Academic Years 2018-2020 are STEM. The first data for GA starts will be available from the end of 2018.

This work is being measured against KPI I c and KPI I d around provision of apprenticeship opportunities which is showing positive progress as above. Data for KPI I d will be available for the next report.

5. Equity

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)

Tackling Inequity in STEM learning and careers

Following a positive evaluation of the 3-year Improving Gender Balance pilot (published in June 2018), a new team of Gender Balance and Equalities officers has being recruited and will arrive in post by February 2019. The officers will work with schools and early learning providers to expand and embed the approaches developed in the pilot on practical ways to address gender bias and stereotyping and tackle inequity in learning. The pilot was jointly led by the Institute of Physics, Skills Development Scotland and Education Scotland. Drawing on this work, Education Scotland has already published a suite of Improving Gender Balance Action Guides for teachers and early learning and childcare practitioners. An SCQF accredited module of professional learning for practitioners is currently being trialled, in partnership with Skills Development Scotland. In 2019, the team will provide gender and equality training to practitioners and will establish a gender champion network and a gender kitemark to grow and spread best practice. The work will be undertaken in collaboration with the six new Regional Improvement Collaboratives along with the new Regional STEM Advisors.

This action is contributing to the wider aims of KPI III to reduce the equity gaps in participation and achievement in STEM learning, engagement, study, courses and training. This will be evidenced in many ways but is being specifically measured through KPI III b on gender balance in attainment in key STEM related subjects measure based on number of females passing Physics and Computing at SCQF level 6 (Higher level). Trends in this area continue to show disappointing numbers of female participation, and it will take some time for outcomes of the Improving Gender Balance work to become apparent as work needs to start in the early years and in primary schools.

Improving participation in STEM further and higher education courses and apprenticeships

A new social media campaign to increase gender balance in participation in STEM study at college and university was launched recently, led by Young Scot. The joint Scottish Government and Young Scot campaign, will encourage young women to study traditionally male subjects at both college and university level by challenging stereotypes and highlighting possible career paths and advantages to studying STEM for all young people.

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 (SFC) in December 2017 and progress reports will now be published annually. Any adjustments required will be managed through the Outcome Agreement process. 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.

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 will be delivered by West Lothian College on behalf of SDS and Equate Scotland.

Skills Development Scotland's team of Equality Executives also work at a local level with individual training providers and employers to help them identify areas of under-representation and take positive action to address these. This includes working with providers and employers in STEM sectors to attract more women. Examples of positive action include holding women's 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.

These actions are contributing to KPI III to reduce the equity gaps in participation and achievement in STEM learning, engagement, study, courses and training, and will impact on KPI III a, b, c and d and outcomes may take some time to become apparent.

Female participation in STEM related Apprenticeship frameworks has increased from 8.1% of Foundation Apprenticeship starts in 2016 to 13.2% in 2017, although this is to be expected as the programme is still expanding.

Increasing access to public science engagement events

Prior to the STEM Strategy, we provided Aberdeen, Dundee and Glasgow Science Centres and Dynamic Earth in Edinburgh with extra subsidies to help them engage with schools and communities in more deprived and rural areas. This year we have conducted an in-depth analysis of this work to help determine how to further improve the offer to under-served audiences. As a result the number of schools and range of community groups eligible for subsidy has been expanded for 2018-19. This will further remove perceived barriers to access these inspirational resources. Data will continue to be collected and analysed over the period of the Strategy to further develop the impact.

Through these subsidies the Science Centres have developed their work with under-served communities in their local areas. Over the first year of the Strategy we have brought the Science Centres together with the larger Science Festivals and the Community Learning and Development (CLD) sector to share best practice and develop a vision for genuinely community-led engagement. This vision will be further developed and implemented during 2019.

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 a 10.8 percentage point increase in the proportion of schools from the most deprived quintile that receive a quality STEM engagement experience from funded Science Centres, and a 4.5% increase in the number of members from community groups from the most deprived or rural areas participating in quality engagement with Science Centres.

6.   Inspiration

We will promote Inspiration 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)

Creating positive STEM role models, mentors and coaches

We have initiated a new Young STEM Leaders programme to stimulate and strengthen the development of peer mentoring and inspiration in STEM for children

and young people by children and young people. The Scottish Schools Education Research Centre (SSERC) is leading the development and management of the programme, working in partnership with the science centres and festivals, and youth organisations, including Young Scot. The Scottish Government has committed a total of £500,000 to the programme over financial years 2018/19 and 2019/20. The focus will be on providing training and support for young people to enable them to effectively carry out a STEM mentoring role, and the development of accreditation routes, to help ensure young people's participation is valued and recognised. Young people in both school and community learning and development settings will be supported.

