EDUCATION AND SKILLS COMMITTEE

AGENDA

26th Meeting, 2019 (Session 5)

Wednesday 2 October 2019

The Committee will meet at 10.00 am in the Robert Burns Room (CR1).

1. **STEM in early years education:** The Committee will take evidence from—

   Ken Muir, Chief Executive, and Charlaine Simpson, Senior Education Officer – Initial Teacher Education and Accreditation, General Teaching Council for Scotland;

   and then from—

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

   Barbara Morton, Team Leader for STEM, Languages and Social Subjects in the Curriculum, Niamh O'Connor, Head of Early Learning and Childcare Quality Unit, and Stuart Robb, Head of the Education Workforce Unit, Scottish Government.

2. **European Union (Withdrawal) Act 2018:** The Committee will consider a proposal by the Scottish Government to consent to the UK Government legislating using the powers under the Act in relation to the following UK statutory instrument proposal:

   The EU Research and Development Programmes (Revocation) (EU Exit) Regulations 2019

3. **Review of evidence (in private):** The Committee will consider the evidence it heard under agenda item 1.
The papers for this meeting are as follows—

**Agenda item 1**

SPICe briefing paper
Submissions pack
Scottish Learning Festival seminar notes

**Agenda item 2**

Paper from the clerk
INTRODUCTION

This is the final week of evidence taking in the STEM in early years education inquiry. The focus of the inquiry has been on STEM learning focusing on children aged 3 to 7 years. In this educational setting this covers the early (pre-school and P1) and first levels (P2-P4) of Curriculum for Excellence (CfE).

The inquiry has used the Scottish Government’s current STEM strategy as context, with specific attention to the relevant KPIs that emerged from that document and progress against these measures. A background briefing that was produced to inform the first meeting on 5 June has been updated and reissued with this week’s papers as a refresher on the main policy issues framing this inquiry. That briefing includes information on the main themes set out in the STEM strategy, progress against the KPIs relevant to this inquiry and information on the qualification routes open to people seeking to work as early years professionals or as primary teachers.

The three sessions that took place prior to summer recess involved evidence-gathering from early years practitioners and primary teachers, who gave evidence on their practical experiences and insights, alongside witnesses from organisations representing different aspects of STEM policy or practice. In this final week, there will be two panels. The first panel is with the General Teaching Council for Scotland (GTCS):

- Ken Muir, Chief Executive
- Charllaine Simpson, Senior Education Officer – Initial Teacher Education and Accreditation

The second panel is with the Minister.

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

This paper is split into two sections to reflect the two panels. Panel 1 sets out possible themes for discussion with the GTCS. Panel 2 sets out possible themes for discussion with the Minister.

PANEL 1: THE GENERAL TEACHING COUNCIL FOR SCOTLAND

The GTCS is the independent professional body that promotes and regulates the teaching profession in Scotland. It carries out a range of statutory functions to promote, support and develop the professional learning of teachers, including:
• Maintaining a register of teachers in Scotland.
• Setting the professional standards expected of all teachers (which include standards for provisional and full registration and for career-long professional learning).
• Accrediting programmes leading to the award of GTCS Standards, including Initial Teacher Education (ITE) programmes offered by Scottish higher education institutions (HEIs).
• Advising the Scottish Government on matters relating to Scotland’s teachers and teacher professionalism.
• Providing public protection and assuring the high quality of the teaching profession by investigating and adjudicating on the Fitness to Teach of registrants through robust and fair regulation processes.

In the context of this inquiry there are two relevant issues. The first is the accreditation of ITE programmes offered by Scottish HEIs. The second is standards for career long professional learning (CLPL). On the latter issue, the GTCS carries out a range of initiatives to promote, support and develop the professional learning of teachers. This includes:

• Managing and signing off the Professional Update, which confirms that teachers have engaged in ongoing professional learning and reflected against the appropriate GTCS Professional Standards. Qualified teachers in Scotland are required to engage in professional learning, self-evaluate this learning using GTCS Professional Standards, and maintain a record of this learning. A Professional Review and Development (PRD) discussion is an integral part of the process. After an initial submission, every five years confirmation of this engagement is required by the teacher and their line manager to be shared with the GTCS in order to maintain full registration.
• Operating and promoting Professional Recognition, “which recognises the enhanced, significant and sustained enquiry a teacher has undertaken and the development of their professional learning in a particular area. The award of Professional Recognition recognises the expertise and accomplishment of the teacher.”

THEME 1: INITIAL TEACHER EDUCATION

One of the core themes of this inquiry, which is discussed more fully in the context of panel 2, is primary teacher confidence in delivering STEM learning. The current requirements for PGDE primary teaching are typically a pass (Grade C or above) at National 5 in Mathematics and a pass at Higher in English. There are currently no requirements for entry or completion of an ITE primary programme in primary education to hold any qualifications in a science subject.

The Learned Societies Group (LSG) in its written submission to this inquiry noted the lack of confidence in STEM among early years professionals and primary teachers as having been “a perennial issue in Scotland”. The absence of any requirement for those seeking to pursue a career in primary teaching to hold a science qualification is highlighted as a problem. The LSG is of the view that ITE applicants should be expected to achieve at least one SCQF level 5 qualification in a science as a minimum requirement:
“While the Scottish Government has reviewed the number of hours dedicated to literacy, numeracy, health and wellbeing, equality and data literacy in ITE programmes, this did not consider science. In our response to the GTCS¹, the LSG recommended that the Scottish Government and GTCS should review the provision of science and mathematics within ITE Primary Education programmes. The review should cover both the disciplinary content and pedagogy of science and mathematics.”

This view is in line with recommendations set out in the STEMEC report (2016). This made a number of recommendations focused on changes to the Initial Teacher Education (ITE) programme (see Annexe C of the SPICe background briefing lists all recommendations along with an update on progress / implementation of each, provided by Prof. Ian Wall earlier this year). The recommendations below are of most direct relevance to ITE as it relates to primary education programmes.

**Recommendation 9** - The qualification requirements for applications from students wishing to study to become primary school teachers should be raised to an SCQF Level 5 in a science and that after a further five years the requirements should be increased to Level 6 in mathematics and a science.

**Recommendation 10** - Universities should review the provision of science education within their primary ITE courses, and local authorities should work with universities to provide structured support for PDGE teachers in primary science pedagogical content knowledge for newly qualified primary school teachers for at least the first two years in a teaching post.

**Recommendation 14** - A short life working party comprising representatives of STEC, ADES and Scottish Government should be convened to develop and implement a long-term programme of financial and practical support for primary school teachers to obtain Diplomas and Masters in Primary Science and Pedagogy.

**Recommendation 15** - Higher Education Institutions, working in partnership with others to ensure the needs of teachers and their learners are met, should develop Masters’ accredited courses recognising the development of pedagogical content knowledge in the STEM subjects.

At the time Prof Ian Wall gave evidence to the Committee (March 2019) he noted that none of these recommendations had been implemented, although he did note that GTCS had undertaken a consultation in late 2018 on proposals to revise the Memorandum of Entry Requirements (last published in 2013).

A new Memorandum on Entry Requirements to Programmes of Initial Teacher Education in Scotland was published in September 2019. This reiterated the minimum entry requirements for admission to a teaching qualification (primary education) as follows:

- For the four-year combined undergraduate degree and other undergraduate degree programmes the applicant must have a National Qualifications at SCQF Level 6 (for example Higher Grade) in at least four subjects (one of these course awards must be in English) and a National Qualifications Course awards at SCQF Level 5 Mathematics or an accepted equivalent.
- For the one-year (or equivalent) PGDE programme the applicant must have an undergraduate degree validated by a UK HEI or an undergraduate degree of an

¹ The submission being referred to here is the consultation the GTCS conducted in late 2018 to review the Memorandum on Entry Requirements to Programmes of Initial Teacher Education in Scotland.
equivalent standard from a HEI outside the UK and National Qualifications in English at SCQF Level 6 (for example Higher Grade) or an accepted equivalent and a National Qualification in Mathematics at SCQF Level 5 (for example National 5) or an accepted equivalent.

It also encourages HEIs to expect at least one SQCF level 5 qualification in either a modern language and/or a science subject. To ensure that primary teachers have a good basis for their role, the GTCS also encourages HEIs to look for evidence that the applicant has studied at least two of the following areas (as well as English and Mathematics): science; social studies; expressive arts; religious and moral education; technology and modern foreign languages.

While there is no standard requirement to hold a science qualification to enter or complete the ITE programme, the GTCS in its written submission highlights that there are ITE programmes for primary education that include a STEM element. For example:

- University of Stirling, BSc Hons in Professional Education (Primary) with specialism in Primary Sciences (STEM)
- University of the West of Scotland, BA Hons in Education – includes the option to exit with Mathematics or Science subject specialism.

The GTCS submission refers to a range of teacher training programmes across Scottish HEIs that have in recent years been accredited or reaccredited, some of which include options to focus on aspects of STEM. Much of the focus of these programmes is on numeracy and mathematics. With the exception of the two examples above, there is also a new postgraduate MSc in Transformative Learning and Teaching being offered by the University of Edinburgh. This MSc is a two-year postgraduate qualification that allows graduates to work across both primary and secondary settings. Neither are STEM specific. One is a generalist route where the entrant will be qualified to work in education settings from nursery through to S3. The second is a subject specialist pathway. This route would enable entrants to choose to focus on a STEM subject (current options are: computing science, mathematics and physics) with graduates able to work with children from the latter years of primary (P5-P7) and across all years of secondary schooling (S1-S6).

In oral evidence and also at the Scottish Learning Festival (SLF) on 25 September the Committee has heard about how crowded the ITE programme is, particularly for those pursuing the PGDE qualification over one academic year. The extent to which the ITE programme can cater to all areas of specialism in the curriculum as well as the pedagogy of teaching has been raised as a question throughout this inquiry. Questions about what the ITE must do and what can be prioritised through continuous professional development have been considered, with no real answers as to how to address this tension. One recently qualified teacher at the SLF noted that the ITE primary teaching programme is trying to do so much that there was not much time for STEM. In that person’s experience the learning around STEM was being shown experiments, which did not help with thinking about how to deliver STEM learning in the classroom with children of different ages.

Members may wish to discuss with the GTCS:

- The decision within the recently updated Memorandum on Entry Requirements to Programmes of Initial Teacher Education to encourage rather than require HEIs to seek entrants to primary education programmes to hold a science qualification.
• Views on the balance between a generalist primary ITE programme and the need to ensure trainee teachers are offered opportunities to learn about all aspects of the curriculum during their training.
• Whether it pursues targeted monitoring / evaluation of teacher training programmes.

THEME 2: CAREER LONG PROFESSIONAL LEARNING

As discussed in more detail under Panel 2, there are a range of initiatives and resources being directed at addressing the career-long professional learning (CLPL) needs of the teaching profession in Scotland. The Committee has heard through oral evidence about teachers seeking out opportunities to pursue career development opportunities in STEM subjects to widen their knowledge or build on their interests or background.

The LSG in its written submission noted that ITE is the starting point in a teachers’ career development. Gaining access to high-quality and continuous CLPL covering both subject-specific knowledge and pedagogy is therefore vital. Data collected by Education Scotland in 2017 shows that early years and primary practitioners most highly value the opportunity to work collegiately in their schools and clusters. However, time availability, staff shortages, difficulty obtaining supply cover, uneven provision, rurality and education authority budgetary pressures pose significant challenges for teachers to pursuing CLPL. The current funding for professional learning (through programmes such as SSERC and RAiSE) is noted as a positive move, assuming this is sustained to allow CLPL to continue over time.

The STEMEC report made one specific recommendation relevant to the role of the GTCS in relation to career development.

Recommendation 24 - The GTCS Professional Update process should be used as the framework and catalyst for effective CLPL for all teachers with sufficient time for effective delivery provided.

Prof. Ian Wall noted in his evidence to the Committee that there had not been a response to this recommendation in relation to the issue of time. In its written submission, the GTCS explains the purpose of the Professional Update:

“After attaining full registration teachers are expected to be committed to career-long professional learning as an aspect of teacher professionalism. Through a process of self-evaluation, underpinned by engagement with the most appropriate Professional Standard, teachers should identify their own professional learning needs and maintain a professional reflective learning record to meet the requirements of Professional Update.”

