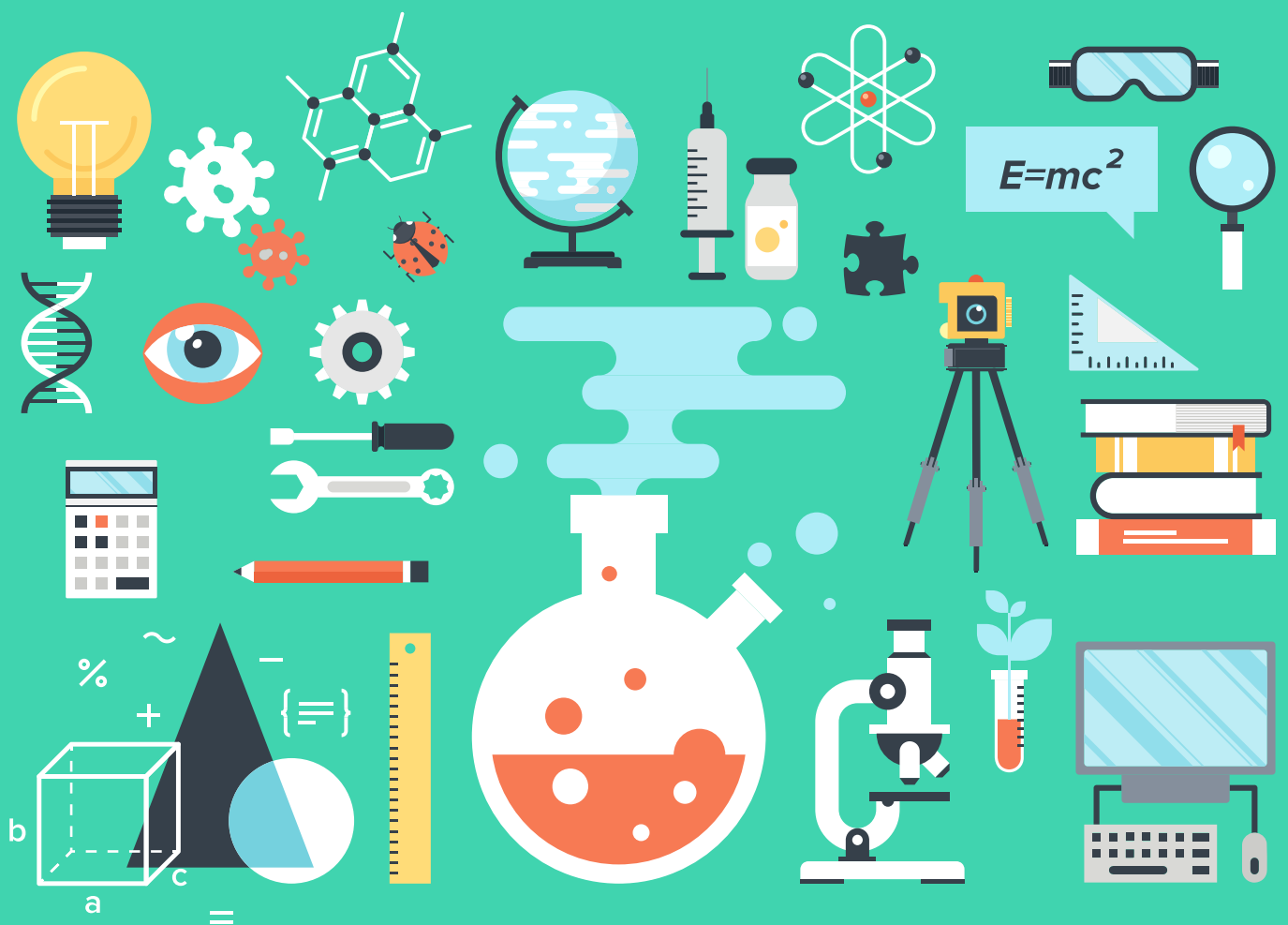




# STEM

Strategy for Education and Training in Scotland  
Third Annual Report

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# Contents

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1.	Ministerial Foreword	02
2.	Introduction	04

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4.	Excellence	06
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5.	Equity	16
----	--------	----



6.	Inspiration	22
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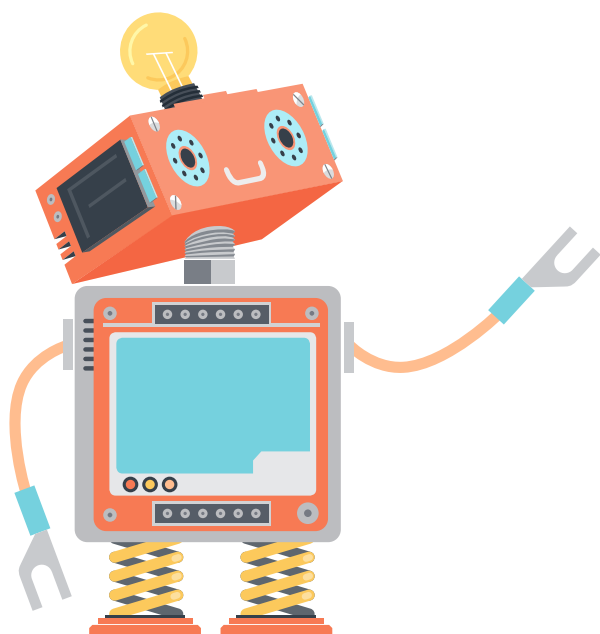
7.	Connection	28
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8.	What's Next?	32
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## Annexes:

A.	What is STEM?	35
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# 1

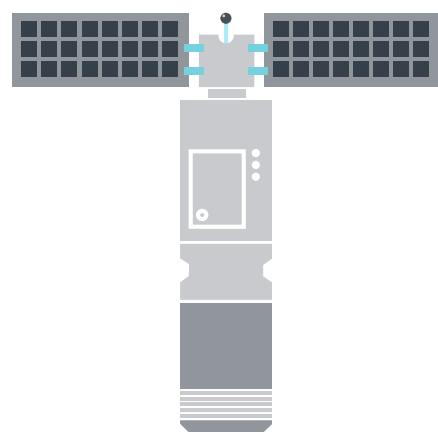
## Ministerial Foreword



Science and innovation are embedded in Scotland's heritage and culture and integral to our future economic growth. STEM – Science, Technology, Engineering and Mathematics – has never been more relevant as we face the challenges of a global climate emergency, uncertainty arising from the UK's exit from the European Union, and the need to recover from the COVID-19 pandemic.

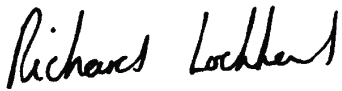
COVID-19 has placed significant stress on the education system and on our young people; from the youngest citizens in early years to those studying at an advanced level at our universities. We have all had to adapt to the restrictions necessary to contain this deadly pandemic. New skills have been brought to the fore such as flexibility, creativity, innovation and a greater capacity to react to changed circumstances at very short notice.

Our education system in Scotland has demonstrated a strong and enduring capacity to adapt over the past year and to make the necessary changes for the benefit of our young people. The aim has been to ensure as much as possible that young people in particular can continue with their learning. Technology has played a key role; perhaps more so than many of us would have imagined only a year ago. The National e-Learning Offer – a collaborative programme involving Scottish Government, Education Scotland and local government – is helping to improve the options available to schools by enhancing the provision for “live” remote learning, recorded lessons and supported learning via online digital learning.



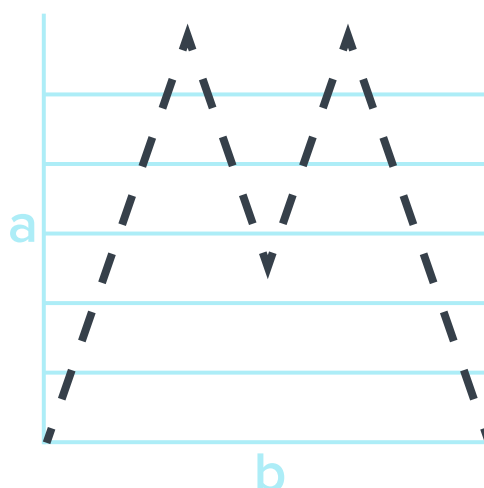
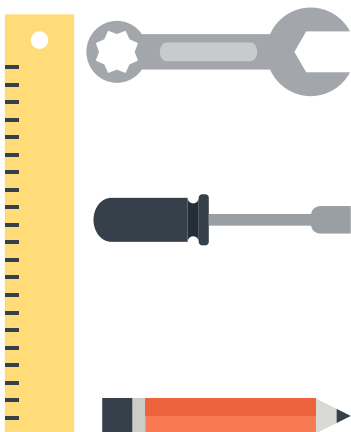
While I would have hoped to have presented this third annual report of the STEM Education and Training Strategy with supporting evidence from a variety of sources and a strong evidential base showing how we have improved STEM provision in schools and beyond, the COVID-19 restrictions mean that level of detail is not possible. Some stakeholders who ordinarily gather data have either been re-deployed to COVID-19 related tasks or have been furloughed. However, I am able to highlight here significant areas where good progress is being made. These include STEM apprenticeships, measures to address gender inequality in STEM and an innovative new STEM awards programme for young people.

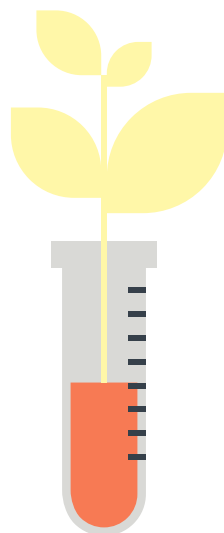
This Strategy sets out our vision of a Scotland where everyone is encouraged and supported to develop their STEM capability. We continue to focus on the themes of excellence, equity, inspiration and connection. We demonstrate how, despite the challenges we face, we have been able to deliver progress that will benefit our young people, their educators and wider Scottish society.



**Richard Lochhead MSP**

Minister for Further Education,  
Higher Education and Science



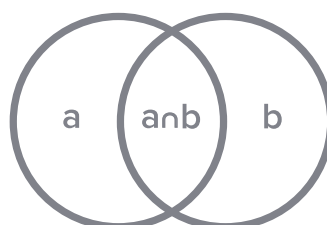


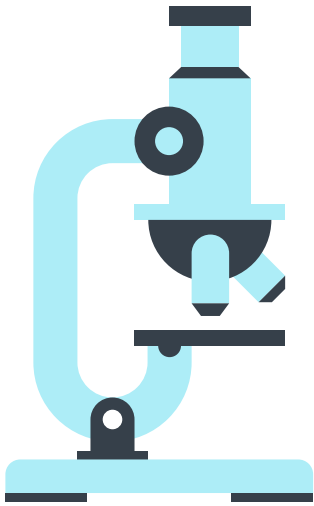
# Introduction



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.





We have made no change to the four key aims of the Strategy that were set out four years ago. These are:



- 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.

This report is divided into actions reflecting each of those themes alongside some of the opportunities that exist for enhancing actions in the years to come. We intend, subject to lifting of COVID-19 restrictions, to produce a short analysis report in the Autumn that will comment specifically on progress in respect of the Key Performance Indicators that are, and will remain, a key feature of our strategic approach to STEM education and training in Scotland.