This action will contribute to measures under both KPI I and KPI IV. However, outcomes are not expected to be immediately apparent as it will take time to build momentum.

Promoting the opportunities and benefits of STEM learning and careers

Maths Week Scotland took place in September 2018 to promote and encourage greater enthusiasm for and increase participation in mathematics through showcasing how mathematics counts in everyday life and work. This is an annual event and will be repeated in 2019. The Deputy First Minister, in partnership with the Scottish Mathematical Council, created a school holiday 'maths challenge' which issued to all primary 6 children in Scotland at Christmas 2017, and Easter and Summer holidays in 2018 to encourage family enjoyment of maths and problem-solving puzzles outwith the classroom

The role of parents, both in influencing decisions and supporting learning at home, is key to delivering many of the ambitions within the Strategy. Work is underway to develop an accessible guide on STEM for parents and new STEM content for the Parentzone Scotland website[3]. Parental Engagement will also be a focus for the Regional STEM Advisors and Improving Gender Balance and Equalities team.

In 2018, we brought together representatives from the many sectors that deliver STEM engagement events and content. As a result, a steering group of volunteers was formed to develop a national STEM engagement campaign. The aim of the campaign is to improve the visibility and impact of the wide range of activities that take place annually across Scotland. This will be done by bringing them together under an umbrella identity in a similar way to Scotland's Themed Years. This identity for STEM engagement activities is under development and will be launched and implemented with the support of sector partners throughout 2019.

In 2017-18, Skills Development Scotland's My World of Work Live (MyWoW Live!) programme, a hands-on experience of science and technology learning linked to STEM careers, continued across three sites in Glasgow, Shetland and Inverness. In the period April - September 2018, 8684 young people participated in MyWoW Live! and 77% said, as a result, they are more likely to think about studying science/technology subjects at school. 93% of parents said that after experiencing MyWoW Live! they believed their child would be more motivated about STEM subjects in school and 97% of teachers said MyWoW Live! increased their awareness about careers in STEM.

Skills Development Scotland is building on the success of MyWoW Live! with a revised offer that includes virtual and mobile face-to-face delivery through recruitment of regional delivery staff to extend the reach of the programme to more remote and rural locations. A review of the first phase of the revised programme delivery will be undertaken with recommendations for further expansion by December 2019. Next steps for programme expansion are to be agreed by March 2020. Colleges and universities are now being encouraged to promote higher levels of progression from school to further education and onward to higher education through Outcome Agreements.

Each of these actions will contribute to measures under KPI I and KPI IV, promoting both Excellence and Inspiration themes. Specific measurables are not expected to see immediate significant improvements as it will take time to build momentum.

Recognising and celebrating success

A key focus for 2019 will be the introduction of new STEM Awards with an initial focus on early learning and childcare, and schools, to recognise and build on activities in these sectors. We will also hold the first annual community learning and development STEM conference to showcase inspirational lifelong learning STEM practice.

This action is being specifically measured against KPI I g around participation in STEM related Youth and Adult Achievement Awards, with baseline data to be collated in 2019.

7. Connection

We will promote **Connection** by:

- improving the support available to schools
- delivering up to date advice and information on STEM careers and increasing responsiveness to the needs of the STEM
- 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)

Improving the support available to schools and increasing responsiveness

As highlighted above, a new college-led STEM Hub network has been created at a regional level to strengthen collaboration between partners including universities, science centres and employers, and to facilitate more joint professional learning between secondary schools and colleges, and primary and early learning settings.

The creation of the 13 regional hubs has already strengthened the links between key stakeholders at a regional level to enable smooth delivery of many of the actions within the Strategy. The hubs have collated a baseline of regional activity that identifies the areas of strength and good practice within the region and areas where further development is required. At the same time, the hubs will influence and be incorporated in the development of regional STEM strategies that are currently being pulled together, with progress being monitored through Outcome Agreements on an annual basis going forward.