The Professional Update was launched by GTCS in August 2014 for all fully registered teachers. Teachers in Scotland are required to engage in professional learning, self-evaluate this learning using the GTC Scotland Professional Standards, and maintain a record of this learning using their online profile on MyGTCS (or another system agreed by their local authority). The Professional Review and Development (PRD) discussion is also an integral part of the process. Every five years, confirmation of this engagement is required by the teacher and their line manager to maintain full registration. The initial submission and the five yearly updates become the source that the GTCS formally uses to regulate the teaching profession through its various statutory functions (e.g. Fitness to Teach or meeting Professional Standards).
In its written submission, NASUWT noted:

“It remains the case that teachers continue to report that their experiences of Professional Learning are mixed, with nearly a quarter of respondents in the NASUWT Big Question Survey 2019 feeling unable to access Continuing Professional Development (CPD) in the last 12 months. While this statistic could, in part, be due to the reduced resources available to local authorities, it does also raise a question as to whether the Professional Update and local authority Professional Review and Development (PRD) processes are operating as they should at school level. All teachers have an entitlement to effective Professional Learning and any meaningful inquiry into STEM in the early years of education must give significant consideration to this issue."

Members may wish to discuss with the GTCS:

- The role it plays in ensuring that CLPL is taking place.
- How the Professional Update is used by the GTCS to monitor, evaluate or to engage with teachers in their continuous professional development activities.
- Whether it actively pursues targeted monitoring / evaluation to assess the quality of CLPL taking place among qualified teachers working at publicly funded schools in Scotland.

**THEME 3: TACKLING GENDER INEQUALITIES**

The 2018 RSE report *Tapping All Our Talents* provides a progress review on women in STEM in Scotland as an update to the 2012 report of the same name. The key recommendations from the 2012 and the 2018 reports are presented at Annexe D in the SPICe background briefing.

The Tapping All Our Talents 2018 report notes that “gender stereotypes and biases abound in all parts of society… [consequently] awareness of gender equality issues amongst teachers, school leaders, careers advisers and parents is frequently low.” The report argues that interventions to “shift norms around gender stereotypes and attitudes towards STEM must begin early in children’s learning and development.”

This chimes with a point raised by Lorna Hay (primary teacher) when she gave evidence to the Committee on 27 March 2019. At that session Ms Hay said:

“[previous research has] said that, if children are not engaged in STEM by the age of 10, they do not make those subject choices… My experience, through my research, is that, by engaging children in engineering activities, we are increasing the likelihood that they will choose those subjects later.”

Dr Fiona McNeill from the Royal Society of Edinburgh at the same meeting pointed out that early years and primary school are important points in education to start tackling conscious and unconscious bias “for pupils right down to age three” where messages such as ‘here are the girls’ toys and here are the boys toys’ start to be absorbed.

Members may wish to discuss with the GTCS:

- What steps it is taking to ensure that teachers are equipped to address gender inequities - including recognising and tackling the unconscious biases they or those around them may hold.
PANEL 2: MINISTER FOR FURTHER EDUCATION, HIGHER EDUCATION AND SCIENCE

In line with previous weeks, this final panel attended by the Minister for Further Education, Higher Education and Science, will consider the same four themes: teacher confidence, knowledge and resources; equity of access (deprivation and rurality); equity of access (gender); and interdisciplinary learning.

THEME 1 – TEACHER CONFIDENCE, KNOWLEDGE AND RESOURCES

Performance measures

The STEM strategy highlights a need to address teacher confidence in STEM learning. There are two relevant KPIs relating to this theme:

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<th>II. Increasing practitioner confidence in STEM learning in the early years, primary years and CLD settings and increasing practitioner engagement in STEM professional learning opportunities.</th>
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<tr>
<td>* Increasing the cumulative hours of STEM professional learning accessed by early years, schools, college and CLP practitioners annually.</td>
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<td>* Meet Initial Teacher Education (ITE) student intake for all STEM subjects.</td>
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The technical information published to accompany the first annual report on the STEM strategy notes (see Annexe B of the SPICE background briefing) the absence of consistent and reliable data for the first measure above. The first annual report does, however, report on data from an online survey of 44 organisations. This showed that practitioners collectively provided 109,969 cumulative hours of STEM professional learning between 1 August 2017 and 31 July 2018. A survey of school based technical support staff and early learning and community learning practitioners (involving 876 practitioners) further showed an average of 21.3 hours of STEM professional learning between 1 August 2017 and 31 July 2018.

The absence of any consistent trend data to track changes over time means it is difficult at present to capture a picture of whether the above figures represent typical levels of provision over time and also where in the educational journey this learning is taking place - given that the measure aims to capture professional learning at all levels of education from early years through school, to college.

The second measure focuses on meeting ITE intake targets for STEM subjects. As primary teaching is a generalist programme with no subject specialism offered or required of entrants, the focus of this measure is on secondary teacher numbers in STEM subjects. Given this, data on entrants to primary teaching will not be captured through this source; In-take targets for primary teaching are typically met (with 2018 statistics published by the Scottish Government indicating that there were 71 more primary teaching entrants above the intake target). What we don’t know at present is the level of science, technology, engineering and maths knowledge or qualifications held by those starting a career in primary teaching.
**Actions to address teacher confidence**

Prior to the introduction of the STEM strategy, measures were being pursued to address the gaps in STEM expertise and confidence among teachers in Scotland. This included:

- Providing career long professional learning to teachers through investment in the Scottish Schools Education Research Centre (SSERC) and the National Numeracy and Mathematics Hub and working in partnership and collaboration with others to provide support to teachers and schools, for example, through the Raising Aspirations in Science Education (RAiSE) project in partnership with The Wood Foundation and the Barefoot computing programme in partnership with BT and the British Computing Society.
- Implementing a Digital Learning & Teaching Strategy with a focus on enriching education through the use of technology and actions to develop the skills and confidence of educators, improve access, enhance the curriculum and qualifications and empower leaders.
- Delivering a successful teacher recruitment marketing campaign with a focus on STEM subjects; working with the teacher education institutions to develop new and innovative routes into teaching, particularly in the hard to fill subjects, including STEM and in geographical areas that have difficulty recruiting teachers.

The first annual report on progress of the STEM strategy adds the following actions as being taken to improve STEM learning and teaching and delivery of enhanced professional learning:

- The publication by Education Scotland of 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 offering ‘one stop shop’ access to a wide range of STEM learning resources for practitioners.
- Continued support for SSERC in financial year 2018-19 for its programme of professional learning for teachers, expanded to include more digital learning.
- Continued funding for the RAiSE programme to support improvements in primary science and STEM practice; working in 2018/19 with its third tranche of local authorities.
- Investment of £1.6 million over four years (2014 to 2019) to support numeracy and mathematics professional development in local authorities. Aligned to this, in 2019-2020 Education Scotland will pursue a national thematic inspection of numeracy and mathematics as part of implementation of the Making Maths Count report recommendations: “to evaluate the quality of children’s and young people’s learning experiences and attainment in mathematics and share examples of good practice.”

Richard Lochhead MSP in his letter to the Committee (4 July 2019), noted other initiatives being funded by the Scottish Government with the aim of addressing STEM learning and teaching in early years education:

- Recruitment of Improving Gender Balance and Equalities Officers within Education Scotland to support expansion of the Improving Gender Balance Programme and

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2 All this work is underpinned by the National Improvement Framework.
new professional learning for teachers, covering early years, primary and secondary schools. This investment is to continue for the lifetime of the STEM strategy (which runs until 2022).

- Funding to support increased professional learning in STEM for early learning and community learning practitioners and for primary and secondary school teachers and school technicians. In financial year 2018/19 this comprised £187,000 of Enhanced Professional Learning in STEM grants awarded to 24 projects (this link offers details on each funded project). A further £571,000 is being made available in financial year 2019/2020 to continue these projects. And £1.3 million of new funding is being provided to support a further round of grants in 2019/2020. The aim of this funding is to provide subject-specific support to each of the STEM related disciplines as well as supporting interdisciplinary approaches to STEM learning.

His letter also highlights funding and activity by Education Scotland, which, in addition to activity listed previously, includes: funding for STEM specialist advisors to support classroom teachers; funding the provision of Digital Skills Officers providing regional and national expertise and support; and conducting "annual practitioner and provider surveys to inform development of resources".

Teacher confidence and knowledge

A letter from the Scottish Government (20 August 2019), following up on issues raised when officials from the Scottish Government and Education Scotland attended the Committee meeting (5 June 2019) shared results from the 2018 online practitioner survey:

- 43 per cent of responses from early learning and childcare professionals agreed or strongly agreed that they were confident in delivering STEM in their practice.
- 63 per cent of responses from primary teachers agreed or strongly agreed that they were confident in delivering STEM in their practice.

The letter notes that this survey work is to continue annually to track progress over time:

“The confidence levels and professional learning priorities of practitioners and technicians will be monitored annually to assess progress and ensure that professional learning interventions to build confidence and capacity of practitioners continues to be targeted appropriately. Levels of confidence in delivering STEM learning amongst practitioners is one of the key performance indicators for the Strategy and data on this will be published as part of the annual reporting for the [STEM] Strategy.”

Throughout the inquiry the Committee has heard concerns about teacher confidence in the early years and primary school setting. For example, at the 12 June 2019 meeting, Lorna Hay reiterated a point raised in written submissions that teacher confidence varies across STEM disciplines, with teachers in the early years / primary setting having less confidence in engineering and aspects of computing science relative to levels of confidence in mathematics and some basic elements of science and communication technology.

On the same topic, Susan Boyd shared with the Committee results from a staff survey at Breadalbane School, which showed that very few primary practitioners had a higher level of learning in technology and engineering. Aligned with that, teachers reported lower levels of confidence in these subjects. This finding was borne out through the poll conducted at the STEM workshop at the SLF on Wednesday 25 September, where 62% of attendees cited engineering as the subject they were least confident in, followed by technology.
In contrast, 50% said maths was the subject they were most confident in, followed by science (45%).

Different approaches to improving teacher confidence have been discussed throughout the inquiry. These centre mainly on:

- Teachers participating in career development opportunities.
- Having a science specialist teacher in each school who is responsible for cascading knowledge or who has strong links with local secondary schools or cluster arrangements where secondary teachers can share knowledge with primary teachers.
- Increasing the qualification level of those taking part in Initial Teacher Education training programmes through requirement of a science qualification at National 5 or above (alongside the current requirement to have mathematics at National 5 or above).

Alastair MacGregor when giving evidence on 12 June noted that SSERC’s primary cluster programme, as well as the work taking place through the RAiSE programme “‘is not about making every teacher a STEM specialist’. Rather:

“It is about saying that we should take some key devoted primary teachers and early years practitioners - such as Shona Birrell and Lorna Hay - and provide them with enhanced mentoring and leadership skills. Let us provide them with additional, practical, hands-on, experiential types of professional learning and they can then go back into their school and work with their peers and learners. They can go back into their local authority and cascade that CPD in that way. That does not mean that everyone has to be a specialist. It is a cascade model. We have piloted a primary cluster programme for the past six years. It is independently evaluated, and it has been said that it works and that there are highly motivated mentors. Those mentors have developed their own pedagogic and assessment skills and have promoted science and technology activities in classrooms across the region.”

Nicola Dasgupta (a teacher and Vice-Convener of the Educational Institute of Scotland Education Committee) talked at the Committee meeting on 26 June 2019 about her own experience in this area:

“I agree that the approach [to address teacher confidence] has been variable in different authorities, with teachers having different experiences. Unfortunately, there is no real mentoring approach where I am. We have had training, but it has been of variable quality. There was a big push on STEM a couple of years ago in my local authority and a lot of time was given to it. However, the approach involved not small groups in which people could have professional dialogue, but a big room with 100 people being talked at by various people who told them how to take forward a certain initiative. There was no real follow-up, so teachers who were not particularly sure or confident had no one to ask. Teachers were all at the same sort of level and were trying to find their way through the training without being sure how.

Nicola Conner (also a primary teacher) at the same Committee meeting highlighted the positive impact of taking part in initiatives to improve teacher confidence:

“We have been part of the SSERC cluster programme, the main aim of which is to raise teacher confidence within our cluster. There are six schools and one early years’ centre in our cluster and we have a science mentor in every school. We did the programme in 2016-17, but even though a couple of the mentors have left to go to
promoted posts or different authorities, other mentors have taken over. Importantly, not only did the mentors ask someone to take on the role in their school, but they took the skills and everything that they learned through the SSERC and for themselves and disseminated it into other schools or authorities.