# 3 Excellence

We will promote **Excellence** by:

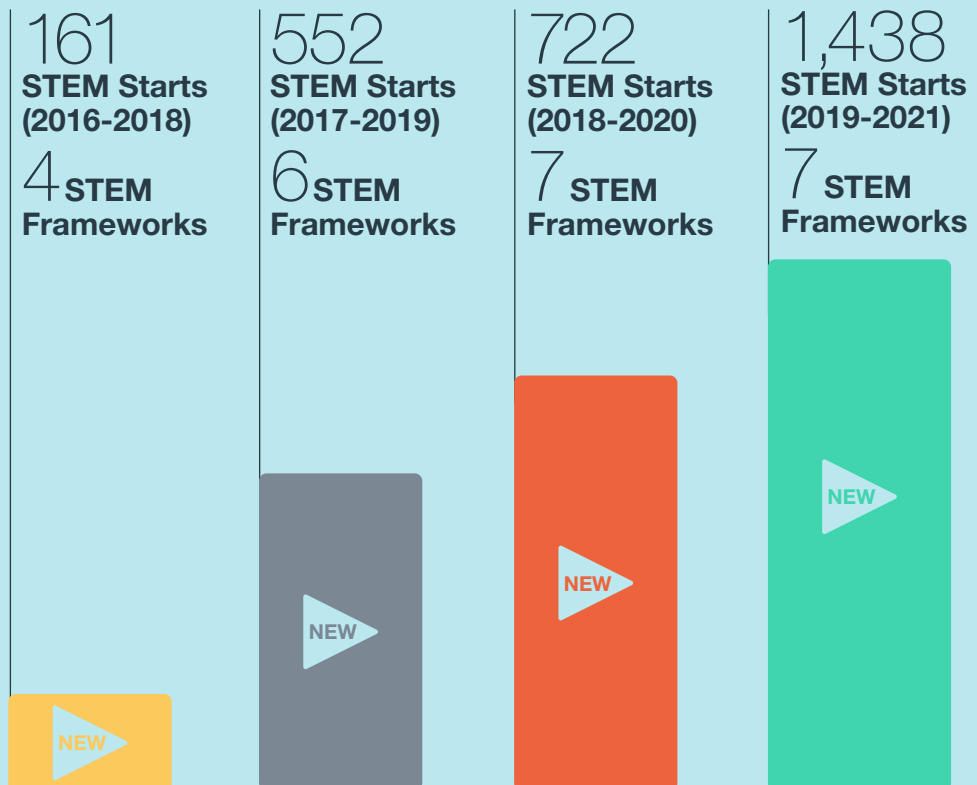
- Improving the supply of STEM talent into the teaching profession.
- Improving STEM learning and teaching, and delivering enhanced professional learning.
- Prioritising STEM in the expansion of apprenticeships.
- Maintaining our research excellence in our universities.

**Skills Development Scotland** continues to work with partners at a local level to increase uptake of Pre-Apprenticeship and Foundation Apprenticeship STEM-related programmes, starting in 2018 and continuing until 2022. Young people from 325 schools across 32 local authority areas have been participating in Foundation Apprenticeships, representing a significant increase in school engagement from 66 schools in 2016-18 across 19 local authority areas. SDS has worked with the SQA, sector skills councils and learning providers to accelerate planned adaptations and ensure delivery of Foundation Apprenticeships could be effectively managed within current COVID-19 restrictions.

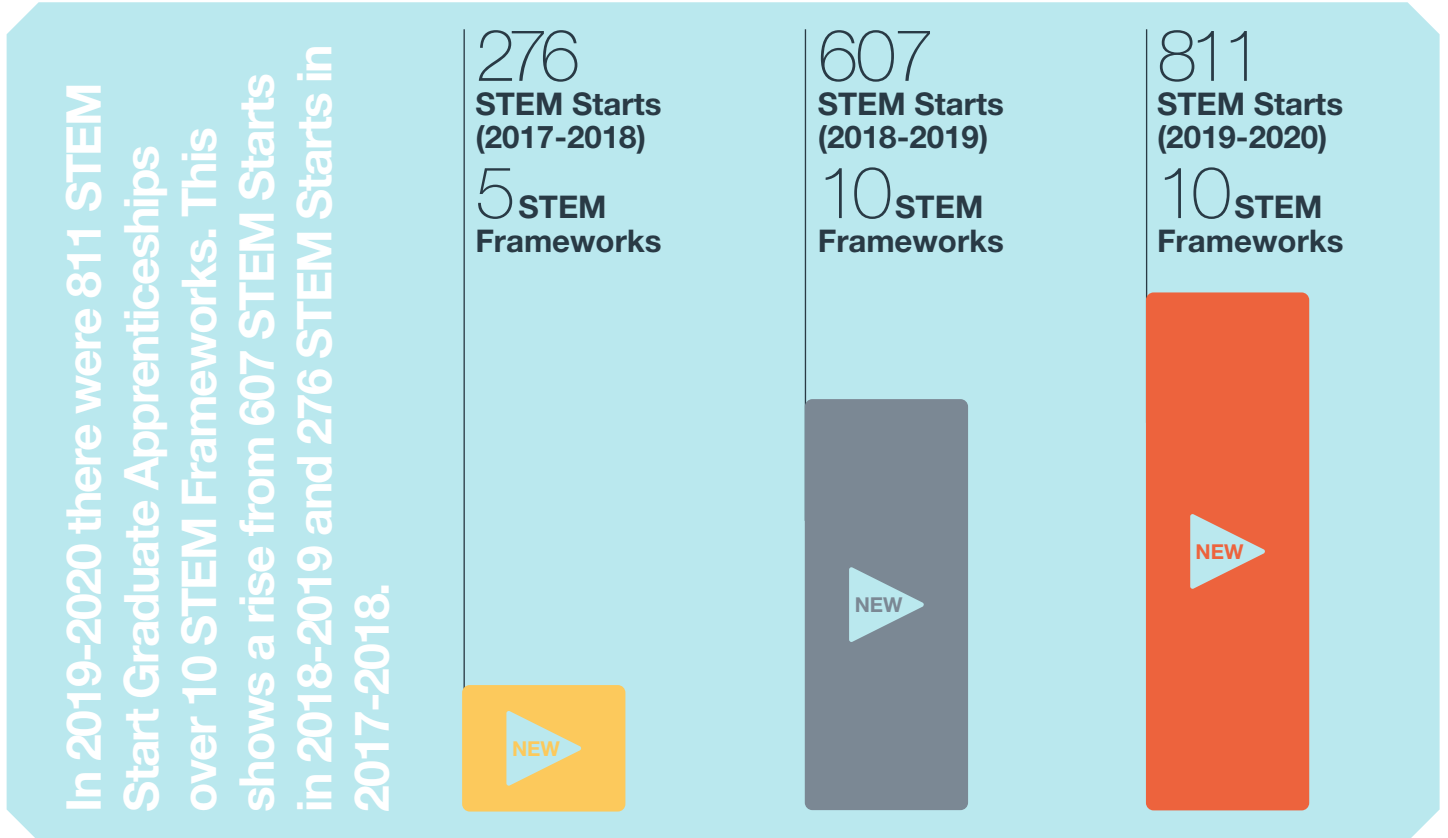
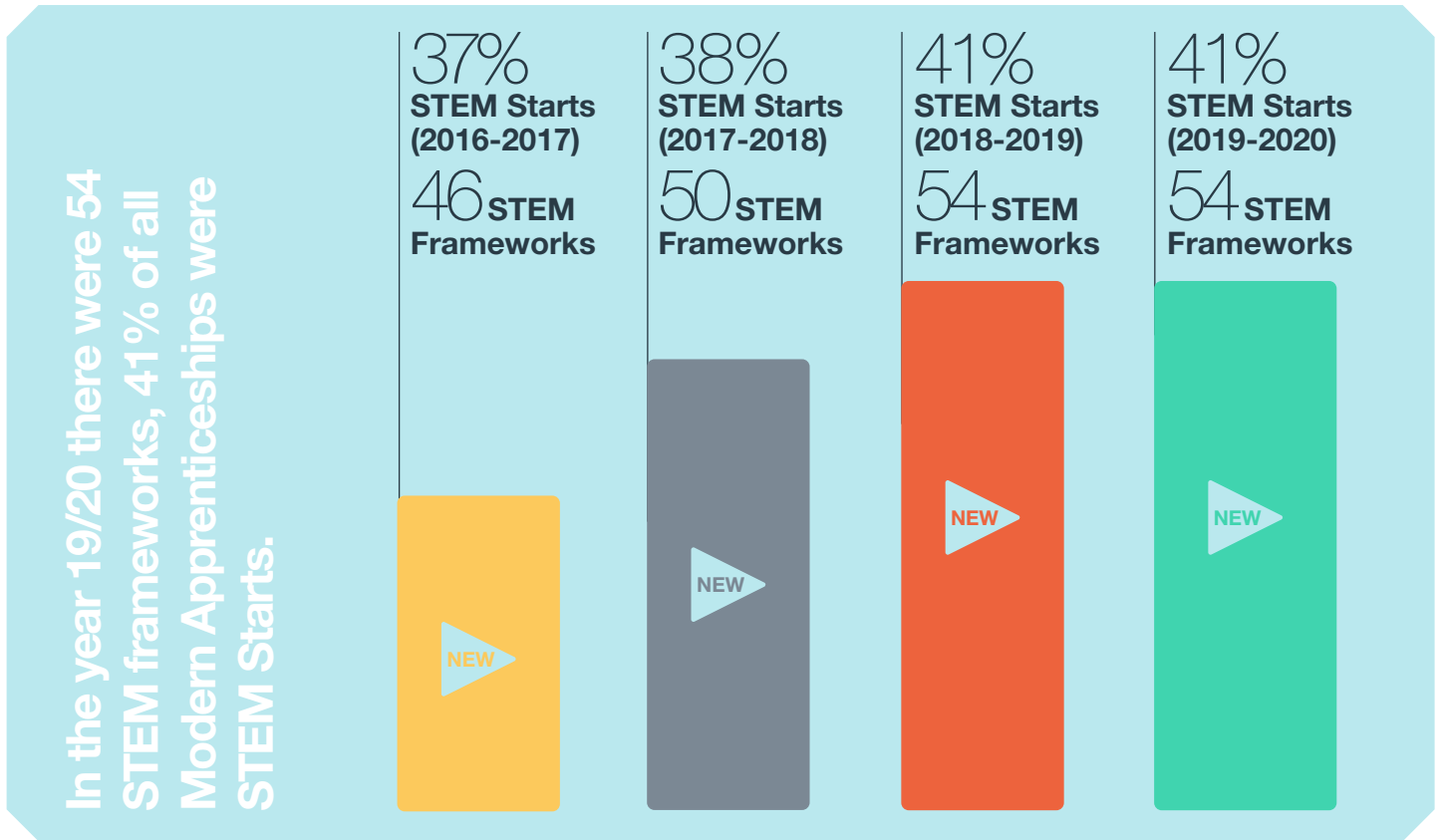
Data published in June 2020 show that in 2019/20 41% of Modern Apprentice starts were in STEM frameworks. Of all STEM starts, 64% were aged 16-24 and 81% of STEM starts were at SCQF Level 6 and above or VQ level 3. 10 out of the 14 available Graduate Apprentice Frameworks are focussed on STEM subject areas.

Number of STEM Foundation

Apprenticeships new starts increased from 161 in Cohort 1, to 552 in Cohort 2, to 722 in Cohort 3 and to 1,438 in Cohort 4.







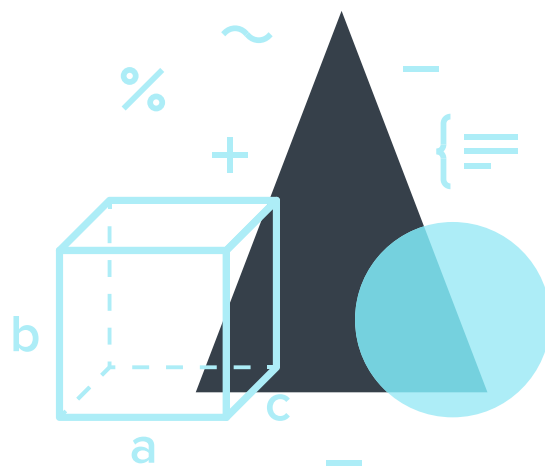
**STEM Bursaries**

We have been able once again to continue the **STEM Bursaries** programme administered by Skills Development Scotland. To date, 368 bursaries have been awarded. In the past two years, we exceeded the bursary target with 107 bursaries awarded in 2018-19 and 111 in 2019-20 and in 2020-21 we awarded 150. The 2021-22 STEM

bursary scheme will offer a bursary of up to £20,000 to encourage career changers to train as secondary school teachers in Physics, Chemistry, Mathematics, Computing Science, Technical Education and Home Economics. The bursary scheme will be open for applications on 5 April 2021.