College Regional STEM Strategies will indicate priorities for joint-working between schools, colleges, universities and employers, in which the regional hubs will play a key supporting role bringing together stakeholders and facilitating Career Long Professional Learning (CLPL) and STEM engagement. Work has been undertaken at Scottish Funding Council to develop guidance on the use of credit activity in primary and secondary schools delivered through colleges, providing the work ties in to the STEM Strategy themes.

A key focus for 2019 will be the development of an online directory of quality assured STEM inspiration activities for schools by external partners, including employers. Work will take place to scope and decide on the criteria and process for including activities. Together with the STEM Hubs, this will address a key issue identified in our consultation on the Strategy which was the need for more co-ordination of such 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. The Scottish Government funds the Scottish Council for Development and Industry's Young Engineers and Science Clubs and 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 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. Options around data collation for this KPI are currently being explored.

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

Skills Development Scotland (SDS) is developing a new system to make sure that STEM labour market information is available to careers advisors and teachers in an easily accessible form. There will be additional support and resources for teachers to help them use this information to put STEM learning into context.

The Scottish Funding Council has been auditing current practice on industry placements for students at college and university to establish a baseline on which to base future actions to increase placements. The results of the university audit will be available at the end of 2018, with the college audit to follow in Spring 2019.

In 2019, as part of our work to follow up the Learner Journey review, we will develop a comprehensive careers strategy for the all age careers service in colleges and

universities. This will link with the Careers Education Standard already in place for education from 3-18.

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 employer satisfaction with STEM skills and capability of employees. Data against this KPI will be monitored and activity adjusted accordingly if needed.

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 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 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 this report.

KEY PERFORMANCE INDICATORS - SUMMARY

Note

In December 2017, we published a set of Key Performance Indicators for the STEM Strategy. These were chosen on the basis that they related closely to the changes that we wish to see as a result of the Strategy. Where well established data sets existed, we set stretch aims for the targets. For others, either further data collection was need or they did not lend themselves to stretch aims. This annex provides an update on the status of each of the KPIs.

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.

Some of the indicators have required new or additional data collection and this is still being worked on (as noted below). Collation of outstanding information will be a priority in 2019. For some of them, only baseline data is provided as new data is not yet available. The changes that we can highlight this year may not be fully attributable to the Strategy actions as they 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. In many cases, time lags in availability of published data means that the information will refer back to year 2016-17. As this is prior to implementation of the Strategy, it may be some time before the impact of Strategy can be fully assessed. Details about underlying data for the indicators are 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 but, 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.

KPI	Baseline value and progress (where applicable)
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)	
Meet Initial Teacher Education student intake targets for all STEM subjects.	We have taken 2015-16 as a baseline. The trends prior to that vary from year to year. In 2015-16, entrants to the Mathematics, Computing and

	Physics courses were slightly down on previous years, up for Biology and Technological studies and the same for Chemistry. Overall, intakes for the STEM secondary teacher training courses were significantly higher in 2016-17 compared to 2015-16 but the targets were still missed, apart from Physics, where the target (73 entrants) was exceeded, with 80 entrants to the courses achieved.
Increase the number of passes at SCQF level 5 in Mathematics by 10% by 2022.	We have taken the 2017 SQA results as the baseline. The number of pre-appeal passes in that year were 28,135. Numbers for previous years were 28,782 (2014), 24,617 (2015) and 27,412 (2016). Therefore, the figures for both 2017 (the baseline) and 2018 (the current year) are similar to each other and slightly less than 2014 but they have increased in comparison to the 2015 figures.
Increase overall provision of Foundation Apprenticeship opportunities to 5000 new starts by 2019 and expand provision and Foundation Apprenticeship opportunities across all Scottish secondary schools.	Cohort 1 of the Foundation Apprenticeships (2016-2018 delivery) is the first year of delivery after the initial pilot phase and is the baseline year. Numbers increased in cohort 2, as might be expected whilst the programme is establishing.
Increase the number of apprenticeship opportunities in STEM related subjects at SCQF Level 9 and above.	The GA programme is still relatively new. The first cohort began in September 2017 and the second cohort in September 2018. We will publish data on both cohorts at the end of 2018 so this data is not currently available.
Increase the proportion of those who successfully completed a recognised qualification at college in a STEM subject.	2015-16 is the baseline year. The proportions of students enrolled onto STEM courses is 24% across all of the three years of 2014-15, 2015-16 and 2016-17, for full time students and ranges between 21% for part time students. Part time students account for about 70% of all STEM enrolments.