There are, of course, teacher confidence issues, but we could say that about music or drama. People have different interests and backgrounds. I do not have a science background; my background is in drama and music. When I was asked to do the cluster programme, it was for my professional development in order to get ideas. The enthusiasm and training that we got from the SSERC was of such high quality that we came back enthusiastic and motivated, wanting everyone to feel the same.”

**Continuous Professional Development (CPD)**

The STEMEC report has a number of recommendations relating to continuous professional development in the STEM education setting. Of particular note is recommendation 8:

| Recommendation 8 - The Scottish Government should lead the development of a coherent national strategy for building teacher and leadership social capital which allows teachers sufficient time to collaborate, undertake career long professional learning and lead the delivery of CfE through consideration and restructuring of teacher numbers, workload, contact time and bureaucratic demands. |

Prof. Ian Wall reports that there has not been a response to this recommendation from the Scottish Government. Saying that, there are a number of funded initiatives aimed at supporting the teaching profession with STEM development including the Scottish Schools Education Research Centre (SSERC) programme of professional learning for teachers, now expanded to include digital learning. The Raising Aspirations in Science Education (RAiSE) programme also continues to operate in partnership with The Wood Foundation. This programme has been established to support improvements in primary science and STEM practice; and is now engaging with its third tranche of local authorities. There is also direct support going to local authorities to improve digital skills and computing learning in schools.”

Through this inquiry we have heard that SSERC is a major contributor to STEM learning among the teaching workforce. It offers a shared service across all 32 local authorities, providing Career Long Professional Learning (CLPL) and a guidance and advisory service supporting STEM education along with wider STEM engagement provision. In SSERC’s written submission, it highlighted its activity in 2017/18 to promote CPD among early years practitioners, primary teachers and childminders, which included a total 2,628 CPD units of which 750 were delivered using SSERC Meet technology³, reached practitioners / teachers at 368 primary schools across 30 local authorities. It's CLPL was delivered across the primary STEM sectors through 3 major strands: The Primary Cluster Programme in Science and Technology (PCP); the PSTT Sustain and Extend Programme (PSTT-SEP), and Open Courses.

Through the PCP programme, SSERC works with clusters of primary schools that have been identified by their local authority where science and technology are part of a cluster improvement plan. SSERC “actively encourage early years participation in this programme”. Two levels of professional learning are offered through PCP:

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³ As well as more traditional CLPL events, SSERC offers online professional development. This online activity is referred to as "SSERC Meet"
• Immersive, residential events for those teachers within a cluster who will assume the role of mentor in science and technology for their colleagues. These teachers work with SSERC to engage all primary teachers in their clusters in professional learning.

• Short, non-residential events (funded largely by NSLC) for all teachers within the cluster, thus engaging teachers who would not normally participate in experiential science and technology CLPL via interactive e-learning, and face to face workshops.

The RAiSE programme is cited by the Wood Foundation as allowing local authorities to develop bespoke plans to reflect their local context, conditions and priorities, including delivery of more than 600 tailored CLPL opportunities focused on team-teaching, remote online delivery, cluster working, and events designed for sharing good practice. The Wood Foundation notes that there have been 6,400 practitioner engagements with RAiSE activities between August 2017 and March/April 2019.

While the programme is well regarded, questions have been raised about the sustainability of activity when the Wood Foundation funds end. For example, at the Committee meeting on 26 June 2019, Kathryn Thomas (seconded from primary teaching to the role of Primary Science Development Officer at Highland Council) highlighted issues with continued financial support for her role:

The Robert Owen Centre for educational change did an external evaluation of the RAiSE project, and it found that the programme had worked very successfully when local authorities have got behind it. This is not to say that Highland Council has not got behind it, but there has been a funding issue in Highland. There are austerity budgets, and lots of additional support needs posts are being cut. There is not a way in which Highland Council will fund a development officer to carry on the programme, so we are looking for external funding in order to continue it. The RAiSE partnership is very keen for us to continue. If funding is secured, we can still be part of the RAiSE network, but that funding would not secure the salary for the development officer post—external funding would be needed for that.

In answer to questions about the sustainability of the activities that has been pursued, Kathryn Thomas noted that the Wood Foundation funding is provided for two year, with the relevant council expected to have a longer-term view of how they want to continue after this funding ends. In Highland, the focus is on targeting resources to P6 to S2 pupils, meaning that there is no funding to support the work that has been done by the PSDO in the early years’ environment. At that point in time, Ms Thomas suggested attempts were being made to seek alternative sources of funding to continue this work.

While there is a commitment to career development for primary teachers to pursue learning in aspects of STEM, the Committee has heard via written submissions, oral evidence and at the SLF event on 25 September about issues with accessing cover to allow teachers to leave the classroom or gaining access to support that would assist with setting up or running experiments or to take the class outdoors (e.g. classroom support / technicians) can be challenging.

In relation to early years practitioners, during his evidence Alastair McGregor from SSERC was asked about whether SSERC works with private sector practitioners or solely with local authorities. He confirmed it was local authorities because of SSERC’s funding regime. He confirmed that there was a “massive appetite” from the private sector for SSERC training. One member, Oliver Mundell, then asked about the potential inequity created where a large proportion of childcare (40% in his constituency) will be delivered
from the private, voluntary and independent sector under 1140 hours provision but there is no scope at present for SSERC to train early years practitioners from those sectors.

Alastair MacGregor advised that “As an organisation, we can do more to offer support but we are probably at a tipping point regarding the level of professional learning that we can offer. Last year, we were funded to undertake 5,200 CPD units across the education community in Scotland; we did more than 6,500 units, so we were well above the target. However, we are now at a tipping point whereby we are limited in what we can do with the resource that we have available to support that CPD. For us, it is about seeing what we can do by working in partnership with the Scottish Childminding Association and Early Years Scotland to support the needs that are undoubtedly there in the system.”

**Resources and workload**

Staying on the subject of career development, but linked to making use of STEM equipment in the classroom, Tim Dreyer, a PDSO from North Ayrshire Council, in a written submission suggested that poorly timed CLPL can be a barrier to high quality STEM learning for practitioners:

> “Through no fault of the provider, a CLPL session may focus on activities or equipment that won’t be used by staff until much later in the session, or if the content has already been addressed, perhaps even the following session. I have seen this in some schools who have received YESC kits and as time passes, their mastery of the kit decreases to a point where it becomes to time intensive to retrain themselves in its use. As a result, the kit is no longer, or was never used.”

A number of submissions discuss the issue of resourcing STEM activity. Jigsaw Family Learning Centre, for example, refers to the cost of resources being a barrier to delivering STEM, with IT equipment noted in particular as expensive. A study by the Learned Society Group found that more than half of respondents felt they did not have sufficient equipment and consumables to delivery practical science work. Others noted a lack of training on use of science equipment and consumables. Most (98% of respondents) reported having to draw on additional funding for practical activities, with parental sources the most common for extra-curriculum activity.  

The point has been raised in oral evidence that the scope to undertake outdoor learning experiences and trips can be limited by staffing levels, including teachers not wishing to spend time on paperwork for risk assessments to take children outside their learning environment due to other workload pressures. In the nursery setting there are particular challenges with pursuing outside learning opportunities, given the short length of the nursery day. Shona Birrell at the 12 June meeting noted that many early years practitioners have undergone training using the forest kindergarten model. However, given that the standard nursery session is three hours ten minutes: “by the time the children were on the minibus and ready to go, it was time to come back.” Ms Birrell also noted that staff to children ratios and funding for minibuses can be further barriers to outdoor learning in the nursery setting.

Susan Boyd has also highlighted that, without sufficient support staff, some early years practitioners and primary teachers may be more hesitant in taking pupils, particularly those who may need additional support, out of school. Ms Boyd notes that STEM activities can

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4 The study was conducted in 2014 and involved a small sample. The LSG proposed that this work be revisited; specifically that the Scottish Government should commission further research to identify the requirements, including appropriate funding, to enable the adequate delivery of practical science.
be resource-intensive. On that basis, support staff are very important in this area of the curriculum. In its written submission, NASUWT notes: “even highly experienced and trained practitioners will find it challenging to undertake practical experiments, investigation and outdoor learning with no pupil support assistants”. Susan Boyd citing her own classroom experience said: “the school does not have the resources to offer support to some of the learners in my class. They are supported by me, parents and volunteers, and in many creative ways that our school is developing, but obviously we would be much happier if we had core support staff to meet those learners’ needs.”

The above highlights difficulties with resources in primary classrooms leading to a reliance on parents either as volunteers in the classroom or to fund STEM activities. As Professor Yellowlees (representing the LSG) noted:

“[in our 2014 research], we found that, if a school did not have the resource because it had not been given that by the local authority or because it had opted to spend its money in another way—we all recognise that such hard decisions have to be taken—it often had to go to external sources of funding. The most common source of funding was parental funding, which was used to set up a club or to provide the materials, the equipment or whatever it was to do the STEM-type activity.”

The NASUWT has argued that accessible training, professional learning and support are invaluable to support STEM learning, “without additional staffing resource, the practicalities of undertaking STEM work within the primary setting are prohibitive”. On a related note, both Susan Boyd and Lorna Hay as primary teachers highlighted the time spent either outside the school day or in breaks or non-teaching time organising STEM learning opportunities e.g. setting up experiments or sorting out kit to teach a specific lesson. The time investment is partly due to there being no other staff, such as technicians, available to support this type of activity. Lorna Hay also noted that: “[break-time] is a useful time to set up a science experiment but, if a teacher works in 50 minute periods and does not start until 10 minutes to 12, and the previous teacher is still in the room, when do they set it up? If they are lucky, they might ask their pupil support assistant to do that but, if they have a pupil support assistant only for 50 minutes in a week, that is a struggle. More hands are needed to do such work. Sometimes we have to rely on older children to get things out for younger children. I have seen no technicians in my experience of primary schools.”

Nicola Connor when attending Committee on 26 June summarises the demands on teachers’ time and how STEM can be delivered in that context:

Perhaps a more consistent approach is needed, both to STEM and to CPD more generally. Again, as other people have mentioned, there is an overload of work for teachers. Therefore, although a lot of teachers are enthusiastic about STEM, they feel pressure, because STEM is not the only thing on their or their headteacher’s agenda or on their school improvement plan. A lot of things are being asked of teachers, and STEM is only one of those things. It is about finding the time. If STEM is a teacher’s particular enthusiasm or they want to focus on it for their professional learning, they might choose it; if it is not, they might find that they are pulled in a lot of different directions.

**Qualification Requirements**

The [SPICe background paper](#) issued alongside this briefing, notes the current requirements for PGDE primary teaching and that the qualification routes into working as an early years’ professional are more varied.
The STEMEC report (2016) made a number of recommendations focused on changes to the Initial Teacher Education (ITE) programme for primary teaching. Recommendation 9 was that teacher training programme should require applicants to have a Level 5 qualification in a science subject and that after a further five years this should be increased to a Level 6 in mathematics and a science subject. An update on progress of all the STEMEC recommendations (as reported at March 2019) is presented at Annexe C of the SPICe background briefing.

Ian Menzies from Education Scotland when giving evidence on 5 June 2019 highlighted that there is an opportunity to promote science competence within teacher training. However, his view was that the focus should be on “the whole journey of a professional from the moment that they qualify as a teacher”, not just the teacher training element. He noted that RAiSE officers, for example, are able to provide support to probationary teachers as well as those teachers with many years teaching experience.

How to ensure that primary teachers have the necessary skills, knowledge, confidence and capacity to deliver different STEM focused learning in the early and first phases of CfE has raised different options. Changing the ITE programme for primary teachers to include a requirement that they hold a qualification in at least one science subject is one option. Investing in continuous CPD that teachers can access throughout their careers to learn and build their science, technology, engineering and mathematics skills and knowledge is another option that has been discussed. The third option is having STEM specialist teachers available to teach in primary schools. They may be secondary teachers who can work with primary teachers to build their skills or can themselves deliver classes where relevant. This issue was discussed at the SLF workshop on 25 September where a secondary teacher who was involved in STEM activities with local primary schools referred to challenges with time to get involved with a range of teachers at different schools and in different school years, as well as timetabling issues, making it challenging to provide the input that may be sought to address the confidence teachers are highlighting.