## Teacher Numbers

Teacher numbers are currently the highest they have been since 2008, with the number of primary teachers the highest since 1980. Figures published in December 2020 show that teacher numbers increased for the fifth year in a row – rising to 53,400 in 2020. The ratio of pupils to teachers is at its lowest since 2010.



### Initial Teacher Education: 2020 provisional student teacher intake

Initial Teacher education	Target	Intake At October 2020
<b>Primary</b>		
U/g degree	711	754
PGDE	1,155	1,214
U/g (combined degree)	68	105
<b>Total</b>	<b>1,934</b>	<b>2,073</b>
<b>Secondary</b>		
U/g degree	165	161
PGDE & other routes	1,800	1,647
U/g (combined degree)	171	118
<b>Total</b>	<b>2,136</b>	<b>1,926</b>
<b>Overall Total</b>	<b>4,070</b>	<b>3,999</b>

*This tables show provisional information received from Universities on intakes to initial teacher education in 2020-21. This information is not official statistics but indicative figures provided by Universities at the start of the academic session. The Higher Education Statistics Agency (HESA) publishes the official data a year later.*

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In 2019 the breakdown of teachers by main subject taught shows 6,120, of which 3,522 were female and 2,298 were male.

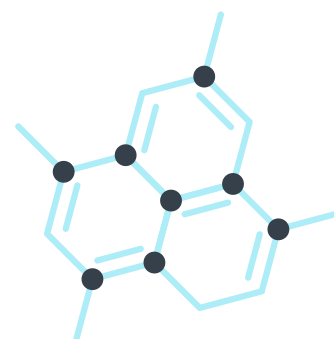
Main Subject Taught								
	2014	2015	2016	2017	2018	2019		
	Total	Total	Total	Total	Total	Female	Male	Total
Mathematics	2,403	2,350	2,331	2,361	2,364	1,384	978	2,362
Biology	1,179	1,165	1,183	1,153	1,213	938	317	1,256
Chemistry	937	932	942	982	948	619	348	967
General Science	129	128	131	136	144	72	78	149
Physics	823	807	814	826	806	261	545	806
Computing Studies	636	601	594	582	595	247	332	579
<b>Total</b>	<b>6,107</b>	<b>5,983</b>	<b>5,995</b>	<b>6,040</b>	<b>6,070</b>	<b>3,522</b>	<b>2,598</b>	<b>6,120</b>

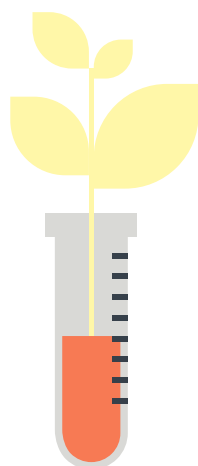
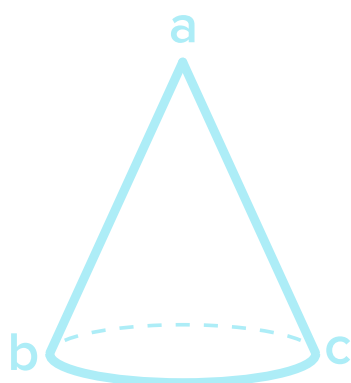
Additional teachers have been recruited in the 2020-21 school year to support the recovery of education following the disruption caused by COVID-19. These teachers are likely to be a major contributing factor to the increase in teacher numbers, reduction in overall pupil-teacher-ratio, decrease in average primary class sizes, increase in proportion of teachers on temporary posts and the overall proportion of the 2019-20 cohort of Teacher Induction Scheme probationers in teaching posts.

### National Improvement Hub

Ease of access to teaching and related resources in STEM continues to be important if teachers are to provide a high-quality learning experience for young people. The [Education Scotland National Improvement Hub](#) continues to offer a range of case study and teacher resources for primary, secondary and early years practitioners. In addition, between January and December 2020,

Education Scotland STEM Officers were able to undertake 580 engagements, benefiting 452 unique establishments and 2,449 attendees. Findings from the annual STEM Practitioners Survey (2018-19) has found that 24% of those surveyed noted that they had engaged with the Education STEM Self-evaluation Framework.





### e-Learning Offer

The Education Scotland National **e-Learning** Offer now contains over 22,000 resource links across 26 subject spreadsheets. Of these, 10,927 were for STEM subjects. This has led to 41,610 page views by 16,055 users, mainly to access

STEM resources. In addition, the STEM Team at Education Scotland has led on the filming of nearly 150 practical science videos for National Qualifications.

### STEM Qualifications

SQF Level 6 entry data shows a 0.4% increase across STEM Subjects.

Subject	2016	2017	2018	2019	2020	% change 2019-2020
Biology	7,492	7,575	7,306	7,686	7,428	-3.4%
Chemistry	10,077	10,135	9,992	10,047	10,038	-0.1%
Human Biology	5,990	5,926	5,938	6,259	6,968	11.3%
Physics	9,129	8,956	8,280	8,327	8,392	0.8%
Other Sciences	392	454	423	392	360	-8.2%
Computing Sciences	4,454	4,476	4,099	3,228	3,164	-2.0%
Mathematics	18,871	18,861	18,753	18,626	19,181	3.0%
Technology	13,218	13,072	12,701	11,506	10,802	-6.1%
<b>Total</b>	<b>69,623</b>	<b>69,455</b>	<b>67,492</b>	<b>66,071</b>	<b>66,333</b>	<b>0.4%</b>

## SSERC – Professional Learning

During 2019-20 SSERC (Scottish Schools Education Research Centre) has continued to deliver a programme of experiential professional learning with the main focus on the curriculum, including digital skills and computing science. Their Primary Cluster Programme has supported 78 teachers from 14 clusters across 7 local authorities to raise their own confidence and expertise in STEM by becoming mentors in STEM. The aim is that as mentors they should provide professional learning support for their colleagues within a local authority area.

### SSERC – Key Facts

- 1,536 CPD training days supporting Primary STEM education
- 50 CPD training days supporting Early Years STEM education
- 1,358 CPD training days supporting Secondary STEM education
- 522 CPD training days supporting school technicians

In the academic year 2020-2021, along with all other organisations, SSERC has faced the challenge of reaching their audience in the face of ‘lockdown’ restrictions. This has meant that courses they offer, including for newly-qualified teachers, have been reconfigured for delivery online.

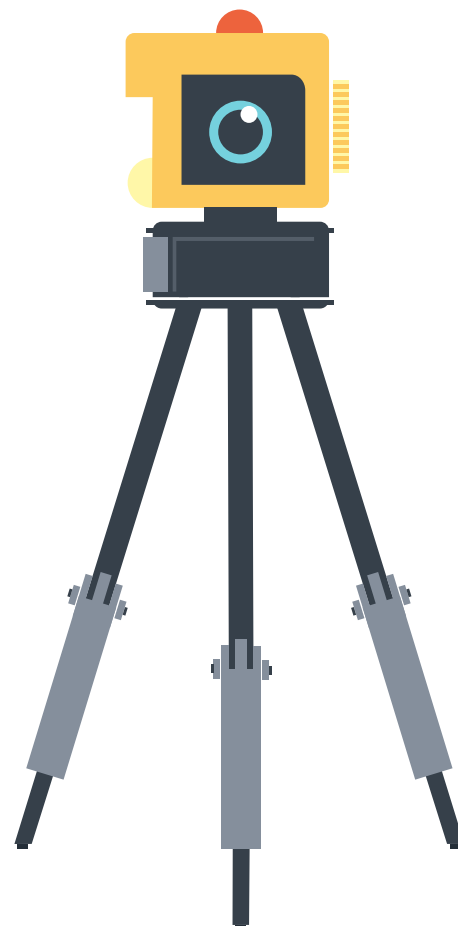
In secondary, SSERC has continued to provide support for 81% of secondary schools across all 32 Local Authorities and in order to recognise the key contribution made by technical support services in schools, SSERC has also provided a competence-based training courses to support school technicians across 6 SSERC Accredited Centres.

In computer science, SSERC has supported two professional learning programmes for mentors in the primary cluster programme – *Laying the Foundations of Computer Science* and *Magnificent Microbits*.

The 3 Scottish STEM Ambassador Hubs (managed by SSERC) collaborated with Maths Week Scotland to deliver a range of STEM activities before and during Maths Week Scotland – see below. STEM Ambassadors have been offered courses in order to gain greater confidence in maths. This was very much a practical activity in which a video “Marvellous Maths” was produced focusing on how maths is used in the workplace.

The first STEM Ambassadors in Scotland Week took place in February 2020 as a celebration of STEM in Scotland. Over 190 schools registered to access the resources created by 60 STEM Ambassadors. Resources included pre-recorded themed careers presentations and short videos on different STEM jobs in Scotland.

The Scottish Hubs continue to work with their local Developing the Young Workforce regional groups and provide STEM Ambassadors for school-led career events and activities, in addition to large scale events such as Scotland’s Biggest Parents’ Evening. Since April 2020 there have been 5,934 approved STEM Ambassadors, clocking up 10,591 volunteering hours.



The UK STEM Ambassador programme has firmly established itself as the leading STEM volunteer programme in the UK. With a 19 STEM Ambassador Hub network across the UK, STEM subjects are brought to life by over 33,000 volunteers who volunteer 640,000 hours per year. In Scotland, the STEM Ambassadors Hubs are:

- SAE@SSERC – covering the East of Scotland
- Science Connects – covering the West of Scotland
- Aberdeen Science Centre – covering the North of Scotland

COVID-19 and the resulting restrictions could have negatively impacted on the ability of SSERC to deliver planned professional learning in 2020-21. In response, the SSERC team quickly reconfigured most professional learning activity to be delivered online, providing a blend of live online, pre-recorded and self-study. Whilst this can never be an adequate replacement for hands-on experiential learning, it did allow for extended reach across the whole of Scotland.

### Support for PGDE Students

All PGDE Science and final year undergraduates following a science with education programme in Scotland are invited by SSERC to the Scottish Universities Science School which is held during their training year.

In order that hands-on practical activities could take place, delegates received a kit of equipment and other resources that would enable them to ‘cook along’ with presenters from the SSERC secondary science team. Young people have responded particularly positively to the kit provided by SSERC. Feedback also indicated that they were pleased to be able to use some of the materials to support their own online teaching.

**“The home kits and resources have been brilliant. The organisation has been great and our kits/instructions have been easy to follow and use. It also shows that if a second lockdown was to occur there is so much that our pupils can be doing at home in relation to Science.”**

## RAiSE

### Raising Aspirations in Science Education (RAiSE)

(RAiSE) is a programme of The Wood Foundation, Education Scotland, Scottish Government, and participating local authorities. RAiSE equips primary practitioners with the skills, networks, and confidence to deliver engaging and motivating STEM experiences. Participating local authorities appoint a Primary Science Development Officer (PSDO) to support professional learning and partnership working. PSDOs co-ordinate and deliver professional learning, create networks, empower practitioners, organise events, develop partnerships, highlight opportunities, and offer tailored operational and strategic support.

There is currently a suite of online resources and opportunities which are shared nationally through social media and other platforms. As at December 2020, 77% of teachers involved in the RAiSE programme noted that the pupils’ STEM aspirations have increased.