Increase the proportion of Scottish Domiciled qualifiers on Full-time First Degree STEM courses.	2015-16 is the baseline year. The proportions of Scottish domiciled qualifiers on first time degree courses is similar across the three years of 2014-15, 2015-16 and 2016-17 but has shown slight increases each year. This reflects a trend prior to 2014-15. The proportions in the baseline year were. 34.6% (excluding medical courses) and 51.2% (including medical courses). In 2016-17 the proportions were 35.4 (excluding medical) and 52.5% (including medical)
Increase in the number of participants in STEM related Youth and Adult Achievement awards.	No baseline data or trends exist. Baseline data will be available by March 2019.

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)

Increase the cumulative hours of STEM professional learning accessed by early years, schools, college and CLD practitioners annually.	No baseline data or trends exist. Baseline data will be available by end January 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)

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.	2015-16 is the baseline year when the gap was 36.8 percentage points. Data from previous years show that the current value (35.6 percentage points) is a reduction on the gap in all previous years. Between 2015-16 and 2016-17 there was a slight increase in the proportion of school leavers with 1 or more STEM award at SCQF level 6 in the most deprived quintiles and a slight decrease in the proportion of school leavers with 1 or more STEM award at SCQF level 6 in the least deprived quintiles.
Improve the gender balance in attainment in key STEM related subjects at SCQF level 6 by increasing	2017 SQA data is the base line 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. For Physics, they declined again slightly in

the number of females passing Physics by 15% and Computing by 20%, by 2022.	2018 to 1863 passes. For computing, female passes declined from 670 in 2014 to 480 in 2017 – again, with variations from year to year - and then increased by 72 passes to 552 female passes in 2018.
Improve the gender balance in STEM subjects studied at college and university.	The percentage of female enrolments across the STEM subjects in HE has been broadly stable from 2015 to 2016. In 2017, it ranges from 65% for the biological sciences to 19% for Engineering and Technology and 20% for Computer Science. There were very slight increases in the proportion of female enrollments in engineering/technology and computing between 2015 and 2017 but a slight decrease for mathematics. In FE, the total proportion of females taking STEM courses has decreased from 14.1% in 2014/15 to 11.8% in 2016/17 for full time students and from 22.8% to 21.7% for part time students.
Increase gender balance in the uptake of STEM related Foundation Apprenticeship opportunities in the senior phase of school.	Females represented 8.1% of starts in STEM Frameworks for cohort 1 (2016) and 13.2% of starts in STEM frameworks in cohort 2 (2017) but this might be expected as the programme expands and develops.
Increase the proportion of schools from most deprived quintile that receive a quality STEM engagement experience from funded Science Centres.	Baseline taken as 34.1% in 2016-17, the year prior to the launch of the STEM Strategy and the first to use data from SIMD16. The proportion in 2017-18 was 44.9% 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 the SIMD data zones in 2016 from the previous data in 2012 and a slight decrease in the total number of eligible schools.
Increase the number of members of community groups from the most deprived or rural areas participating in quality engagement with Science Centers and festivals to 10,000 by 2022.	The baseline has been taken as 8235 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 1000 participants from the previous year. In 2017-18 the number of visits increased again to 8604. This represents the highest participation since the subsidy was started.
IV. Increased numbers of people who understand the benefits and value of STEM for themselves, their families and their communities. (Inspiration)	
Increase the proportion of young people who say they feel studying STEM is important for them and/or for their future careers in the Young People in Scotland Survey.	Baseline data gathered in 2017 survey and will be available every 2 years. Almost two thirds (65%) of respondents said they had chosen or thought they would choose to study a STEM subject. Of these, 52% and 16% said they had chosen a STEM subject because they felt it was important to them/and/or for their future career. 56% said that it was because they enjoyed STEM. We have baseline data from the 2017.
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.)	This information is not currently available and is unlikely to be available via the Developing Young Workforce Regional Groups in the short-term. However, every school in the country should have at least one school / employer partnership in place and in most cases this will include elements of STEM activity.
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)	
Increase the numbers of placements and internships with employers for college learners within STEM curricular areas.	The data for this KPI is not yet available.
Reduce the proportion of STEM employers in Scotland experiencing skills shortages.	The proportion of STEM employers in Scotland with skills shortage vacancies is 7.7% in 2017.