Ensuring that STEM focused learning is available to those working in the early years setting perhaps requires a different approach. Early years professionals who are working in various pre-school learning settings do not typically pursue their training via the ITE route. As Elisabeth Kelly noted in evidence on 5 June (based on her knowledge) there was limited STEM content in the programmes of learning for early years professionals (those not pursuing the ITE route into teaching). In addition, many staff training to be early years professionals through the various pathways on offer will pursue their training while working in an early-years setting. Given these issues, the approach to ensure that early years professionals have the learning resources they need to deliver STEM learning will necessarily be different to those pursuing a primary teaching qualification.

Members may wish to discuss the following with the Minister:

- The measures being taken, or that need to be developed, to monitor and report against the KPI about increasing the hours of STEM professional learning being accessed by early years professionals and P1-P3 primary teachers.

- Given that there are a lot of activities focused on STEM, how to ensure that practitioners are aware, can engage with and get the most of what is on offer; and how the Government is assessing the overall impact of these initiatives to ensure they are integrated into the broad aims of the STEM strategy.
• Whether there is a role for Education Scotland through inspections to assess this impact of STEM activity in early and first phase of Curriculum for Excellence.

• Plans for how and where the Improving Gender Balance and Equalities officers will work; and with only six working across Scotland, the measures being taken to ensure that activity reaches all local authorities and focuses on children in early years and early primary schooling.

• A number of projects and funding streams are offered as special initiatives (e.g. RAiSE); whether and how to assure the longer-term sustainability of this type of activity.

• Whether any inequity in STEM training provision for early years practitioners between private and state provided childcare requires to be addressed.

THEME 2: EQUITY OF ACCESS TO STEM LEARNING – DEPRIVATION / RURALITY

Performance measures

The STEM strategy includes two relevant measures intended to address equity issues in relation to people living either in areas of deprivation or in remote / rural Scotland. Both measures rely on engagement with Science Centres as their route into STEM learning – one in the school context and one in the wider community setting.

<table>
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<tr>
<th>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.</th>
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<tr>
<td>* Increase the proportion of schools from most deprived quintile that receive a quality STEM engagement experience from funded Science Centres.</td>
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<tr>
<td>* Increase the number of members of community groups from the most deprived or rural areas participating in quality engagement with Science Centres and festivals to 10,000 by 2022.</td>
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Data on the first measure – increasing the proportion of schools from the most deprived quintile that receive a quality STEM engagement experience from funded Science Centres – is reported in the first STEM strategy annual report. The data used to measure this element is: “schools with postcodes in most deprived 20% of Scottish Index of Multiple Deprivation receiving a visit from or a visit to one of the 4 Scottish Science Centres through the School Transport Subsidy”. The baseline for this measure is 2016/17 when the figure was 34.1%. The proportion in 2017/18 was significantly higher at 44.9% of eligible schools receiving a visit from or making a visit to one of the four Scottish Science Centres. This rise is explained as a result of “efforts on the part of [Science] Centres supported by changes in policy and funding for them”.

Data on the second measure - increasing the number of members of community groups from the most deprived or rural areas participating in quality engagement with Science Centres and festivals to 10,000 by 2022 – is also reported in the first STEM strategy annual report. The data used to measure this element is “community groups with members based in most deprived SIMD or in areas 3-6 of Urban Rural Classification going to or receiving a visit from one of the 4 funded Scottish Science Centres via the Community Subsidy”. The baseline for this measure is 2016/17 when the number of visits was 8,235. It
rose to 8,604 in 2017/18 with the Scottish Government noting that “this represents the highest participation since the subsidy was started in 2012/13”. As further context to these figures, the data table for the KPIs shows that:

“The trend since 2012/13, when the subsidy was started, has been for increasing numbers of participants as the [Science] Centres have developed relations with community groups in their areas. The subsidy was increased in 2016-17, leading to an increase of over 1,000 participants from the previous year.”

**Actions to tackle STEM inequity affecting areas of deprivation / rural areas**

As noted above, it is Science Centres that are charged with delivering the STEM strategy’s approach to tackling geographical inequities in access to STEM education. The first annual report notes its activity in this area as follows:

“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 sector to share best practice and develop a vision for genuinely community-led engagement. This vision will be further developed and implemented during 2019.”

The LSG submission highlights the central role played by parents / families as influencing engagement with STEM in the early years of learning:

“While schools can help build science capital among families, action needs to be taken by a wide range of influencers. Yet there have been relatively few interventions aimed at increasing the science capital of parents and families, so that they are more likely to support their children.”

This submission goes on to note that this is now changing, with grant funding from the Scottish Government provided to Scottish Science Centres to make provision to support engagement with a greater diversity of people; supporting pupils in rural and deprived areas to access Science Centres. There is also funding going to the three Science Centres (Aberdeen, Dundee and Glasgow) from the UK Association for Science and Discovery Centres and Science Museum Group to promote diversity. This will give these centres additional resources to enable children and adults from a more diverse range of backgrounds to participate in science-related experiences.

However, while a great deal of focus is going on supporting engagement through Science Centres, there are those who point to the limits of this approach. For example, Elisabeth Kelly stated in her written submission (and reiterated in oral evidence) that:

“STEM needs to be embedded in everyday learning and teaching and not seen as a once a term or year initiative supported by a local business or science centre.
Initiatives can be useful as a provocations or as a reflection tool but should not be a one–off STEM experience.”

When this issue was raised at Committee on 26 June, Matt Lancashire from SCDI did acknowledge that rural communities in Scotland do face particular challenges with accessing the Young Engineers and Science Club (YESC) programme that SCDI offers. In his view, the infrastructure is in place, but more needs to be done to engage parents in these opportunities:

In Shetland, 79 per cent of primary schools and 100 per cent of secondary schools have a registered YESC. Likewise, in the Western Isles, 83 per cent of primary schools and 100 per cent of secondary schools have a YESC. That is where we are. We want to continue that engagement and expand that provision. The issue is how many children come along to those clubs and participate. There is infrastructure to support the YESCs, but we need to encourage and motivate the children to come along a second time. That goes back to the point that was made about parental motivation and parents supporting their children to participate. The infrastructure is there. Maybe there is a role for the ambassadors and the co-ordinators to play in helping to provide motivation and spreading the message among parents and the wider communities in such far-flung areas.

In response, Nicola Dasgupta points out that “STEM is probably not a priority for parents who are struggling with their financial background and other issues and will have other priorities.”

Access to “science capital”

Edinburgh Science noted in its’ written submission that it “is committed to engaging and informing our young audiences and will continue to seek support to develop and improve what we do with STEM messages and concepts for 3 to 7-year olds. We play a part in the national picture and have invested people, time and money over the past 30 years to do just that. We support young people to actively engage with STEM so they become the problem solvers of tomorrow. We see the building of science capital and cultural capital in our young people as a key part of developing the four capacities outlined in the Curriculum for Excellence.”

Glasgow Science Centre at the 5 June Committee emphasised an increased focus in their work to removing barriers to access for those from deprived and rural areas of Scotland. For example, there are grants available to help schools fund travel to the Science Centre and exhibitions are being designed that can be taken on tour around Scotland. The Centre did, however, recognise that its work with local authorities has focused on nearby authorities – specifically Glasgow and West Dunbartonshire. In its written submission, West Dunbartonshire Council refers to work it is doing with Glasgow Science Centre, specifically the Inspire and Challenge STEM professional learning initiative, which the GSC notes is a teacher training programme for existing primary teachers to improve confidence (this initiative has worked with 240 teachers specifically in the West Dunbartonshire area).

Beyond the work of Science Centres, many of the innovative initiatives highlighted within submissions do not explicitly refer to action that is being taken to tackle area-based inequities in access to STEM education. The RSE report Tapping All Our Talents (2018) highlights that pupils are influenced by teachers, careers advisers, the media, peers and, often to the greatest extent, by their parents or carers. As such, “students from families with medium or high science capital are more likely to aspire to science and STEM-related careers and are more likely to plan to study science post-16”.

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Education Scotland at the 5 June meeting noted that the STEM strategy recognises the importance of building science / STEM capital among families and communities across Scotland: “Engaging parents is part of the work that we have been doing through the RAiSE programme.” Ian Menzies from Education Scotland further noted that the STEM strategy focuses significantly on community learning and development: “Over the past few months, for instance, we have been doing a series of events around Scotland, bringing together community learning and development specialists with early learning specialists and primary and secondary school staff to look at the connections and how we can take STEM into the wider community and families. Our RAiSE team has been running a lot of parental engagement events”.

The sustainability of measures to engage communities across Scotland in STEM learning has been considered throughout this inquiry. The Tapping All Our Talents (2018) report notes that: “in isolation, one-off initiatives such as a talk from a female scientist or visits to a STEM workplace, having been shown to have little or no long-term impact.” Getting parents / carers / families involved in learning about and better understanding the opportunities offered by science, technology engineering and mathematics has been repeatedly highlighted as a way to ensure that even single interventions offered by Science Centres and others have a longer lasting impact on young learners’ engagement with science and STEM more generally.

Submissions from those who lead on smaller / local initiatives suggest the basis for providing support to particular schools or targeting particular areas can relate to factors such as people within the schools having an interest in STEM or ease of access. For example, Dr Francesca Iezzi explains the challenges she faces with her mathematics initiatives, pointing out that the time and location of activities5 “prevents us from reaching a wider demographic, such as pupils from widening participation schools, or those whose parents are less likely to bring them to a University event.” In relation to workshops she states: “We prioritise the schools who actively ask for a visit”. These tend to be schools in more affluent areas, with the result that schools located on the outskirts tend to be underrepresented.

Members may wish to discuss with the Minister:

- Whether the right balance is currently being struck between specialist / one-off STEM activity and more continuous and sustainable ways of bringing STEM into early years and primary school settings.

- Whether any discussion has taken place in Scottish Government about the development of performance indicators to measure STEM engagement among young school aged children who live in deprived or rural areas where the activity is not delivered by Science Centres or Festivals

- With various initiatives to promote STEM in different geographical areas and run by different bodies, whether the Scottish Government is taking sufficient steps to ensure the correct balance of provision reaches those less likely to engage in STEM learning, particularly taking account of the need to address inequities in science capital.

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5 Which take place at the University of Edinburgh Maths Department on a Saturday afternoon.
THEME 3: EQUITY OF ACCESS TO STEM LEARNING – GENDER

There are no specific KPIs in the STEM strategy that focus on gender inequity in the early years or primary school setting. There are, however, KPIs on qualifications achieved at school, and subject uptake in college and university and also in relation to Foundation Apprenticeships.

The 2018 RSE report *Tapping All Our Talents* provides a progress review on women in STEM in Scotland as an update to the 2012 report of the same name. The key recommendations from the 2012 and the 2018 reports are presented at Annexe D in the SPICe background briefing.

The *Tapping All Our Talents* 2018 report notes that “gender stereotypes and biases abound in all parts of society… [consequently] awareness of gender equality issues amongst teachers, school leaders, careers advisers and parents is frequently low.” The report argues that interventions to “shift norms around gender stereotypes and attitudes towards STEM must begin early in children’s learning and development.”

At the Committee meeting on 26 June, Simon Gage from Edinburgh Science referred to the ROSE project – Relevance of Science Education – an international comparative research study exploring factors affecting learning of science and technology among 15-year olds. He pointed to findings from that international survey that indicate that young women are turned off science as they see it as not social enough.

A summary published in 2010 reports that girls were less positive about their view of science by the age of 15 than boys, this was especially the case in wealthier countries.

At the 25 September SLF workshop, one participant referred to activity focused on getting girls into STEM careers and raised concerns that this might put young girls and women off as they may not wish to, for example, pursue a career in engineering. Another participant asked if there is role of Skills Development Scotland in promoting careers in STEM among girls and women. The inquiry has, however, highlighted repeatedly that at the early learning and first phase of CfE the main focus should be on tapping into children’s natural curiosity about the world around them. In doing that, the world of science, mathematics, engineering and technology is opened up that may later in the learner journey lead to considering a STEM career.