The initiative is now a national offer with a rolling programme of education authority engagement. As of February 2021, 17 authorities have been involved and over 300 professional learning events have run between August and December 2020. To date, RAiSE has delivered over 1,450 professional learning events, with over 54,605 cumulative hours of professional learning.

### SSERC – Key Facts

- Number of Practitioner engagements in RAiSE Activities – 3,273
- Number of establishment engagements in RAiSE Activities – 809
- Number of Cluster engagements in RAiSE Activities – 62
- Number of CLPL events delivered – 408
- Number of cumulative CLPL hours an authority delivers through RAiSE – 4,725

## Cyber Skills

Since the launch of the **Discover Cyber Skills programme** in 2017 over 130,000 young people have used the initiative to explore careers in this sector through classroom-based and online lessons and challenges. The Digital World platform provides information and insights into careers in cyber security, including through case studies.

## Digital

Education Scotland is providing dedicated support to digital skills development in early learning settings and schools, including primary schools. The use of digital tools for learning and teaching has been extensive since March 2020 and has enabled practitioners to provide better continuity for the learning experience of young people. The skills practitioners have gained and the breadth of applications they use to facilitate, support and lead learning will continue as part of everyday learning and teaching post-COVID-19. This work will continue to develop the digital literacy skills that learners will require for their learning, life and work in the future.

Currently, the focus is on supporting practitioners with remote learning pedagogies. This work includes delivering new content online, interactive learning, a digital day in a primary school and subject-specific examples of online delivery.

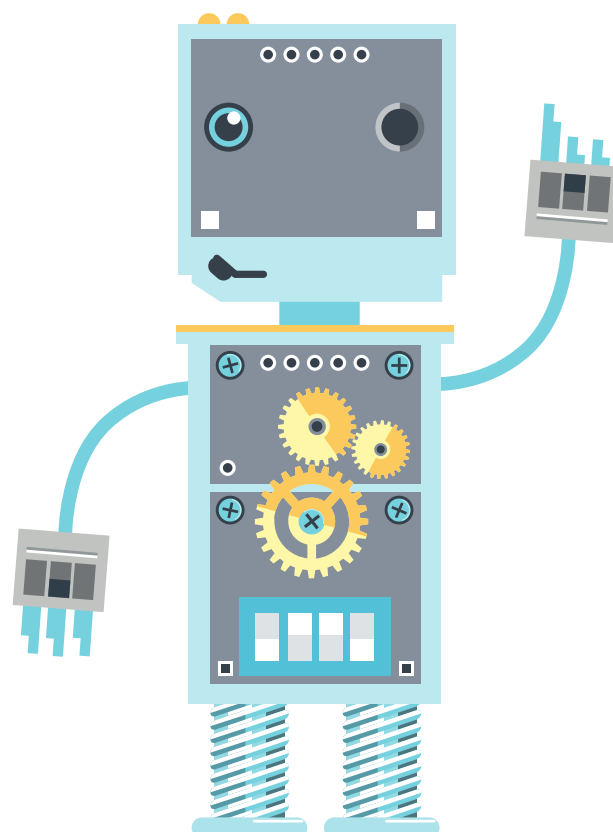
Since March last year, over 11,000 practitioners have engaged in the 203 webinars delivered by Education Scotland Digital Officers, focusing on the delivery and creation of online learning. The Education Scotland **digilearn.scot** website hosts access to a range of support such as live and recorded webinars, practitioner learning pathways and practitioner blog posts which have had over 259,000 views. The YouTube channel hosting all video content has had more than 5,000 hours of videos viewed since April 2020.

## Numeracy and Mathematics

Education Scotland's Numeracy and Mathematics officers, continue to work alongside practitioners, schools, local authorities and regional improvement collaboratives (RICs) to deliver support and drive improvement. In August 2020, a series of **Professional Learning Resources** were published to advance effective learning and teaching of discrete themes within numeracy. To complement these publications a series of national

webinars were designed and delivered to over 1,000 practitioners from across Scotland during the period of September 2020 - March 2021. These sessions were well received and resulted in subsequent webinars being requested by RICs and local authorities. To date an additional 84 webinars/professional learning events have been delivered to practitioners, each reinforcing effective learning and progression within numeracy and exemplifying skills and application within the context of STEM.

The reach of the Education Scotland Numeracy and Mathematics officers continues to be extensive. As a result of regional working, strengthened relationships with local leads and schools has resulted in a significant amount of national support being delivered directly to schools and practitioners. In addition to the impact and reach of webinar events, during the period of March 2020 - March 2021, 651 hours of interaction, arising from 397 engagements with over 168 establishments were recorded. The core focus of these engagements included planning, delivering professional learning to enhance learning and teaching and supporting improvement through collaboration.

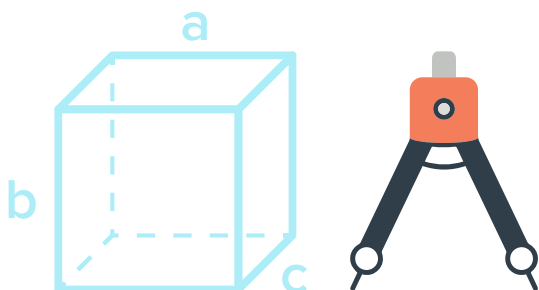


## Learning for Sustainability

The links between STEM subjects and our cross-curricular theme of Learning for Sustainability are vitally important to this Strategy. The Scottish Government and partners in Education Scotland, SQA and other organisations have continued to work together to implement our Learning for Sustainability action plan. Much of this work reaches into STEM subjects in both the Broad General Education and Senior Phase, where the study of environmental science, the living environment, the Earth's resources and sustainability is so crucial to delivering on learners' entitlement to LfS.

Strong links between STEM and Learning for Sustainability exist in engineering and technologies, in particular when looking at energy production and distribution.

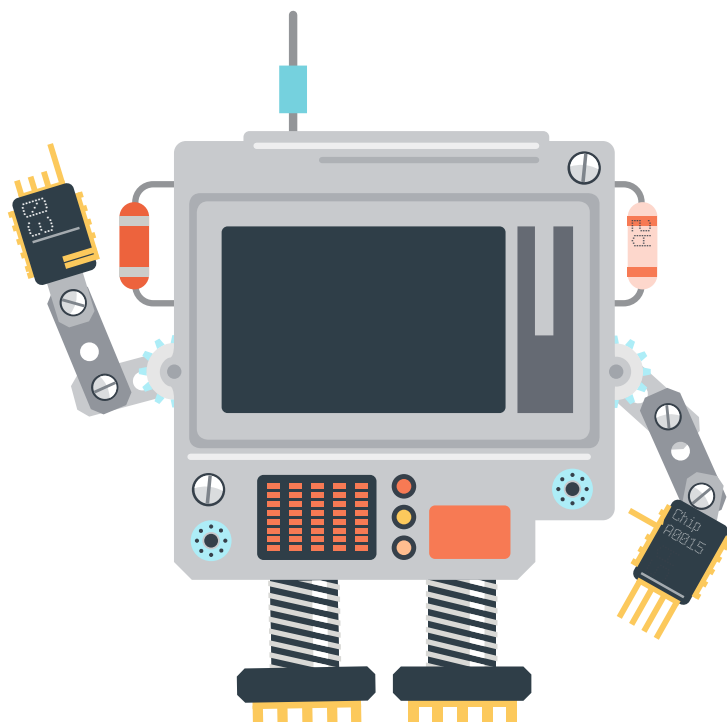
There has been a noticeable increase in taking STEM outdoors, demonstrated by the professional learning in STEM grants. The Royal Highland Education Trust has been delivering sessions on STEM in farming and food production across Scotland, as have Kemnay Academy in Aberdeenshire. Projects such as Aviemore Early Learning and Childcare Service in Highland, and Inverkip Primary in Inverclyde have focused on looking at STEM in their local environment in early and first levels. In addition, the Field Studies Council and the John Muir Trust have been supporting practitioners in developing the STEM by Nature project in Tayside.



## STEM Grants

The **STEM Grants Programme** was launched in October 2018 to build the capacity and confidence of practitioners and to support the STEM Strategy. The grants are available to support practitioners across early learning and childcare, primary, additional support needs and secondary school, community learning and development and school-based technical support staff. 8,392 practitioners benefitted from the 24 projects funded through Round 1 of the grants programme.

The programme aims to increase access to STEM learning opportunities and encourage confidence in practitioners across Scotland. These focus on the sciences, maths and numeracy, digital learning, engineering and technologies.





## Some examples of where project grants have been provided include:

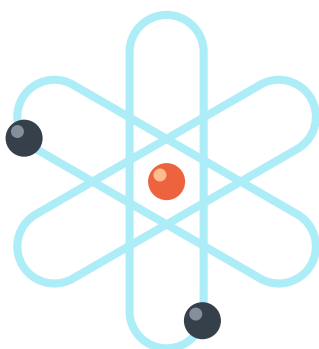
- **The Institute of Physics** planned to create three new professional learning hubs in rural areas in Scotland. These were to support high quality, bespoke professional learning for physics teachers and build relationships with schools and clusters in areas with deprivation in relatively remote and rural locations.
- **The Royal Society of Chemistry** aimed to increase primary teacher confidence within STEM subjects and promote a seamless transition in learning from P7 to S1. This was to engage with practitioners to identify their professional learning needs and provide online opportunities for teachers in rural areas to participate in professional learning.
- A project by **East Ayrshire Council** set out to inspire practitioners, build confidence, skills and knowledge in STEM subjects and help ensure equitable and engaging learning environments. Sessions were supported by staff from the Forestry Commission, the Environment and Forestry Network and the Collaboration Cluster Team. This resulted in five interdisciplinary lessons focusing on developing STEM skills.
- **Glasgow City Council** supported planning for the extension of the successful STEM Glasgow programme of professional learning for practitioners to 3 interested local authorities within the Regional Improvement Collaborative. This enabled a greater number of practitioners to benefit from the Primary STEM Leaders Programme providing experiential professional learning for practitioners.

# 4

## 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.



### IGBE Programme

Tackling gender inequality across different areas in the education and learning landscape is of fundamental importance, in order to ensure equality of access, opportunity and outcomes for all girls and women, at every point of their learning and development journey. Current activity falls in to two broad categories: strategic frameworks and policy commitments.

We aim to change perceptions about STEM and challenge assumptions about who does what job. Education Scotland has a dedicated team working with schools and early learning providers to tackle gender bias and improve gendered participation and subject choice. In the period December 2019 to December 2020, Education Scotland's Improving Gender Balance and Equality Officers engaged with 279 distinct establishments, and over 2,100 practitioner engagements.

In addition, Scotland's Youth Employment Strategy, Developing the Young Workforce, acknowledges that too many young people continue to make career and training choices which conform to gender stereotypes, which in turn limit their longer term career opportunities. It underlines the need to counter the influence of early culture and prejudice to better enable young people to make choices which are right for them in the long term. The DYW Strategy includes specific actions around promoting career options to different protected groups, designing senior phase vocational pathways to improve gender balance, reducing occupational segregation in Modern Apprenticeships and embedding equality across Curriculum for Excellence. Throughout the COVID-19 pandemic, the Developing the Young Workforce programme has continued to provide support and deliver relevant work-related learning under challenging conditions, with partners adapting to changing restrictions.

## STEM Highers – Entries and Passes by Gender – 2016 to 2020 Colleges and Universities – Gender

STEM Higher entries by gender show a 0.7% increase for Females and a 0.1% increase for Males in the year 2019-20. The passes by gender show a 19% increase for Females and a 22.6% increase for Males in the year 2019-20

	2016	2017	2018	2019	2020	% change 2019-2020
<b>Entries</b>						
Female	32,309	31,916	32,033	31,797	32,021	0.70%
Male	37,313	37,536	35,448	34,271	34,310	0.10%
<b>Passes</b>						
Female	24,117	24,068	24,537	23,647	28,132	19.00%
Male	26,279	26,898	25,248	23,896	29,298	22.60%

### Colleges and Universities

Colleges and universities continue to prioritise the recruitment of women into STEM courses, with a slight increase in 2019-20 of the proportion of STEM enrolments in colleges by women. However, much more progress is required.