STEM STRATEGY DATA

In the STEM Strategy we said we would collect and analyse a wide range of data and information about STEM education and training.   Key findings from our analysis, in addition to the KPI data are:

- Overall, numbers of secondary STEM teachers have remained relatively stable in recent years and currently total 8,604. In 2015, STEM teachers accounted for 16.2% of all secondary teachers. In 2017 they accounted for 15.9% of all teachers. . There are fluctuations within these figures at a local authority and subject level with some areas and subjects experiencing acute shortages. For the fifth year in a row, the targets for student teacher intakes to STEM courses have increased. The Teaching Makes People campaign, the STEM Bursaries and a range of alternative routes into teaching targeted at STEM shortage subjects are aimed at improving this position.

- Reflecting changes for other subjects and in line with changes to the numbers of young people going into the senior phase at school, passes in STEM subjects at SCQF levels 3,4,5 and 6 (Higher) have decreased in recent years. In 2018, there were 5.8% fewer passes across the STEM subjects compared to 2017. For SCQF level 6 (Higher) level, the decrease was 2.3%. Passes at Advanced Higher level increased by 2.9%.   There are differences between the subjects and fluctuations from year to year. The gender balance in subjects has remained similar in recent years with higher proportions of female passes in Biology and higher proportions of male passes in Physics, Computing and the Technologies. A number of actions within the strategy are aimed at ensuring that learners from all backgrounds experience excellent STEM learning and are inspired to select STEM subjects from an early age and continue these through to qualifications and employment.

- At colleges, STEM related study accounts for 24% of all full time enrolments and 21% of part time enrolments. These proportions have been similar in the recent years. In 2016, there were 10,990 full time enrolments and 25,762 part time enrolments in STEM courses (excluding medical, health and veterinary related courses). There are higher proportions of males than females at all levels of STEM subjects at colleges and this has been the case for a number of years. The Scottish Funding Council has produced a Gender Action plan and publishes a detailed technical report each year with data on participation in college courses by gender.

- Enrolments at Higher Education Institutions on STEM (non-medical) courses increased over the past year, up 3.6% to 79,200 in 2016-17. 84% of all STEM (non-medical) enrolments in 2016-17 continue to be on full-time courses. In general, those in STEM (non-medical) courses are younger than those on non-STEM (including medical) subjects. 79% of all STEM (non-medical) enrolments are undergraduate level – this compares to 74% for non-STEM subjects. Scottish domiciled enrolments make up 64.2% of all STEM (non-medical) enrolments. EU domiciled students make up 11.5% of all STEM (non-medical) enrolments. Males make up 59.6% of all STEM (non-medical) enrolments in

2016-17, a decrease from 60.5% in 2014-15. Non-STEM (including medical) enrolments are markedly different with only 32.8% of enrolments on non-STEM (including medical) subjects by males (down from 33.9% in 2014-15).

- Actions within the Strategy look at identifying new ways of opening up opportunities in STEM study by breaking down gender barriers and encouraging prospective students from deprived areas; encouraging higher levels of progression and pathways from school to further education, and onward to higher education STEM courses; promoting the expansion of financial support for taught postgraduate study; and enhancing the focus on STEM careers by college and university careers advice services.

- In 2017-18, there were 50 STEM MA frameworks, where 38.1% of MA starts were STEM. Further analysis shows 65.1% of STEM starts were aged 16-24; 9.1% of STEM starts were female; and 57% of MAs in-training were in STEM Frameworks. This compares to 2015-16 when 34% of MA starts were STEM. STEM framework starts tend to be at a higher level with 79.9% at SVQ level 3 or above, compared to 68.2% across all MA starts. This is an increase on the previous year of 4.3% or 337 STEM MA starts. Nine of the 13 new GA frameworks developed for delivery in Academic Years 2018-2020 are STEM. The number of STEM FA frameworks has increased from 4 in 2016 with 161 starts to 6 in 2017 with 552 starts.

- In 2017 an estimated 804,000 people were employed in STEM related industries in Scotland, an increase of 6.5% from 755,000 in 2014. STEM related industries accounted for 30.7% of all employment in 2017 compared with 29.5% in 2014. These figures include health related businesses and activities. Excluding these, STEM industries account for the employment of 616,000 people, 23.5% of all employment in Scotland in 2017. Males account for 70% of the STEM related employment that excludes medical and health related activities and 58.2% of all STEM related employment including health related activities. STEM education and training therefore connects to a sizeable proportion of the Scottish labour market. The actions we are taking to promote a better gender balance in STEM education and training should provide a platform for action on gender equality in the workplace.