**Action to tackle gender inequality**

The LSG in its submission argues that systemic change is required to address gender inequality in STEM throughout the learner journey. A ‘whole school’ approach is required to mainstream culture change, with a focus on “all strands of gender inequality” - and not limited to only focusing on girls and STEM. It refers to the work being pursued by the Scottish Government and Education Scotland through the Improving Gender Balance Scotland (IGBS) project in supporting schools and early learning and child care centres to establish interventions to effect long-term cultural change around gender stereotypes, unconscious bias and inequity.

Following successful evaluation, the LSG submission notes that Scottish Government has made a commitment to embed the learning from IGBS in to the practice of every school by 2022, including the recruitment of a team of Improving Gender Balance and Equalities (IGBE) officers to work with regional teams. This is highlighted in the STEM strategy first annual report, with IGBE officers recruited to work with schools and early learning providers to expand and embed the approaches developed in the 3-year Improving Gender

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6 See also this report: [Review of Improving Gender Balance 2018](#) by Skills Development Scotland
Balance pilot\(^7\) (published in June 2018). Education Scotland has also published a suite of Improving Gender Balance Action Guides\(^8\) for teachers and early learning and childcare practitioners. In addition:

- An SCQF accredited module of professional learning for practitioners is currently being trialled, in partnership with Skills Development Scotland.
- In 2019, there will be gender and equality training provided to practitioners and a gender champion network and a gender kitemark will be established to grow and spread best practice.

This work will be undertaken with the six new Regional Improvement Collaboratives along with the new Regional STEM Advisers. There will be external evaluation of the impact of this work, which will inform the future direction of interventions and build capacity for local evaluation. The programme will also be informed from wider evidence gathered via the Regional STEM advisers, the college-led STEM Hubs and through the education inspection and review process.

This inquiry has highlighted different ways to tackle gender inequality. These include focusing STEM initiatives directly on girls and women; reinforcing positive role models for girls and women to aspire to; and taking on the longer-term work of challenging and changing gender stereotypes.

Gender stereotypes are deeply ingrained and therefore difficult to change and challenge. The recruitment of the IGBE officers is one measure to address this challenge. Elisabeth Kelly on 5 June noted that teachers themselves are still learning to better understand their own unconscious bias. As such, many are not yet in a position to have any significant influence over parents, to challenge or question their unconscious biases and the impact of these on their children. At the 26 June meeting, issues were raised around teachers having adequate training to address gender stereotypes, particularly those that may be hidden as a result of the unconscious biases of both parents and teachers.

Picking up on the issue of training, Kathryn Thomas said:

“I welcome the Improving Gender Balance team within Education Scotland, which has six officers who will deliver training. The aim is to deliver training in all schools by, I think, 2022. I question how feasible it is for six officers to do that, because it is such a wide remit, but I welcome the fact that training will be made available to teachers.”

At the 12 June Committee meeting, Professor Yellowlees suggested that addressing gender inequality needs to start early and continue throughout education. There has been recognition in this inquiry that there is a role for family and wider society as well as the curriculum / education setting both to start intervening at a young age to address gender stereotypes, but also to continue that work throughout different ages and stages of learning. Wider societal change was noted by Professor Yellowlees as opening up more discussion of these issues. However, the Scottish Government has a significant role to play in providing strong leadership on this issue in relation to the Scottish education system.

**Members may wish to discuss with the Minister:**

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\(^7\) Various resources from this work (including summary, literature review and subject specific findings) are available via [this link](#).

\(^8\) These are available on the Education Scotland [Improving Gender Balance 3-8 page](#) (guides are toward bottom of the page).
• Whether primary teacher training gives sufficient attention to challenging
gender stereotypes (given that teachers are key influencers); and what could
be done to make progress on this issue

• How progress to tackle gender inequality in early years / primary settings can
be tracked in the absence of a relevant KPI in the STEM strategy

• Whether measures need to be put in place to ensure that activity to tackle
gender inequality that starts in early years is sustained and built on as
children go on to the next stages of their learning.

• Whether there could be more focus in school inspections on assessing and
uncovering gender inequality.

THEME 4: INTERDISCIPLINARY LEARNING

The STEMEC report highlights the need to focus on interdisciplinary learning in the
approach to engaging learners in STEM education. Professor Wall in his submission for
the 27 March meeting noted that interdisciplinary learning is one of the key areas raised in
the reports leading up to the publication of the Scottish Government’s STEM strategy:

“It is very important that learners are able to make connections between and across
different disciplines since life, especially the world of work, requires people who are
able to solve problems that draw upon knowledge from more than one discipline.
Having secured its place as an explicit context for learning, interdisciplinary learning
(IDL) is one of the most innovative features of CfE. However, progress in implementing
IDL in Scottish schools has been slow and patchy. There remains a lack of clarity and
understanding among many headteachers and teachers about what constitutes IDL,
how it relates to the disciplines across the curriculum, how it should be assessed and
why it is important for learners.”

On this point, NASUWT suggests that this inquiry should “bear in mind the objectives and
structure of Curriculum for Excellence (CfE), which set out that pupils from the age of three
are entitled to access a Broad General Education (BGE).” This submission notes that BGE
is underpinned by the four capacities that pupils are expected to develop across all the
eight curriculum areas, which include mathematics, sciences and technologies: “The
structure of CfE deliberately places considerable emphasis on the interconnectedness of
the curriculum experience and making links between subject areas is seen as critical to
ensuring that children can progress and achieve in respect of the four capacities.” Given
this focus, NASUWT suggests that BGE in the early years should “be regarded as holistic
rather than as a series of disconnected areas of learning”:

“While it is entirely legitimate for policymakers and parliamentarians to consider
different aspects of this curriculum, this must be done in a way that respects the
foundations on which CfE is structured. Consequently, it is of concern that so much
attention seems to be focused currently on different elements of the curriculum. For
example, there are many ‘initiatives’ looking at relatively narrow segments of the
curriculum. In addition to STEM, these include: Read, Write, Count; the First Minister’s
Reading Challenge; Making Maths Count; Learning for Sustainability; and music
education.”

These initiatives, while addressing important issues, are argued to give special attention to
specific elements of the curriculum. They put “the coherence of the overall curriculum… at
risk”. A focus on some aspects of the curriculum is said to inevitably lead to under-
emphasis of others. Many of those giving evidence have argued that STEM should feature more in the core curriculum alongside literacy, numeracy and health and wellbeing. At present the view the Committee has heard is that STEM is not given as high a profile as other subjects in the curriculum. Alastair MacGregor from SSERC suggested [at the 12 June meeting] that STEM learning can be used as a tool to prioritise attainment in literacy and numeracy so improving equality and equity. At present, however, it is “number 12 on a list of 17” priorities.

Elisabeth Kelly in written evidence pointed out that, in an early learning environment, interdisciplinary learning to explore STEM is straightforward given the “holistic nature of learning” at that age. However, she reinforces the points made by other contributors that the “National Improvement Framework focus on discrete subjects such as Literacy, Numeracy and Health and Wellbeing has meant that training on STEM has not been a priority for many.” She suggests that STEM is commonly thought of as a set of discrete disciplines that stand alone. This means that “opportunities to teach and explore it in interdisciplinary ways are being missed.”

The SCDI highlighted that inter-disciplinary learning is “critical to support children and young people to thrive in the future economy and society. The outputs of the recent Royal Society of Edinburgh conference on inter-disciplinary learning highlighted its value in inspiring and motivating creativity, innovation and problem-solving in children and young people.” The report of the conference can be found here.

Science education, Jenny McAllister MBE, notes is not just for those aiming for a scientific or technical career. As well as offering opportunities to develop skills around analysis, evaluation, thinking critically, being creative and innovative, it can also teach skills such as resilience, risk taking, self-reflection and collaboration.

March et al (University of Sheffield) make the point that to introduce STEM into the early education curriculum in line with the ethos and practice of early childhood education could usefully consider a focus on STEAM: “that is the integration of STEM subjects with arts and humanities subjects such as art, craft and design, and literacy.” Marsh et al suggest that “this approach has been found to increase pupils’ engagement in, and motivation for, STEM subjects. The inclusion of arts and humanities subjects has been found to be of relevance to marginalised learners who otherwise feel excluded from STEM activities.” While studies in this area are relatively new, the team indicated that emerging findings suggest a STEAM approach “leads to the development of a range of STEM knowledge and ‘21st century’ skills’ and what might be recognised as ‘engineering habits of mind’”. For a STEAM approach to be effective requires attention to teacher education.

At the 26 June 2019 Committee meeting Kathryn Thomas highlighted the importance of not segregating subjects: “keeping them far more integrated and linking them to literacy, numeracy and health and wellbeing”. Nicola Dasgupta at the same meeting said:

“As practitioners, we are always encouraged to take an interdisciplinary approach, certainly at primary level. That probably happens a lot, although it might not always be branded that way or advertised as such. Teachers do not shout about it, because it is a natural approach for us. Expressive arts and other subjects being brought into STEM probably happens a lot more in schools than you might imagine. It has a massive impact on children, because they love all of that. It increases their engagement and enjoyment, and it adds to a positive experience for them. I would welcome more of it.
Dr Gage from Edinburgh Science concurred, highlighting the focus in their activity on motivating people “through their artistic aspirations so that they use, learn and acquire new skills in technology”. In addition, Matt Lancashire from SCDI noted that:

Interdisciplinary learning is increasingly important due to the shifts in our economy. Adding art and humanities into STEM can create further resilience, creativity, adaptability and flexibility, which is important when we are talking about people having nine or 10 different jobs in their lifetimes. If we want to have a successful fourth industrial revolution economy in Scotland, which we all desire, it is critically important that we have interdisciplinary learning, so that those skills can flourish and people can work with the technologies of the future.

Dr Gage pointed out that there are those who are not using the language of “STEM” at all so as to focus on the interplay between learning that is focused on science while embracing arts and culture: “The Edinburgh Science Festival is a cultural event that involves humour, eating, drinking and so on.” He suggests that: “Talking about creativity, problem solving, coming up with great ideas that will make the world a better place, being inventors, working in teams— that is the sort of language that young people will respond to, rather than: 'It’s time to do your STEM'”.

Members may wish to discuss with the Minister:

- Views on whether the focus on STEM should be broadened to include arts and humanities (STEAM) and, if so, how this might be taken forward.

- How best to balance the need to improve teacher confidence in STEM disciplines (specifically technology and engineering) with the need to focus on interdisciplinary learning.

Suzi Macpherson
SPICe Research

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Education and Skills Committee

26th Meeting, 2019 (Session 5), Wednesday, 2 October 2019

STEM in early years education submissions pack

Responses have been received from the Minister for Further Education, Higher Education and Science and the GTCS in response to correspondence from the Convener in June. The responses are attached in Annexe A and B and links to the original letters are below.

- Annex A: Scottish Government
- Annexe B: General Teaching Council for Scotland (GTCS)
- Read the letter from the Convener to the Minister for Further Education, Higher Education and Science. 12 June 2019 (92KB pdf)
- Read the letter from the Convener to GTCS. 12 June 2019 (62KB pdf)

The Scottish Government sent in additional information following on from the evidence session on 5 June 2019

- Annexe D: Letter and supplementary information including Primary Teacher Statistics 20 August 2019 (518 KB pdf)
- Annexe E: 2018 Teacher Census Data

A link to the data from the Scottish Government on the School technician support staff (FTE) is here.
Scottish Government

Minister for Further Education, Higher Education and Science

Clare Adamson MSP
Convener
Education and Skills Committee

4th July 2019

Dear Clare

Thank you for your letter dated 12 June 2019 which requests information on STEM-related funding provided by Scottish Government and its agencies which is intended, entirely or in part, to contribute to STEM learning experiences of children between the age of 3 and 7.

The STEM Strategy for Education and Training contains a number of actions which are aimed at contributing to STEM learning across the education and training landscape, including for children between the age of 3 and 7. Most of the strategy’s actions are being delivered through re-prioritisation within existing policy budgets and resources for Early Years, Higher Education, Further Education, Apprenticeships and public science engagement, as well as being factored within partner budgets for Education Scotland, Skills Development Scotland and the Scottish Funding Council. As the Committee is aware, it is the responsibility of local authorities to provide staff and other resources to support education, including STEM education in schools.

In addition to the mainstreamed provision for STEM education and training referred to above, we have made some new funding available for key projects and activities within the strategy. This letter provides information about these projects along with details about activities being supported from the partner budgets referred to above.