The Scottish Funding Council supports institutions to tackle gender imbalance and inequality as set out in institutional Gender Action Plans, which each college and university has developed. SFC works with **AdvanceHE** to help institutions improve their Gender Action Plans, many of which have a focus on STEM. Furthermore, SFC is working closely with **EHRC** to help institutions reduce persistent inequalities.

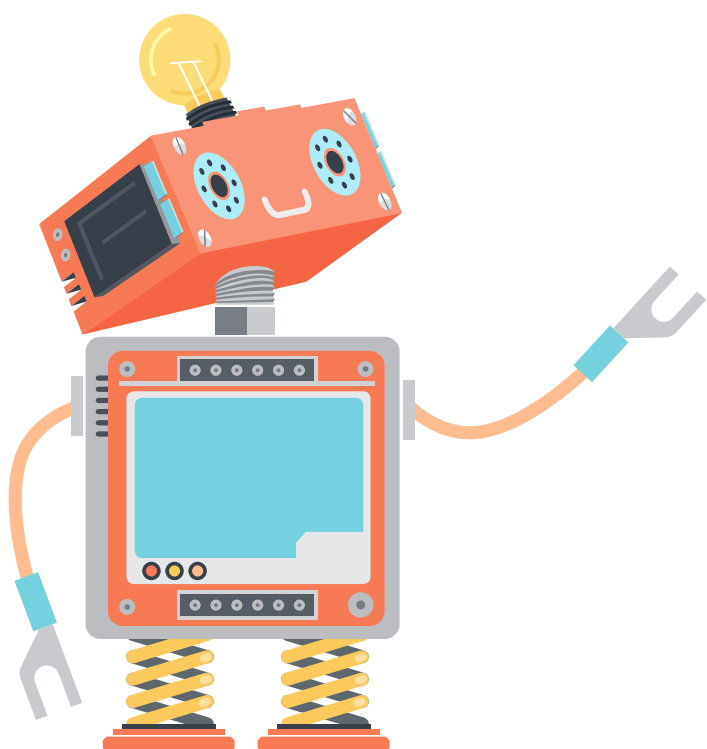
### Gender Action Plans (GAP)

The aim of the GAP is that, by 2030, no college or university subject will have a gender imbalance greater than 75% of one gender. Each college and university setting has a GAP outlining how they will advance equity and reduce gender disparities within STEM subject areas. Higher Education Institutions are also seeing an increasing number of Scottish domiciled applications in a variety of STEM associated subject areas.



Scottish Domiciled Applications to all UK Higher Education Institutions in selected STEM related subject groups shows increases of 24% in Medicine & Dentistry, 29% in Subjects allied to medicine, 29% in Vet Sci, Ag & related subjects, and 33% in Education.

Subject Group	2017	2018	2019	2020	2021	Change between 2020 & 2021
Medicine & Dentistry	4,790	4,910	5,080	5,430	6,710	24%
Subjects allied to Medicine	21,470	21,570	22,320	24,690	31,920	29%
Vet Sci, Ag & related	2,020	1,900	1,960	1,830	2,370	29%
Education	21,070	21,650	20,190	19,610	26,050	33%



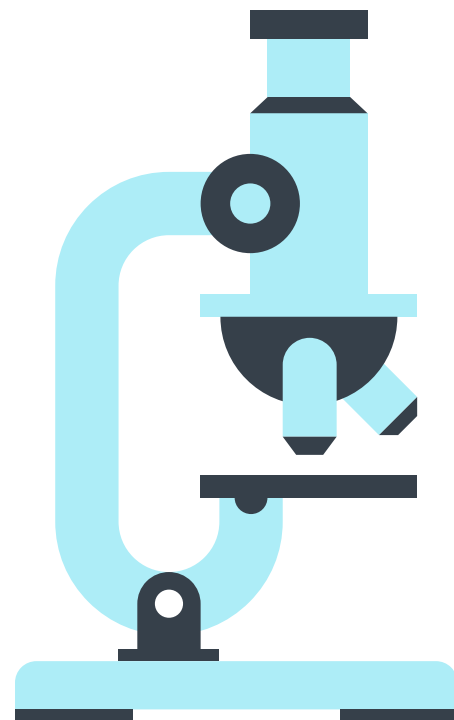
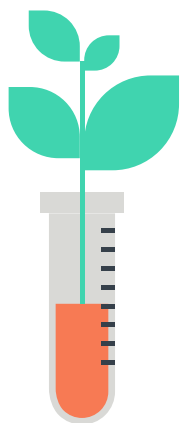
### Enrolments in STEM courses at Scottish Higher Education Institutions by Sex – 2019-20

Subject Classification (CAH01)	Male	Female	Total	% of female enrolments
Biological and Sport Sciences	5,145	6,990	12,160	57.5%
Psychology	2,185	8,600	10,855	79.2%
Agriculture, Food and Related Studies	955	1,465	2,425	60.4%
Physical Sciences	4,805	3,635	8,460	43.0%
General and Others in Sciences	485	630	1,120	56.3%
Mathematical Sciences	3,070	2,285	5,360	42.6%
Engineering and Technology	16,570	4,580	21,180	21.6%
Computing	12,000	3,470	15,515	22.4%
Architecture, Building and Planning	3,790	2,545	6,340	40.1%
Geographical and Environmental Studies (natural sciences)	1,120	1,595	2,720	58.7%
<b>STEM excluding medical related</b>	<b>50,125</b>	<b>35,795</b>	<b>86,135</b>	<b>41.6%</b>
Medicine and Dentistry	3,020	5,115	8,185	62.5%
Subjects Allied to Medicine	5,330	26,165	31,525	83.0%
Veterinary Sciences	335	1,770	2,105	84.0%
<b>STEM including medical related</b>	<b>58,815</b>	<b>68,845</b>	<b>127,945</b>	<b>53.8%</b>
<b>Non STEM Subjects</b>	<b>46,715</b>	<b>85,295</b>	<b>132,540</b>	<b>64.4%</b>
<b>Total</b>	<b>105,530</b>	<b>154,140</b>	<b>260,490</b>	<b>59.2%</b>

### Enrolments in STEM courses at Scottish Higher Education Institutions by Sex – 2019-20

Totals include a small number of enrolments with unknown or prefer not to say sex. Numbers rounded to nearest 5 and percentages based on unrounded numbers. 2019-20 subject classifications are based on the new Common Aggregated Hierarchy, as such they are not directly comparable to previous years.

Source: HESA Student Data



### Gender Pay Gap Action Plan

The Scottish Government's **Gender Pay Gap Action Plan** acknowledges that inequalities in the labour market are strongly influenced by societal attitudes. It pulls together a broad ranging suite of actions from across the Scottish Government which will address gender stereotyping, unconscious bias and occupational segregation in both the Early Years and Schools settings which will ultimately contribute to reducing the gender pay gap.

Skills Development Scotland (SDS) has also recently established a Gender Commission, in response to findings by the Scottish Apprenticeship Advisory Board, with members drawn from employers, education, trade union and parent/carer representatives. The Commission's objectives are to 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.

### Digital Skills and the Logan Review

Data, digital skills and computer science are an increasingly prominent feature of the curriculum in schools in Scotland, underpinned by the focus on numeracy and mathematics in education. The Government's acceptance of the recommendations of the Logan Review demonstrate the commitment to putting these skills at the heart of our young people's education, recognising how fundamental these will be in their future lives.

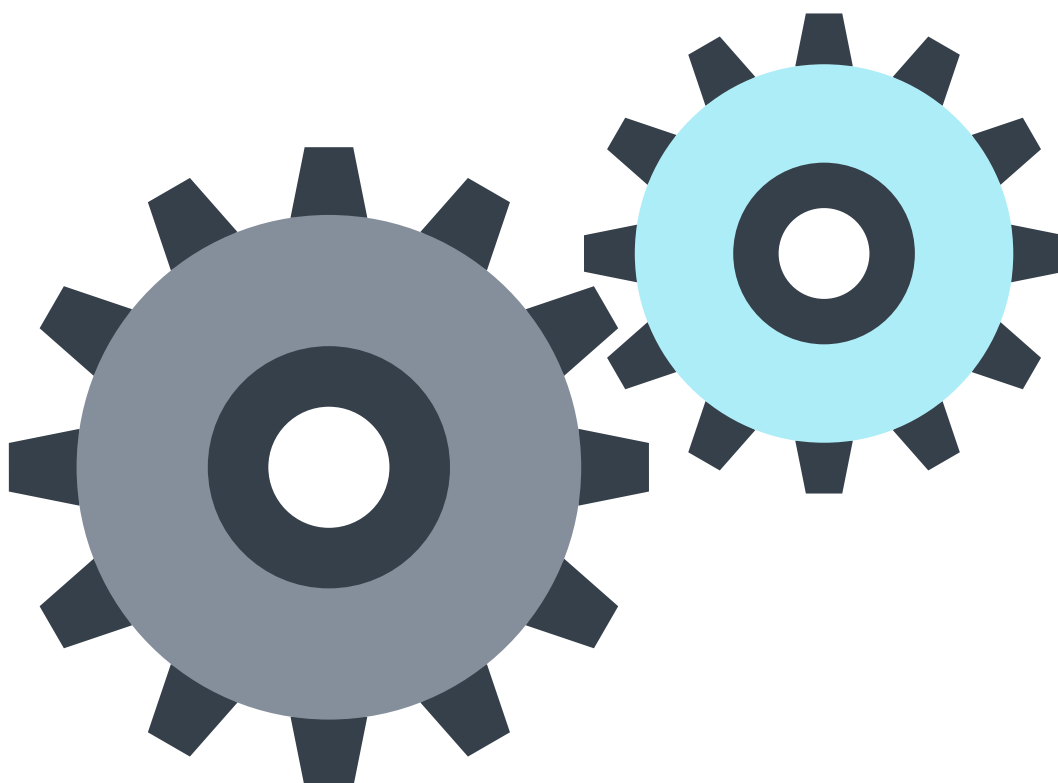
We are developing an action plan for Mark Logan's education recommendations which capitalises on what is already in place through the STEM Strategy and Developing the Young Workforce to bring about improvements in this important area of learning.

Among other things, the Logan review of education recommends that computing should be treated as a core subject such as Maths and English, more project work in the curriculum, more professional development for computing teachers, better

information about digital careers and greater industry engagement. A formal programme is being set up to manage the Logan review as a whole, with specific workstreams on pre and post 16 education.

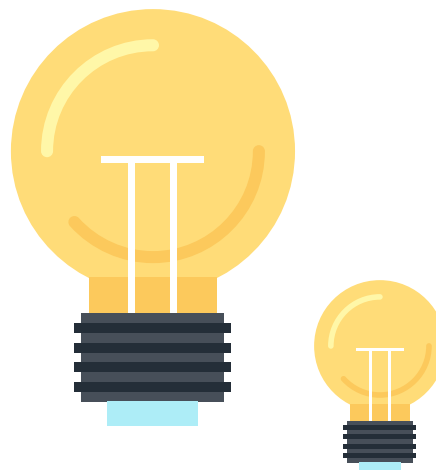
In 2017, a process was undertaken to ensure the Experiences and Outcomes set out in the Curriculum for Excellence reflected the most up to date and relevant learning for young people on computer science and digital skills. We expect digital skills, including coding, to be a part of the curriculum in schools in Scotland, with the foundations of coding being built up from the early years onwards through the development of computational thinking. We continue to engage with experts across the system to ensure our teachers have access to the best resources and professional learning to deliver their curriculum with confidence.