Given the wide range of activity and the variety of audiences involved, identifying the proportion of our funding that is used specifically to support the STEM learning experiences of children aged 3 to 7 is not straight-forward. The Committee has also asked for information about work that is targeted at improving equity in access to STEM experiences, including for those from deprived areas and also from rural and remote areas. There are some specific initiatives within the strategy that address this, and information on these is provided in this letter. It should be noted that ensuring equity of access is embedded across all of the actions in the strategy.

I attach at Annex A an overview of activity and budgets that contribute to STEM learning experiences of children between the age of 3 and 7 and would highlight the following points:
Annexe A

- We have made some new funding available for key projects within the strategy:
  - Improving Gender Balance and Equalities Officers have been recruited within Education Scotland to support the expansion of the Improving Gender Balance Programme and new professional learning for teachers covering early years, primary and secondary schools. This has been supported with funding of £189,382 in FY18/19 and £300,000 in FY19/20 with a commitment to continue supporting the programme for the lifetime of the strategy;
  - The Young STEM Leaders Programme is being delivered by the Scottish Schools Education Research Centre (SSERC), in partnership with science centres and festivals to support young people to inspire each other to get involved in STEM with £500k being provided across three financial years - FY18/19, FY19/20, FY20/21;
  - Funding to support increased professional learning in STEM for early learning and community learning practitioners and for primary and secondary school teachers and school technicians. This comprised £187k of Enhancing Professional Learning in STEM grants awarded to 24 projects in FY18/19, with £571k being made available in year FY19/20 to continue these projects. In addition, a further £1.3M of new funding is being provided to support a further round of grants in FY19/20. The aim of these funding streams will be to provide subject-specific support to each of the STEM-related disciplines as well as interdisciplinary approaches to STEM learning. Improving gender balance, equality and equity have been identified as priority areas. Further information on the criteria for these grants can be accessed at: https://education.gov.scot/improvement/learning-resources/A%20summary%20of%20STEM%20resources

- In addition, Education Scotland:
  - is funding the provision of STEM specialist advisers to support classroom teachers.
  - is funding an enhanced team of numeracy and mathematics officers providing regional and national expertise and support.
  - is funding the provision of Digital Skills Officers providing regional and national expertise and support.
  - is working in partnership with industry to deliver the Digital Schools Award programme with almost 50% of primary schools already registered.
  - is developing an on-line resource for STEM for early learning practitioners, primary and secondary teachers, technicians and community learning and development practitioners.
  - is conducting annual practitioner and provider surveys to inform development of resources.
  - has published a self-evaluation and improvement framework to support ELC settings and schools in the delivery of STEM learning and teaching.
  - is developing an online directory of STEM inspiration activities covering early learning, primary and secondary schools.
Specifically, for the early years sector, we:

- have contracted University of West of Scotland for a period of 3 years to develop a free STEM on-line learning module for all early learning and childcare (ELC) practitioners to help ensure they have appropriate skills, knowledge and confidence to deliver STEM learning in ELC sector. The cost of the 3-year contract is £27,114.
- have provided £886k of funding to Inspiring Scotland to work with eight local authorities to improve outdoor learning as part of their expansion of ELC. The learning from this work will be shared across the regions through the Regional Improvement Collaboratives.
- have produced a guide on Outdoor Learning, 'Out to Play', linking strongly to STEM skills.
- are supporting ELC settings to promote positive engagement with STEM and tackle gender stereotypes through their parental and family engagement activities through gender resources, STEM Conversation Days with children and families officers, and funded CLPL delivery.
- have been promoting and sharing existing good practice within the sector through existing communication channels.
- have refreshed the Digital Schools Award programme to support more engagement with ELC settings.

We have also committed to ongoing funding and support for the following programmes:

- **Scottish Schools Education and Research Centre (SSERC)**
  We have provided financial support to SSE RC for more than 10 years and in FY19/20 their grant will be approximately £870K. Within this, we have funded the Scottish Schools Education Research Centre's primary science cluster programme since 2012.

- **National Numeracy and Mathematics Hub**
  For FY19-20, the funding previously allocated through Education Scotland's National Numeracy and Mathematics Hub has now been increased and subsumed within the Enhancing Professional Learning in STEM Fund, referred to above, which totals £1.3M. This move seeks to consolidate professional learning and support for numeracy and mathematics within the STEM context as well as a separate and high priority discipline. Delivery of the recommendations of the Making Maths Count report is one of the key functions of the Fund.

- **Scottish Attainment Challenge**
  The Scottish Attainment Challenge is providing £750M during the course of this Parliament to tackle the poverty related attainment gap. Of this, in FY19/20 £SOM has been allocated through the Attainment Scotland Fund to 9 local authorities with the highest concentrations of deprivation and an additional 73 schools out with these 9 local authorities to support them to close the poverty-related attainment gap. The majority of these have specific numeracy interventions or interventions where
improved numeracy is an indirect outcome. The funding has been used in a range of different ways to support improvements in numeracy such as the recruitment of numeracy specialists, staff training and development, research and to purchase to numeracy resources. In addition, £120M of Pupil Equity Funding has been allocated directly to headteachers in over 95% of schools. This funding may also be used on interventions, activities and resources designed to tackle the poverty related attainment gap in numeracy and other STEM subjects.

➢ Digital literacy and digital skills
Through a dedicated Digital Team, Education Scotland continues to work with Local Authorities who request support in all areas of digital and in all sectors including early years and primary practitioners.

➢ RAISE Programme
We have supported the Raising Aspirations in Science Education programme (RAISE) since 2016. We have provided a total of £400,000 for the RAISE programme since FY16/17 and will provide up to £190,000 for the programme in FY19/20. 12 local authorities have been involved to date and an invitation has been extended to all local authorities who wish to join the programme on a rolling basis. The programme provides support to enhance confidence and skills of primary practitioners with the aim of improving learning and teaching in STEM education.

➢ Maths Week Scotland
Now established as an annual event, we have funded a full-time Maths Week Scotland Co-ordinator post to deliver events, resources and activities that promote the relevance, value and joy of maths. Early years, primary schools and family learning are all key sectors for activities and engagement across Scotland celebrating maths. The project is funded £240,000 over 3 years and supported by a small grants fund to inspire participation.

➢ Read, Write, Count
We continue to support the Scottish Book Trust and Save the Children (through combined grant funding of £1.1 M in FY19/20) to deliver resources and outreach support on numeracy (as well as literacy) to encourage families to engage with their young child’s learning. This is supported by a social marketing campaign providing accessible advice and tips to parents on how to support learning and development.

➢ Colleges are developing 13 regional STEM Hubs to strengthen collaboration between partners including universities, science centres and employers and to facilitate more joint professional learning between schools and colleges. This will include primary and early learning settings from 2019. One of the aims of establishing the hubs is to ensure greater consistency in STEM engagement across different parts of the country. Proposed changes to Scottish Funding Council Credit guidance will also allow colleges to draw down funding Credits for work with schools that links to the STEM strategy and to enable them to develop the hubs. STEM activity equates to 26.7% of total SFC activity within
the college sector, with a portion of this activity in several colleges used for work around STEM engagement in primary settings.

➢ The Science Centres and Festivals are provided with annual funding from Scottish Government which includes targeted activity for under-served groups. In FY18/19, we provided funding of £2.625M to be shared between Scotland’s four science centres and £250,000 for the Science Festivals. Science centre support includes a school transport subsidy and a community subsidy to enable engagement with a greater diversity of people.

➢ Science Festivals support requires them to specifically target some of their activity towards encouraging more girls and women to engage with STEM, and to widen their audiences so that people in deprived and/or rural areas can access STEM activities.

As well as the funding the Scottish Government provides, Education Scotland is working with the Science Centres to extend the reach of its programmes to parents and families in designated SIMD areas.

As you will appreciate, forward funding will be confirmed on an annual basis as part of the budget process, however, we have made a commitment in principle to continuing to support all of the above activity for the duration of the strategy.

I hope that the above information is helpful to the inquiry.

Best Wishes

Richard Lochhead
The General Teaching Council for Scotland

Clare Adamson MSP
Convener
Education and Skills Committee

23 August 2019

Dear Ms Adamson

Education and Skills Committee STEM and Early Years Inquiry

I write in response to your letter dated 20 June 2019, in which you seek information in relation to the General Teaching Council for Scotland's (GTCS) perspective on STEM and Early Years Education.

In particular, I note the three key areas in which the Inquiry has an interest:

• Minimum standards of course content in relation to STEM for those training to become primary teachers and details of any specific course content from any institutions where GTCS has recently accredited or renewed accreditation for course content.
• Minimum qualification requirements for different forms of primary teacher training course, and ideally details of the outcome of GTCS' recent review of entry qualifications.
• Details of any courses GTCS is aware of where students are able to gain a qualification in a STEM specialism during the course or are required to have such a qualification at the end of the course as opposed to at the start.

The list of documents in the attached Appendix sets out the various policies, procedures and requirements which GTCS applies in relation to the entry requirements for Initial Teacher Education (ITE), the accreditation of ITE programmes and the professional learning of teachers. The list also includes information on programmes, courses and modules for primary education across the range of ITE institutions in Scotland.

I provide below a response to your Committee's three key areas of interest.

"Minimum standards of course content in relation to STEM for those training to become primary teachers and details of any specific course content from any institutions where GTCS has recently accredited or renewed accreditation for course content."

It is the expectation of GTCS, in terms of primary education, that all teachers who successfully complete an ITE programme have the skills and knowledge to deliver a broad and balanced curriculum relative to the needs of the children in their care. This is clearly indicated in the Standard for Full Registration and the accreditation criteria for ITE programmes both of which clearly reflect the requirements for Curriculum for Excellence where it is stated that;

"the broad curriculum should bring the experience and outcomes together covering, science, languages, mathematics, social studies (including Scottish history),
expressive arts, health and wellbeing, religious and moral education and technology". (Building the Curriculum 3)

Such a broad and balanced curriculum would clearly require the inclusion of the range of STEM areas. We do not however set a minimum standard for course content per se. Each ITE institution has the autonomy to decide on the most appropriate structure and content of its programmes in the full knowledge of the requirements of national organisations, including GTCS. Some institutions choose to adopt a very focussed approach to the coverage of STEM within the primary curriculum, while other institutions adopt a more interdisciplinary approach to STEM coverage, both of which are regarded as acceptable. In adopting an approach which includes a specific mandatory requirement in relation to STEM, there is the significant risk of all other curricular areas, such as Modern Languages, also making a similar request. In the view of GTCS, this would have a significant impact on the viability of the ITE model as it presently exists. This is an aspect which was explored in the course of the recent consultation on the Memorandum on Entry Requirements for ITE Programmes in Scotland (Memorandum). (See also the response below)

The ITE period of a teacher’s career is a very intense and demanding experience and can, by its nature, only cover the initial skills and knowledge required of a beginning teacher. We are satisfied that this is the case at present. It is over the course of the rest of their career, that teachers in a planned and focused way, continue to deepen their skills, knowledge and understanding of areas such a STEM.

For ease of access, details of specific course content for the various institutions has been provided in the attached appendices. Information in relation to STEM course content has been specifically highlighted in recently accredited and re-accredited programmes.

**Minimum qualification requirements for different forms of primary teacher training courses, and ideally details of the outcome of GTCS' recent review of entry qualifications.**

The minimum qualifications for primary education, both undergraduate and postgraduate, are set out in the Memorandum.

The minimum entry requirements for admission to a teaching qualification (primary education) are as follows:

For the four-year combined undergraduate degree and other undergraduate degree programmes the applicant must have:

- National Qualifications at SCQF Level 6 (for example, Higher Grade), in at least four subjects (one of these course awards must be in English); and
- National Qualifications Course awards at SCQF Level 5 mathematics or an accepted equivalent.

Included for your information, there are a number of documents which outline the recent Entry Memorandum consultation, the outcome of which is that there is a requirement for all primary teachers to hold a Level 5 Mathematics - a STEM subject - based on its significance to developing numeracy and life skills. There is however, no mandatory requirement for all potential primary teachers to hold a further specific STEM qualification such as Chemistry, Technology or Computing, etc. This is for a
number of reasons including the impact on teacher recruitment and the need to maintain a workforce which reflects a range of skills and knowledge appropriate to the primary curriculum. In discussion with the profession on the Entry Memorandum consultation, it was felt that should a STEM qualification be given a priority this would have a significant impact on subject choices made in the Senior Phase of secondary schools across the country.