We are working to ensure that all teachers have access to high-quality support for computing in the classroom. Education Scotland has set up regional primary and secondary led teacher networks to up-skill teachers in knowledge and effective teaching approaches in computing science. Employers and other partners are doing great work with schools to inspire and engage children and young people through extra-curricular clubs and activities. We expect to re-examine work in this area as we develop our response to the Logan Review.



# 5

## 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.

### SCQF Level 6 Passes - 2016-2020

SCQF Level 6 Passes show a 20.7% increase from 2019 to 2020 across STEM subjects.

	2016	2017	2018	2019	2020	% change 2019 - 2020
<b>Subject</b>						
Biology	5,167	5,480	5,376	5,593	6,314	12.9%
Chemistry	7,710	7,718	7,679	7,616	8,865	16.4%
Human Biology	4,122	4,209	4,165	4,347	5,878	35.2%
Physics	6,788	6,806	6,281	6,242	7,271	16.5%
Other Science	238	258	274	268	322	20.1%
Computing Science	3,153	2,898	2,817	2,069	2,824	36.5%
Mathematics	13,906	13,978	13,990	13,485	15,984	18.5%
Technology	9,475	9,776	9,340	7,989	9,998	25.1%
<b>Total</b>	50,559	51,123	49,922	47,609	57,456	20.7%



In March 2020 it was announced that the 2020 exam diet could not go ahead and that an alternative certification model would be developed. Under the revised approach to certification, candidates received teacher estimated grades except where these estimates were moderated upwards by the SQA. In these cases candidates received the moderated grade. SQA have noted that the 2020 results should be seen as unique, due to the disruption caused by COVID19 and the cancellation of the exam diet.

### Young STEM Leader

The **Young STEM Leader** programme is inspiring and rewarding excellence of young people to create and lead inspirational STEM activities. Since the launch of the Young STEM Leader online programme over 700 trained Tutor Assessors, over 380 delivery centres and an estimated 2,500 Young STEM Leaders (YSLs) have engaged across all local authority areas.

The Project Team from SSERC will, over the academic year 2021-22, provide Tutor Assessor training to a minimum of 1,500 teachers, youth and community workers who will subsequently deliver STEM leadership training to a minimum of 7,000 YSLs. The aim is to inspire young people to develop a greater interest in STEM and consider these areas as potential future pathways, as being enthused about those subjects at school.

Young people involved in the programme complete a digital “log” of their experiences that is assessed by trained Tutor Assessors. The impact of the programme is currently being evaluated by a research team from the University of Stirling. Despite some of the inevitable challenges associated with COVID-19, the programme has continued to grow over the past year and further growth is anticipated. The award is split into formal and non-formal versions and is a valuable opportunity for young people to gain an insight into the world around them in a fun and engaging way.

## North Ayrshire Council: Family Learning Team



Across ten primary schools and one secondary school in North Ayrshire Council, the Local Authority’s family learning team have been working with select groups of young people to achieve the Young STEM Leader Level 2 award. The aims of the family learning work are threefold:

- **Achieving:** Parents and carers know how their child learns in school and how to support learning at home;
- **Nurtured:** Family interacts positively through play/interactions;
- **Included:** Family feels included in the school community.

In completing the award, more than 100 Young STEM Leaders were supported to deliver STEM activities, events and interactions to their household groups. By delivering video career profiles, guided sensory nature walks, kitchen science experiments and more, YSLs were able to actively involve their family groups in their leadership journey whilst together engaging more deeply with STEM.

## Kilcreggan Primary School, Argyll and Bute



In a bid to improve STEM capital across the school, a website was set up to promote interaction between classes for the benefit of pupils and teachers: peer-to-peer mentoring, digital exchanges of information and resource sharing. This website was created and maintained by a group of digital leaders in the upper school, who then went on to achieve the Young STEM Leader 2 Award.

## Peebles High School, Scottish Borders

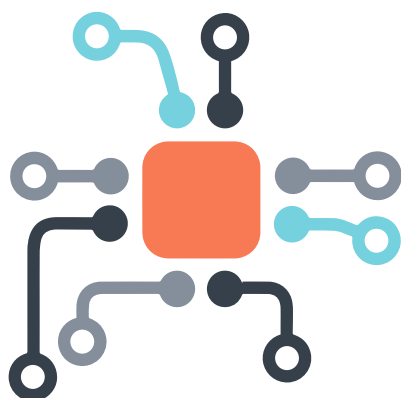


As a response to the COVID-19 pandemic, a team of five S6 pupils set up a group to support girls to challenge discrimination they may face in STEM. Through delivering careers talks, supported study sessions and social media campaigns, the STEM Girls are working towards their Young STEM Leader Level 6 award. Using their own experiences, the STEM Girls are advocates for gender equality in STEM and are inspirational role models showing student-led action within their learning community.

## Linlithgow Academy, West Lothian



Throughout the first year of delivery, the Young STEM Leader Level 6 Award is timetabled at Linlithgow Academy as part of a careers pathways class for S5 and S6 pupils. Working around COVID-19 restrictions, the young STEM leaders worked with pupils from local primary schools to improve STEM knowledge, understanding and engagement. In order to lead STEM activities, events and interactions virtually, the YSLs filmed a series of “how-to” videos explaining various science experiments that could be performed by their audiences remotely.



The development phase of the YSL Programme is complete and all six levels of the award are now available to young people in Scotland. Three levels in the non-formal version of the programme are aligned to Curriculum for Excellence Second, Third and Fourth Levels. The levels in the formal version of the award are offered at SCQF Levels 4, 5 and 6 and are credit rated by the Scottish Qualifications Authority. There are now an estimated 2,500 active YSLs in Scotland representing an excellent demonstration of how to inspire young people into STEM.

### Parental Support

We are aware that COVID-19 and the associated disruption to education creates a number of challenges for parents and for parents' involvement in schools. The experience of school closures has further reminded us of the vital role that parents play in supporting their children's learning. Communication between school and home has remained vitally important at this time. Advice was published on how local authorities and schools should involve and engage parents during this period. In relation to STEM, Education Scotland continues to promote and support a range of family learning resources associated with STEM and the National Parent Forum's **STEM in a Nutshell** guide provides information to parents about STEM careers and subject choices.

### Maths Week

The fourth annual **Maths Week Scotland** took place from 28 September to 4 October 2020. Despite the challenges of 2020, the week was a huge success with a greater emphasis placed on virtual and outdoor activities, as well as an enhanced social media presence. 2020 saw Maths Week Scotland trending at #1 or #2 in all cities across Scotland at the start of the week.

Many local activities were funded by the Maths Week Scotland Small Grants Fund, established by the Edinburgh Mathematical Society, the Glasgow Mathematical Journal Trust and the Scottish Government to encourage innovation and participation. Around 40,000 pupils registered as taking part in Maths Week Scotland via the website from every local authority in Scotland. The outdoor maths theme was really embraced by teachers this year and maths trails, take-home kits and resource packs meant that outdoor learning, learning at home or socially distanced learning

were all accommodated within the programme. For example, a new collaboration with Science Skills Academy saw the creation of Outdoor Maths kits for primary school pupils with a total of 174 kits delivered to every primary school in the Highland Council area, supported with online training for teachers.

Online sessions during the week for pupils were well attended and featured well-known mathematics communicator Dr Hannah Fry, and several other individuals using maths in a variety of unexpected settings. Olympic athlete and mathematics graduate Eilish McColgan shared how she uses maths in her training with primary school pupils in Stirling, while Amar Latif shared how maths has impacted his life, from measuring ingredients in MasterChef to setting up his own business.

Focusing on maths in careers, a social media campaign #ShowYourWorking ran on Twitter across the week encouraging people to share how they use maths in their work, with many organisations taking part. Various organisations hosted online public events with hundreds of people virtually attending. The LMS Popular Lecture by Dr Diana Davis, Billiards on Regular Polygons, hosted by the University of Glasgow, was well attended, as was a headline talk from Marcus du Sautoy, sponsored jointly with the International Centre for Mathematical Sciences and Heriot-Watt University, on whether algorithms can create works of art.

Additional talks throughout the week covered topics such as virus spread, coding and origami. Despite restrictions there were some in-person family day activities at informal learning centres such as Scottish Maritime Museum and the National Mining Museum. The national Maths Week Scotland challenges returned, including the photo contest Maths Inside, Maths Week Scotland competitions from Sumdog and Mangahigh, the Deputy First Minister's Challenges and the Maths Wi Nae Borders competition.



## STEM Nation Award

The **STEM Nation Award** Programme and Young STEM Leaders Programme (described earlier) are two new programmes that have been trialled and developed to increase leadership opportunities in STEM for young people and to help education settings develop coherent whole-setting approaches to STEM. These will continue to play a key role in supporting the ambitions of this Strategy, including in relation to equity and equality.

The STEM Nation Award was developed by Education Scotland to celebrate, promote and build on effective practice in STEM education within and across sectors. All early learning and childcare settings, primary schools and secondary schools are eligible to apply for the STEM Nation Award. Settings may apply for an individual element or any combination of elements. Settings which achieve all five elements within a three year period will be eligible for the full STEM Nation Award. 19 settings and schools were the first to gain the full STEM Nation Award in October 2020.

### The five elements are:

- **Leadership in STEM** – celebrates effective leadership at all levels including children and young people leading STEM learning;
- **STEM family learning** – recognises commitment to family learning and practice which is helping to build the STEM capital of learners and their families;
- **Employability and STEM partnership working** – celebrates sustained collaboration between settings and their STEM partner(s) to develop learners' STEM and employability skills;
- **STEM curriculum and learner pathways** – recognises the work of settings in developing an inspiring STEM curriculum and associated learner pathways;
- **Equity and equality in STEM** – celebrates the work settings are undertaking to address the issues of equity and equality in STEM.

STEM Nation Award materials are now live and available for use. Equality and equity are central to the new STEM Nation award and form one of five central elements (above) that schools must achieve before a full award can be granted. The award programme is open to early learning and childcare settings, primary, ASN and secondary schools and community learning and development settings.

## Science Centres

Following from the previous positive impact of the community subsidy, science centre funding levels for 2020-21 have been maintained. Although face to face engagement with community groups has not been possible, all science centres have continued to engage with community groups. This engagement is crucial at a time when other learning and support services are limited and many people in deprived communities have been particularly affected by the impacts of COVID-19.

## Glasgow Science Centre

From January last year to February 2021, the Centre's Community Learning and Development team delivered 79 learning opportunities to 1,845 individuals. This year the Centre has been involved in a foundation apprenticeship programme to provide opportunities to young people when they needed it most. Since last October the Centre has had 15 young people taking part in a foundation apprenticeship virtually. Topics being studied include Engineering, Creative & Digital Media, Business Administration, Scientific Technologies & Finance.

## Dynamic Earth

At the start of the pandemic, Dynamic Earth launched #DynamicEarthOnline across their social media channels and website. This was aimed at both schools and families, to support blended and home-learning and included five daily strands delivered on a weekly basis. STEM learning content, in the form of videos, activity and experiment ideas, profiles of scientists and thought-provoking environmental content was posted on social media and linked to downloadable resources. Special events such as Earth Day, World Oceans Day, and Scottish Climate Week were marked with themed content.

### Aberdeen Science Centre

Feedback from a survey of head teachers and practitioners found that nearly 73%, preferred virtual engagement. The two most effective methods were pre-recorded videos of shows and workshops (87%) and Live Virtual Sessions streamed into the classroom (64%). This evidence formed the basis of the Centre's digital offer for schools.

ASC in your classroom is the offer for schools to engage with the Centre virtually. The aim is to provide support to teachers and practitioners with STEM in their classroom. The programme supports delivery of Curriculum for Excellence through fun, inspirational and enjoyable activities, promoting curiosity and using question-led investigations.

### Dundee Science Centre

The Centre launched their Digital Home Learning Programme in March 2020. Since lockdown the Centre has reached 99,200 children with a meaningful interaction. The programmes align with the themes of the Centre's exhibition zones. The digital programme saw collaborative efforts with STEM Ambassadors, educational institutions and companies. Having launched this initiative, the Centre decided to bring science directly to the home through their Science@Home Activity Boxes. The aim is to bring science activities to children who might otherwise not have had the opportunity. The initial phase saw weekly boxes, delivered locally alongside weekly food bags, giving children and their families a real boost, a focus and some fun while keeping up some science learning in the process. This is now a Centre legacy project reaching 1,250 children throughout key holiday periods.

### Festivals

We have required Science Festivals to promote at least one event specifically targeted towards women and girls since 2017-18 as a condition of funding. This requirement was maintained for 2019-20 and 2020-21 and includes festivals being delivered online and those delivered as physical events. Evidence shows that events have been well received and are varied in type. The move by many festival organisers to online delivery brings opportunities to involve more girls and women in the delivery of the festivals, whilst also increasing the reach of the events to wider geographical areas. All of the festivals planned for Spring 2020

were affected by restrictions, however many festival organisers have adapted and delivered online events.

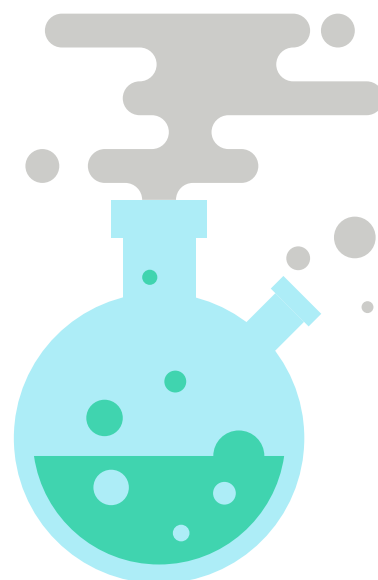
### STEM Engagement

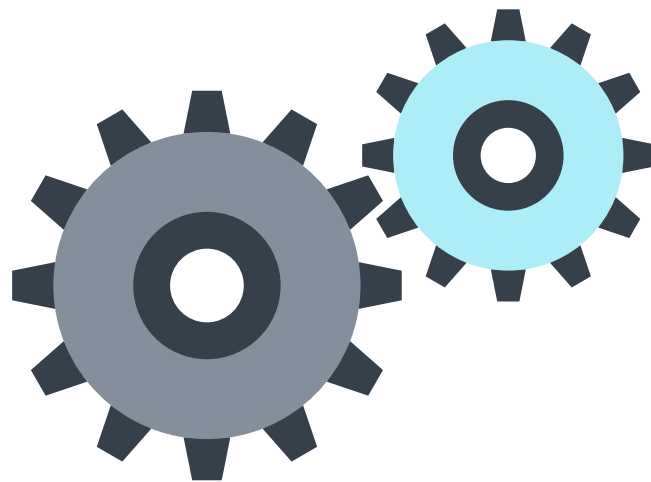
The 'Aye For Ideas' national engagement campaign is to run for the duration of the STEM Strategy. Campaign resources have been produced and branding and social media hashtag are being utilised positively by stakeholders. For example, science centres and science festivals are currently using them in a range of ways, including featuring the branding on printed promotional materials such as brochures and posters and across social media and online posts to promote activities and events with a particular focus on community engagement.

### My World of Work Live

**My World of Work Live** is a set of fun, interactive activities to help young people understand future careers. Aimed at 8–18 year olds, activities are designed and delivered by experts with a passion for education and learning. As a response to the COVID-19 pandemic, My World of Work Live successfully shifted to virtual delivery, delivering hands on, interactive sessions to over 3,330 young people across Scotland. They use the latest technology to engage and inspire, bringing school subjects to life. Activities are:

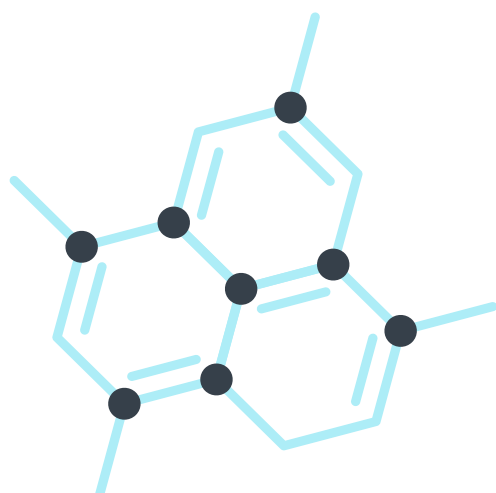
- Designed to support the delivery of experience and outcomes in Curriculum for Excellence;
- Aligned to the Career Management Skills framework and support the realisation of self, strengths, horizons and networks.





# 6

## Connection



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.

### National Manufacturing Institute Scotland – NMIS

**NMIS** is an industry-led international centre of expertise which will make Scotland a global leader in advanced manufacturing. The work of NMIS is absolutely crucial for the sector as we seek to protect long-term prospects, and ensure we have vibrant manufacturing industries for future generations – transforming skills, productivity and innovation to attract investment and make Scotland a global leader in advanced manufacturing. NMIS will have three elements:

- a digital factory to explore and develop next generation technology;
- a manufacturing skills academy to transform the skills of today and tomorrow's workforce; and
- a collaborative hub as a space to allow companies to work and innovate together.

NMIS is drawing on the strength and expertise of all our universities and colleges, having already signed a collaboration agreement with the Energy Skills Partnership to support building expertise across Scotland's colleges.

### Labour Market Information

SDS publish a suite of resources to support partners with strategic skills investment planning. At a national level, the monthly COVID-19 Labour Market Insights (LMI) report and dashboard provide up to date information on Scotland's economy and labour market in response to the COVID-19 pandemic. In addition, detailed regional and sectoral skills assessments provide analysis of skills supply and demand across Scotland's regions and key sectors to inform future investment in skills.

This information is used to support the 'Labour Market Essentials' toolkit for careers staff. The toolkit is a package of LMI resources in the form of videos, slides, and links to relevant information. Work is ongoing to review the toolkit and this will include strengthening the profile of STEM LMI.

### The Science Skills Academy

The **Science Skills Academy** (SSA) was established to inspire young people across the Highlands of Scotland to become engaged with the core STEM subjects. Led by Highlands and Islands Enterprise, the SSA wants to encourage more young people to study STEM subjects in school and beyond, have the skills to enter employment in STEM sectors, and raise awareness of STEM-related careers, particularly those in the Highlands and Islands.

This innovative project ensures an equity of provision, overcoming barriers of geography and scale, to reach all schools in the region. Working in partnership with FIRST Scandinavia in Norway, the project is international in outlook and this provides exciting opportunities to engage with projects and organisations from different countries. The project also works in partnership with regional (Highland Council; University of the Highlands and Islands; High Life Highland) and national (Skills Development Scotland; NHS; Science Centres) organisations to ensure added value is achieved through creative collaborative approaches to rural delivery.

### Science Skills Academy – Newton Room Network

Newton Rooms are a key part of the SSA as they provide modern, bright and stimulating settings. Facilities are already established in Thurso, Fort William and Dingwall and, when COVID-19

restrictions allow, a Pop-Up Newton Room will be used for the region's most remote and rural schools in Skye and Lochalsh. It is anticipated a new-build bespoke facility will be established in Inverness in 2021. Each Newton Room has its own dedicated member of staff to deliver Newton Modules to school groups, and other STEM activities to the wider community.

Newton Modules are full-day activities that allow P6-S2 pupils from Highland to participate in hands-on activities that are tailored to complement Curriculum for Excellence and reflect STEM sectors relevant to the Highlands and Islands. As well as aligning activities with the STEM requirements of the region, the SSA work with local STEM employers to shape Newton Modules so as they incorporate skills or real-life applications from STEM sectors.

In its first 20 months of operation the SSA delivered activities to 4,718 school pupils across the Highland Council region including: Robotics and Mathematics taster and full day Newton Module sessions to P6/7 pupils; Renewable Energy taster and full day Newton Module sessions to S1/2 pupils; other extracurricular activities to P4-S2 pupils.



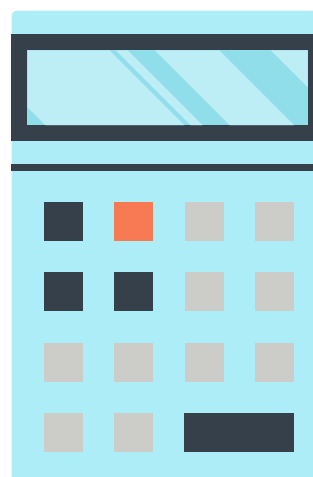
To complement the Newton Modules, the SSA have created a series of videos that highlight both regionally significant STEM sectors as well as local STEM employers. These include on-site footage of young employees who, in another series of videos, go into more detail on their own STEM pathways. Despite COVID-19, the SSA has continually reviewed options and adapted delivery plans to ensure that the project continues to deliver high-quality interventions to young people in Highland.

### **Regional STEM Partnerships (STEM Hubs)**

Scotland now has 13 Regional STEM Partnerships, formerly known as STEM Hubs. The Partnerships are college-led hubs that bring together key regional stakeholders to drive progress around STEM. Actions are coordinated by a national Steering Group. In addition, the STEM Leads Forum is a group coordinated by the Energy Skills

Partnership bringing together representatives from each college region. The Partnerships share expertise on curriculum development and co-ordinate regional CLPL activity for lecturers and teachers. Links are developed with local authorities with the aim of improving the pipeline of learners choosing STEM subjects at college or university.

Achievements have included STEM students in the Lanarkshire working closely with Early Learning and Childcare students to upskill the future ELC workforce on teaching STEM for very young children. Although COVID-19 has slowed down some of the outreach activity usually targeted at schools, a great deal of best practice has been shared around blended learning and existing initiatives have been adapted to enable schools, colleges and universities to adapt their curriculum.