"Details of any courses, GTCS is aware of, where students are able to gain a qualification in a STEM specialism during the course or are required to have such a qualification at the end of the course as opposed to at the start."

In response to your final area of interest, I am able to confirm that there are two particular ITE programmes which provide primary ITE students with additionality in terms of STEM.

Stirling University as part of its BSc (Hons) in Professional Education (Primary) with specialism programme provides an opportunity for students to enhance their knowledge in particular STEM areas. Summary details of these programmes are set out below.

- **University of Stirling**  
  **BSc Hons in Professional Education (Primary) with specialism in Primary Sciences (STEM)**  
  This programme offers students the opportunity to study education and STEM subjects in partnership with the School of Engineering and Physical Sciences at Heriot Watt University, Edinburgh.

Stirling University also offers the following programme.

- **BSc Hons in Professional Education (Primary) with specialism in Numeracy**  
  This programme offers students the opportunity to study education and Mathematics where the students will engage with a broad base of practical numerical skills modules, designed to introduce students to studying numeracy at university level.

The University of Glasgow delivers a MEd Middle Years Mathematics programme which offers an opportunity for those students undertaking the primary programme to enhance their knowledge in Mathematics.

- **University of Glasgow**  
  **MEd Middle Years Maths**  
  This innovative programme provides teachers with a primary teaching qualification as well as a specialism in Mathematics from Early level to level 4 of the Curriculum for Excellence.

A further approach which has been adopted by a number of ITE institutions, is that of embedding electives within their programmes. An example of this can be seen below in the BA (Hons) Primary Education programme offered by University of Strathclyde.

- **University of Strathclyde**  
  **BA (Hons) Primary Education**  
  The successful negotiation of a particular route through the available suite of modules, results in an award accredited by the GTCS to practise in Primary Education. This includes enhancements to personalisation and choice, professional enquiry and the promotion of self-regulated pathway choices by students.
As indicated previously, the ITE experience is both intensive and demanding, be that the four-year undergraduate or one-year postgraduate. It is designed to lay the foundations for a teaching career. An expectation of all teachers is that they will commit themselves to career long professional learning as well as maintaining the Standard for Registration. Equally, every teacher has the entitlement to an annual Professional Review and Development (PRO).

Any primary teacher who is of the view that he or she requires to enhance their skills and knowledge in the area of STEM, can do so by engaging in professional learning. This professional learning may be formal or informal. Due to the collaborative and collegiate nature of our schools, colleagues take the opportunity of sharing their knowledge in a number of areas. Some colleagues choose to undertake more formal qualifications or pursue GTCS Professional Recognition.

**GTCS Professional Recognition**

Professional Recognition recognises the enhanced, significant and sustained enquiry a teacher has undertaken and the development of their professional learning in a particular area. The award of Professional Recognition by GTCS recognises the teacher as an accomplished practitioner in a particular area, whose practice is underpinned by ongoing reflective enquiry. Professional Recognition can also be awarded to professional learning programmes that provide high quality learning for teachers.

https://www.gtc.org.uk/professional-update/professional-recognition.aspx

Examples of programmes that have Professional Recognition include Learning for Sustainability and Engineering STEM Learning - Primary Engineer. Details are set out below.

**Learning for Sustainability - Connecting Classrooms West of Scotland Development Education Centre (WOSDEC)**

"Learning for Sustainability' is a whole-school commitment that helps the school and its wider community develop the knowledge, skills, attitudes, values and practices needed to take decisions which are compatible with a sustainable future in a just and equitable world. Learning for sustainability has been embedded within the Standards"

https://www.gtc.org.uk/professional-standards/learning-for-sustainability.aspx

**Engineering STEM Learning - Primary engineer**

Teachers develop an enhanced understanding of how engineering can positively impact on children's learning. Teachers increase their understanding of the STEM 'landscape' through critical engagement with research and develop an understanding of their role within the STEM landscape through undertaking a critical reflection and evaluation of their current practice.

**The Scottish Schools Education Research Centre (SSERC)** offers a number of programmes of study and professional learning experiences specifically for primary teachers that have been accredited by GTCS.

https://www.sserc.org.uk/professional-learning/primary-clpl/

Finally, and with regard to your Committee's Official Report, GTCS offers the following observations.
• There is a need for systemic change and public awareness raising of the importance of STEM and the need for teachers of STEM subjects.
• There is a continuing need for high quality professional learning across the country to ensure that primary teachers are confident in delivering the STEM agenda.

I hope that the information provided is helpful to you and your Committee.

GTCS already plays an important role in supporting the STEM engagement. This is done through our ITE accreditation; our Teaching Scotland publications; our engagement with professional learning providers such as SSERC and Primary Engineers; and our awarding of Professional Recognition to teachers and programmes offering high quality professional learning in STEM and STEM-related programmes. GTCS is committed to continuing and extending these activities as part of the drive to improve STEM provision in Scottish education.

Yours sincerely

Kenneth Muir
Chief Executive and Registrar
GTCS response to information request from Education and Skills Committee, Scottish Parliament - 12 June 2019 (re. STEM and Early Years Inquiry)

GTCS Response to Education and Skills Committee STEM and Early Years Inquiry

12 June 2019
1 Relevant Documents

1.1 “Minimum standards of course content in relation to STEM for those training to become primary teachers”
- Evaluation Framework: Accreditation of Programmes of Initial Teacher Education in Scotland, June 2019, GTCS
- Guidelines for Accreditation of Initial Teacher Education Programmes in Scotland, April 2019, GTCS
- Policy Statement: Accreditation of Programmes of Initial Teacher Education in Scotland, April 2019. GTCS.

1.2 “Details of any specific course content from any institutions where GTCS have recently accredited or renewed accreditation for course content”. (see courses/programmes and related documentation listed below)

1.2.1 Undergraduate programmes accredited / reaccredited since January 2016
QMU, BA in Education Studies (Primary) - accredited 20 May 2019
- Validation Document, January 2019, QMU
- Mathematics and numeracy: theory and pedagogy (module descriptor), QMU
- Everyday life contexts: A problem solving approach to mathematics (module descriptor), QMU.

University of Aberdeen, MA Primary Education – reaccredited 24 April 2019
- MA Primary Education Handbook, University of Aberdeen.

University of Dundee, MA (Hons) Education – accredited 17 March 2017

University of Glasgow, MA in Primary Education with Teaching Qualification (Crichton Campus) – reaccredited 15 May 2019
- MA (Hons) Primary Education with Teaching Qualification Accreditation Document,
- MA (Hons) Primary Education with Teaching Qualification Appendices, University of Glasgow, April 2019.

UHI, BA (Hons) Gaelic Education – accredited 22 February 2017
- No specific reference to STEM subject areas in accreditation documentation.

University of Stirling, BSc (Hons) Professional Education (Primary) with specialism in Primary Science (STEM) – accredited 25 April 2017
- ITE Student Handbook 2017 - 18, University of Stirling.

University of Strathclyde, BA (Hons) Primary Education – reaccredited 24 August 2018
- BA (Hons) Primary Education Review, University of Strathclyde.

University of the West of Scotland, BA (Hons) Education – reaccredited 12 February 2019
- Option to exit with Mathematics or Science subject specialism.
- BA Education Programme Specification and Module Descriptors, University of the West of Scotland
BA Education Programme Design and Development Plan, University of the West of Scotland.

1.2.2 Postgraduate Programmes accredited/reaccredited since January 2016

   University of Aberdeen, PGDE Primary Education – reaccredited 24 April 2019
   
   University of Aberdeen, PGDE Primary Handbook.

University of Strathclyde, PGDE – reaccredited 8 May 2019

   Review document for PGDE 8 May 2019 validation and reaccreditation, University of Strathclyde.

University of Edinburgh, MSc Transformative Learning and Teaching – accredited 24 January 2017

   Option to qualify to teach primary curriculum plus a STEM subject or English as specialist subject in S1 – S3.

   MSc TLT Programme Documentation, University of Edinburgh
   MSc TLT Numeracy, Learners and Learning Module descriptor
   MSc TLT Computing Science (1) Subject Specialism
   MSc TLT Computing Science (2) Subject Specialism
   MSc TLT Mathematics (1) Subject Specialism
   MSc TLT Mathematics (2) Subject Specialism
   MSc TLT Physics (1) Subject Specialism
   MSc TLT Physics (2) Subject Specialism.

University of Glasgow, MEd Middle Years – Mathematics (formerly known as MEd Enhanced Practice Mathematics) – accredited 5 October 2017

   Includes qualification to teach primary curriculum plus Mathematics subject specialism in S1 – S3
   MEd in Enhanced Practice Self-Evaluation Document, University of Glasgow.

1.3 “Minimum qualification requirements for different forms of primary teacher training course, and ideally details of the outcome of GTCS’ recent review of entry qualifications”.

   Memorandum on Entry Requirements to Initial Teacher Education Programmes in Scotland 2019.
   Review of the Memorandum on Entry Requirements to Initial Teacher Education Programmes in Scotland Consultation Results, GTCS.

1.4 “Details of any courses GTCS is aware of where students are able to gain a qualification in a STEM specialism during the course, or are required to have such a qualification at the end of the course as opposed to the at the start”.

   University of the West of Scotland, BA (Hons) Education – concurrent degree combining academic study and teacher education.
20 August 2019

Dear Jane

On behalf of Andrew Bruce and Ian Menzies, I am writing to provide the additional information discussed during their Committee appearance on 5 June. The information is enclosed as follows:

**Annex A** Primary Teacher Statistics (and separate attachments with extracted information)

**Annex B** The Learned Societies’ Group on Scottish Science Education, November 2014 - The Resourcing of Science in Scottish Schools

**Annex C** Inspection Information

I hope that this information is helpful in your considerations and please let me know if you require any additional information.

Kind regards

Sara Lightbody

STEM Strategy Manager
Primary Teacher Statistics

The Committee requested information about the numbers of primary teachers in the context of discussing whether there were sufficient numbers of teachers, support staff and technicians in the classroom. For completeness, therefore, as well as providing information about the numbers of primary teachers we are also providing information on numbers of vacancies and support staff in the primary sector. This information is published on the Scottish Government website on an annual basis and can be accessed via the following links:

Primary teacher numbers (Table 7.1 shows primary teachers by local authority): https://www2.gov.scot/Topics/Statistics/Browse/School-Education/teachcenssuppdata


Support staff data: https://www2.gov.scot/Topics/Statistics/Browse/School-Education/SupportStaff and https://www2.gov.scot/Topics/Statistics/Browse/School-Education/Datasets/supportstaffm

and in the teacher census supplementary tables for 2016 and earlier (Table 7.11 for primary split by local authorities): https://www2.gov.scot/Topics/Statistics/Browse/School-Education/teachcenssuppdata

Statistics showing primary teacher numbers, vacancies and support staff have been extracted from these publications and are attached separately for ease of reference.

We would like to make the Committee aware of the following points when interpreting the information:

- As this information has been drawn from different statistical publications they should be considered as providing an indicative rather than a comprehensive picture of the situation. This is because the relationship between teacher numbers, vacancies and support staff is complex and varies according to local circumstances.

- The definition of a vacancy is complicated and the total vacancy figures will include a significant number of posts which are not vacant until some point in the future, or are only vacant for a short period. We have included this information for completeness, but suggest that the Committee focus on the figures relating to vacancies of three months or longer as these will provide a more accurate overview of the position on the ground.

- A range of categories are used to report on support staff, not all of which will be relevant here. Each local authority has its own model for providing support and its own job titles and roles which they map to the reported categories as they see fit.

As the Committee was also discussing school technicians, we have provided some information on numbers of technicians in a separately attached spreadsheet. This is based on data collected from local authorities by the Scottish Government as part of the annual school staff census. This census is conducted in September and captures a snapshot of the school staff situation at that time. This data has been extracted from management information systems used by schools and local authorities. The data has not been through a formal centralised quality assurance process. As such, the Committee should exercise caution when interpreting the data.
The Learned Societies’ Group on Scottish Science Education, November 2014
The Resourcing of Science in Scottish Schools

As discussed at the Committee meeting, we have revisited the Learned Societies’ Group (LSG) survey from 2014 on the Resourcing of Science in Scottish Schools.