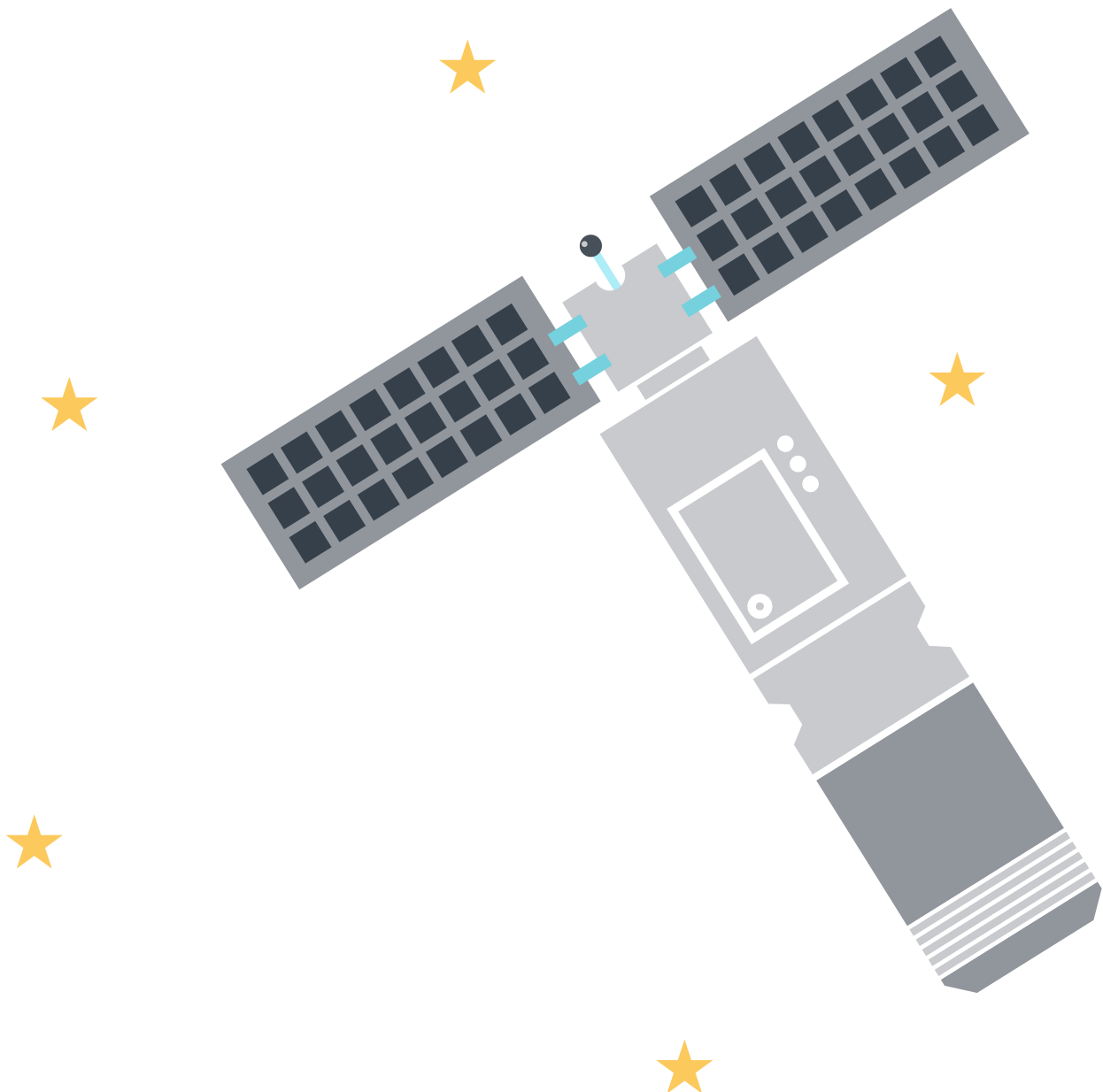


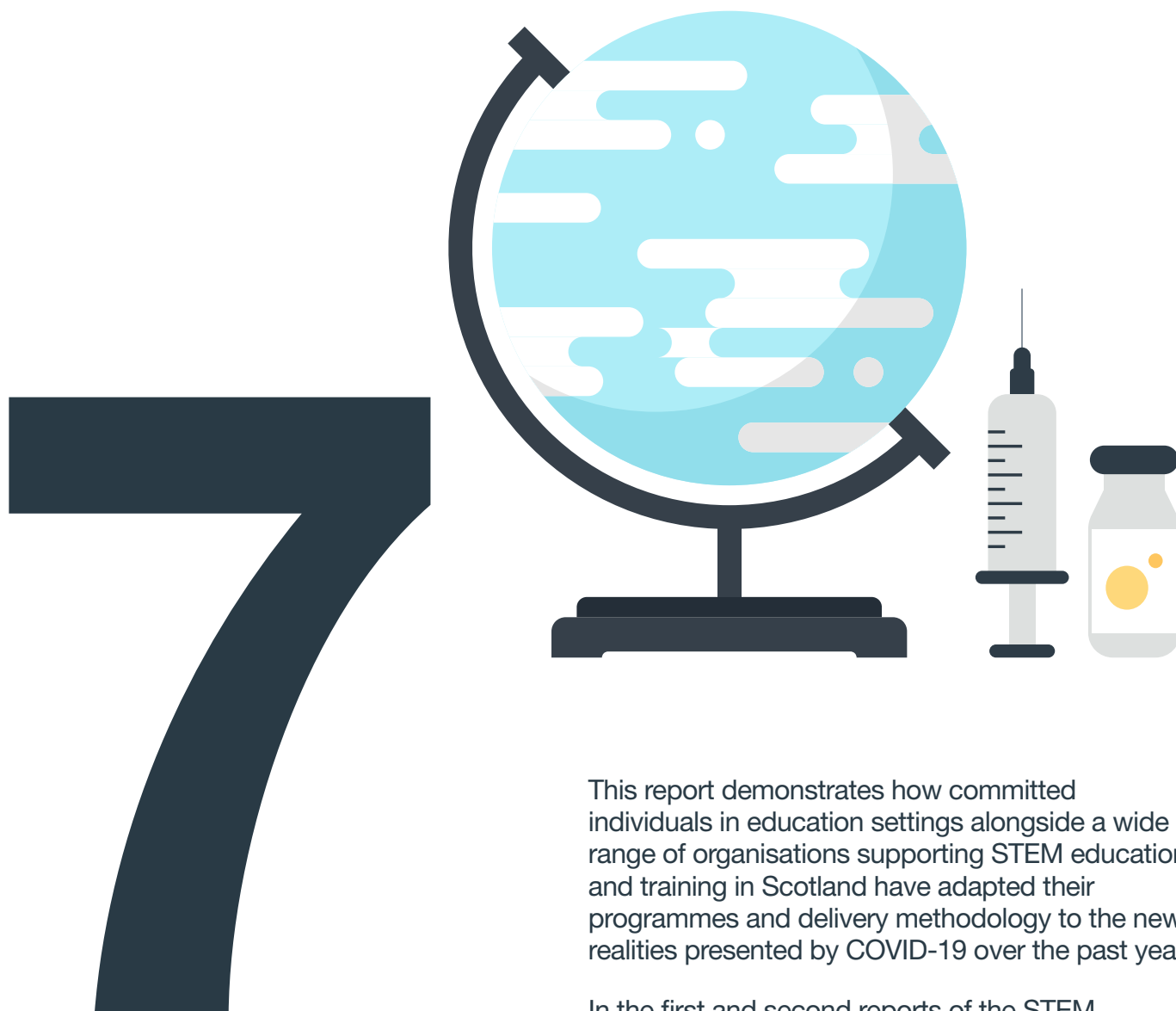


Schools and colleges working in partnership remains crucial to the promotion of STEM education and careers. A partnership between Dumfries and Galloway College and Borders College, is in place to develop a network of STEM Hubs across the South of Scotland. The aim is to address the immediate skills gaps in areas such as Energy and Engineering, Construction and Care. Hubs are accessible to school and college students and employers wishing to try the latest technologies or upskill their current workforce. In addition Borders College has provided new STEM and Care facilities in Hawick and Galashiels and the STEM Construction and Renewables Hub in Hawick promotes training and development of new

and emerging technologies in the construction and renewables industries.

Through the **National Transition Training Fund**, SFC has invested £2.9 million of funding to train and retrain up to 2,000 individuals in those sectors that have been identified as being disproportionately affected by the impact of COVID-19. Working with Forth Valley College, the Construction Scotland Innovation Centre (CSIC), Energy Skills Partnership (ESP) and the National Manufacturing Institute Scotland (NMIS), it is proposed to deliver a series of training opportunities to individuals currently out of work or facing the prospect of redundancy in STEM related areas.





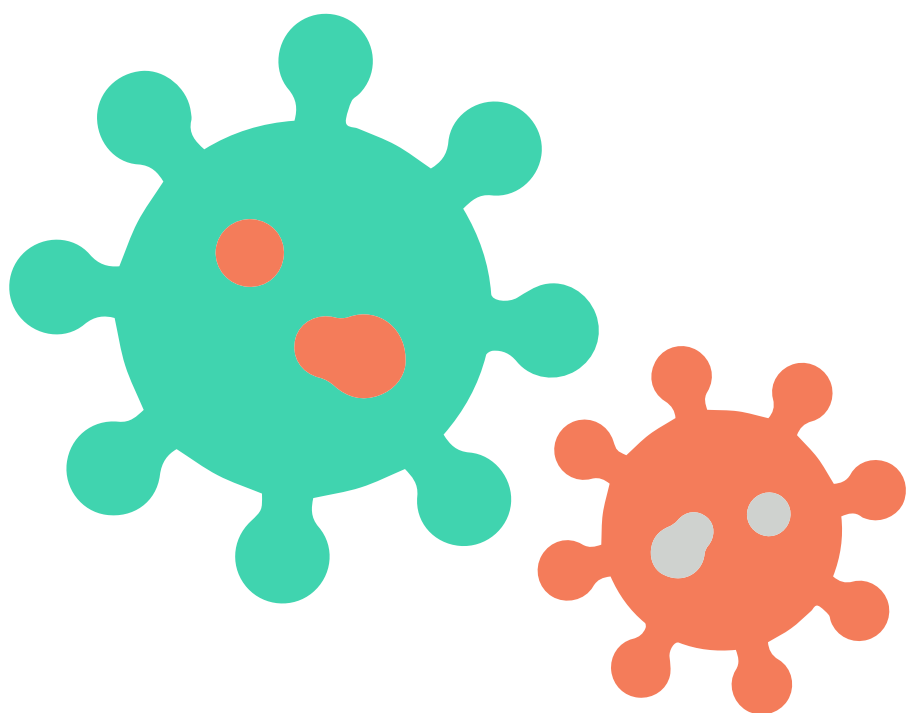
## What Next?

This report demonstrates how committed individuals in education settings alongside a wide range of organisations supporting STEM education and training in Scotland have adapted their programmes and delivery methodology to the new realities presented by COVID-19 over the past year.

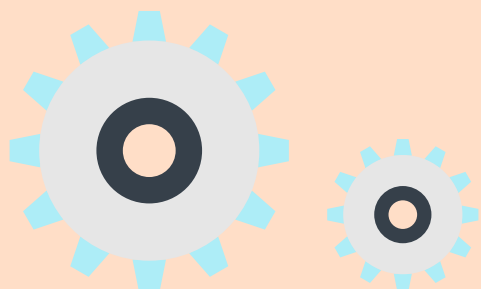
In the first and second reports of the STEM Strategy, a strong supporting evidence base had been developed in order to measure and challenge progress against a set of Key Performance Indicators that had been established in 2018. This year, demonstrating progress against a strong and compelling set of data sources has not been possible. However, we are able to offer up-to-date information on apprenticeships, teacher numbers, school-based qualifications, STEM applications to Higher Education Institutions and a range of data on performance of specific projects and programmes, mainly concerned with school education and public science engagement.

In recognition of the current lack of data and the fact that some STEM-related support programmes have been unable to progress, it is necessary to consider reporting on progress against the Strategy Key Performance Indicators later in 2021. Therefore, should the situation in relation to COVID-19 restrictions ease to the extent that a series of meaningful STEM datasets can be fully developed, a stand-alone STEM Strategy: Key Performance Indicators data report will be published before the end of October 2021.

In the meantime, Scottish Government STEM policy and direction will continue to reflect the four key aims of the STEM Strategy and respond to the challenges and opportunities outlined in this report for the benefit of all those involved in STEM education and training in Scotland.



# 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.

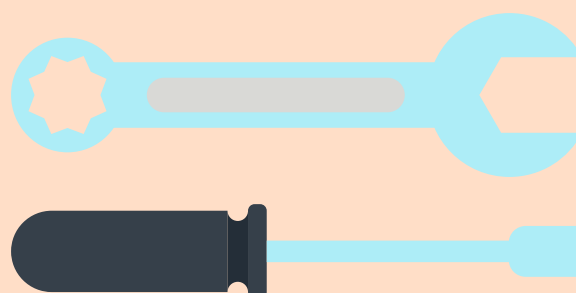
This broad definition allows for different interpretations of data about STEM in education and training in what is, in practice, a complex set of inter-related disciplines and skills encompassing a very broad field of study. It is often more important to know about the differences that exist within STEM 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.





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