The LSG suggested that results indicated that science resourcing levels are not sufficient to fully and effectively meet the requirements of the curriculum. The main areas of concern picked up from the survey were:

1. Equipment and consumable provision was not sufficient

2. Funding allocated to science resourcing in budgets was not sufficient The reported average annual spend per pupil on science in primary (£1.62) and secondary (£7.33) schools is lower than funding levels reported in comparative research conducted in England.

3. Teacher confidence was low in primary schools and teacher support was low at all levels

The survey was based on a sample of 39 primary and 46 secondary schools in Scotland – a relatively small sample size with low confidence levels as acknowledged by the LSG.

The survey findings were amongst the evidence that was considered during the development of the STEM education and training strategy. The strategy contains a number of actions and commitments that address some of the issues raised in the survey findings and these are summarised below.

Decisions on resourcing for consumables and equipment within individual schools is a matter for them and their schools. Education funding is rolled up in the local government settlement, the amount provided to each local authority for all its services. It is for local authorities to prioritise funding to meet local needs and allocate budgets accordingly, including funding for equipment, consumables and for other science resources.

We are committed to working with local authorities to ensure that excellent spaces for STEM learning are included in new builds and developed through school refurbishment projects. STEM features prominently in the updated Suitability Guidance for the School Estate which was published in November 2017.

The strategy makes it clear that we recognise that practical experience is an important part of STEM learning and that opportunities to carry out experiments and engage in practical investigations and activities should be an integral part of STEM learning across all ages and stages. Many practical activities can be done in standard classroom settings and outdoor settings in the setting or school grounds, and do not require specialist equipment. This is particularly the case in primary and early years settings where there is no need for the dedicated facilities required for more advanced or specialist levels of learning.

The Scottish Schools Education Research Centre (SSERC), with funding from the Scottish Government and support from educational charities provide both physical resources and provide teachers with the knowledge of how to use resources that are readily available in the classroom for practical STEM activities. The Primary Science Development Officers in the Raising Aspirations in Science Education (RAISE) programme are also encouraging teachers in their authorities to make the best use of the resources that they already have in schools for practical investigations and experimentation. SSERC also offers training opportunities for technical support staff in health and safety matters. This activity is supported from the Scottish Government’s funding for SSERC.
The strategy includes a number of programmes that provide professional learning for practitioners and aim to enable them build their confidence in STEM including:

- Since 2012 we have funded the SSERC’s primary science cluster programme. To date, the programme has engaged with 85 school clusters across all 32 local authorities and more than 5,000 teachers. The programme has received a positive evaluation from the Robert Owen Centre.
- Since 2016 we have supported the RAISE programme. Following a positive evaluation in May 19, all local authorities have been invited to join the programme on a rolling basis.
- Education Scotland’s regional STEM specialist advisers are supporting learning across sectors including early learning and childcare, ASN, primary schools and secondary schools.
- Education Scotland have introduced a new Enhancing Professional Learning in STEM Grants programme which is providing new professional learning opportunities for early years and community learning practitioners, teachers (including primary teachers) and school technicians. £187k of funding was distributed across 24 organisations in financial year 2018/19 to develop new approaches to professional learning or extend existing provision, in round one of the programme funding. These projects are being supported again in the current financial year and £1.3m has been made available for new projects and programmes.

Education Scotland has also started carrying out an annual online practitioner survey. In 2018:

- 43% of ELC responses agreed or strongly agreed that they were confident in delivering STEM in their practice
- 63% of primary teacher responses agreed or strongly agreed they were confident in delivering STEM in their practice.


The confidence levels and professional learning priorities of practitioners and technicians will be monitored annually to assess progress and ensure that professional learning interventions to build confidence and capacity of practitioners continues to be targeted appropriately. Levels of confidence in delivering STEM learning amongst practitioners is one of the key performance indicators for the Strategy and data on this will be published as part of the annual reporting for the Strategy.
Inspection Information

You requested information as to whether issues on STEM teaching/resources are being flagged in Education Scotland school inspection reports.

Inspection activity, carried out by HM Inspectors, focuses on outcomes for Scotland’s children and young people. If inspectors identify issues around staffing and resources which are impacting on outcomes for learners they will discuss this with the school and education authority, making comment in the summarised inspection findings as appropriate.

A recent report by HM Inspectors of Education *Thematic Inspection of Empowerment for Curriculum Leadership* (March 2019) reported on how schools are leading collaborative work to co-design and develop the curriculum and empower collaboration and collegiality. HM Inspectors engaged with various groups, including senior leadership teams, teachers, non-teaching staff, pupils, parents and wider partners. HM Inspectors noted that ‘difficulty in staffing mean that headteachers sometimes have to cover classes which impacts on how well they can lead learning and how often staff participate in a range of professional learning and dialogue.’ HM Inspectors also identified one of the overarching areas for development was: ‘Address staffing shortages, particularly in rural areas, to ensure teachers can participate in opportunities for professional learning and schools are able to deliver a curriculum that best suits the needs of children and young people.’

Further information can be found in the full report.  
### 2018 Teacher Census Data

**Table 7.1: Teachers in publicly funded primary schools, by local authority, 2004-2018**

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<tr>
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---

**Notes:**

1. Data on early learning and childcare, primary and total teachers along with associated pupil teacher ratios for 2010, 2011, 2012 were revised in 2013 to remove teachers who were double counted as a result of working in both sectors.

2. 2014 Teacher figures were amended in February and December 2015. See background notes.
## Teacher Vacancy Statistics


<table>
<thead>
<tr>
<th>Local authority</th>
<th>Pre-school/ primary vacancies</th>
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<td>10</td>
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<td>Argyll &amp; Bute</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Clackmannanshire</td>
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<td>6</td>
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<td>Dumfries &amp; Galloway</td>
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<td><strong>Total</strong></td>
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<td><strong>309</strong></td>
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### Table 1.2: Support staff in primary schools, by local authority, 2018

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<th>Local Authority</th>
<th>Pupil Support Assistant</th>
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<th>School nurse or other medical</th>
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Education and Skills Committee  
26th Meeting, 2019 (Session 5), Wednesday 2 October 2019  

Scottish Learning Festival STEM workshop

The Committee has heard direct from teachers and early years practitioners in all of its evidence sessions on its STEM inquiry. It agreed to hold a seminar at the Scottish Learning Festival to explore the extent to which some of the experiences and views cited by teachers in evidence were shared by other teachers. The Committee held a workshop at the Scottish Learning Festival on Wednesday 25 September which involved over 50 attendees, the majority of which were teachers. The seminar involved two open discussions and six votes on closed questions.

Those who did not have the chance to speak during the seminar, or did not want to make comments to an audience, were able to write comments on postcards and leave them in a ballot box at the end of the seminar. These comments are at Annexe A.

Teacher training, knowledge and confidence

The first discussion was around the question:

“In your experience, what STEM training and knowledge sharing works well? What are the barriers?”

Continuous professional development

The first comment echoed by a number of others during the discussion was “the issue is workload”. The Deputy Head teacher of a primary school highlighted the number of priorities in the curriculum – literacy, numeracy and wellbeing, the need to train colleagues on the play-based approach. The Deputy Head teacher suggested they were seeking to balance ensuring there is training on STEM with the need to ensure staff are not overloaded with work.

The Convener asked for a show of hands later in the workshop as to who had had training or any involvement with SSERC. 6 people from over 50 attendees raised their hands (It should be noted not all attendees were teachers)

Knowledge sharing

A secondary teacher in science said his work as a co-ordinator for primary schools in his cluster for science knowledge-sharing with teachers and pupils was undertaken in his non-contact time (6hrs per week). Primary teachers have said that given the importance of sharing the specialism with them they consider that a science specialist for the cluster should be a full-time role. A need for more non-contact time was raised by a number of participants. Time constraints were cited a number of times in the second discussion in relation to cluster work. The need to be sharing real specialist expertise was also highlighted so teachers were not teaching pupils misconceptions.
The Convener sought a show of hands on how many people were involved in a cluster programme. 8 people of over 50 in attendance had had an involvement (It should be noted that not all present were teachers).

A university lecturer suggested there was scope for university staff, especially those experiencing a drop off in student numbers for certain science courses, could undertake the role of science specialist for primary schools if they had a means of identifying where there was a need.

A positive example of knowledge sharing was primary teachers that swap classes one day a week so that their respective specialisms can be shared with different classes. Another positive example was a secondary teacher working in a primary school cluster where the primary children visited secondary school for science experiment demonstrations. They found visiting high school and the experiments really exciting. Another teacher later in the workshop emphasised the importance of inspiring young children and captivating their imagination during early years education.

On the question of teachers in primary schools being generalists or having specific specialisms one attendee suggested that generalist primary teacher was the role people had ‘signed up for’ and if they wanted a specialism they could be a secondary teacher. One teacher responded that they agreed primary teachers are generalists but that the system needs to be able to support teachers to gain more specialism where they need it and suggested that was not the case at the moment. They continued on ITE highlighting no science qualification was needed to become a primary teacher and ITE covered relevant content in a “handful” of sessions. She surmised that it was an “unreasonable expectation” for primary teachers to be knowledgeable in all of these areas.

Initial Teacher Education

A primary teacher who recently completed ITE reflected on her experience suggesting that she had been shown how to do a number of experiments during her training but that the time available for training in this area was limited due to the amount of course content to work through in teacher training. For example she had not been taught how to ‘range up’ or ‘range down’ for different age groups and felt she did not have a depth of understanding and therefore would struggle to embed learning in the classroom.

Confidence

At the end of the discussion, there were two votes to ascertain confidence levels in different elements of STEM.

Vote 1

Attendees were asked “Which element of STEM do you feel most confident in?” – 45% said science, 2% technology, 3% engineering, 50% maths.
Vote 2

Attendees were asked “Which element of STEM do you feel least confident in?” – 5% said science, 27% technology, 62% engineering, 5% maths.

Equity gaps

The second discussion was based around the question:

What does, or what would, help address equity gaps in relation to:

- Gender?
- Deprivation?
- Rurality?

Role models and one-off interventions

One teacher suggested, in particular in relation to deprivation, that one-off interventions “do not work” they need to be longitudinal. Another commented that these interventions can be inspiring and that can lead to more in-depth learning at a later stage in school. A third suggested that having role models coming into schools can be inspiring but this needs to be more than a one-off. Having the time and the ability to make connections with other teachers with specialisms or with outside organisations with expertise was a limiting factor in their view.

The Convener sought a show of hands to reflect the number of people who had had involvement with STEM ambassadors. Around a third of attendees had.

Rurality

One attendee highlighted that accessing training and resources is more expensive in rural areas. SSERC webinars were highlighted by another attendee as a “great way to access training”. A third contribution highlighted the Highland Council travel ban which had been in place for some time was a limiting factor.

A representative of the Institute of Physics drew the distinction between the term “rurality” and “remoteness”. He suggested the issue was distance from key centres of learning, such as SSERC in Dunfermline. For example East Lothian would be considered rural but not remote from access to resources and training available in Edinburgh.

One attendee commented on the suggestion in evidence of a science specialist in each primary school, suggesting that for small rural primary schools this was not a viable option. Similarly, clustering primary schools was highlighted by another attendee as challenging given the distances involved.

Gender

One teacher highlighted a successful workshop run in their school by local businesses aimed at encouraging young women into industry. The feedback from
students had been that an interactive experience with people with life experiences of a particular career had been really engaging. The workshop ran for S1 to S6 and was for young women only. The role for SDS in providing and facilitating careers guidance was highlighted.

Another teacher highlighted that her two daughters had had messages on STEM careers “hammered home” at school and as a result had been put off engineering.

**Curriculum**

One early year’s practitioner highlighted the status and place of STEM in the curriculum suggesting “literacy and numeracy are embedded but STEM is not”.

**Resources**

Attendees were asked to vote on four extracts of evidence received so far in relation to resources. The purpose was to see whether teachers had had similar experiences to those cited in evidence or not.

**Evidence extract 1**

“One study found more than half of respondents felt they did not have sufficient equipment for practical work.”

Attendees were asked if this was their experience.

Attendees answered: yes 76%, no 12% and neither 12%. (This third option was intended to cover those who are not in a teaching role)

**Evidence extract 2**

“98% of respondents drew on additional funding for practical activities, with parental sources the most common for extra-curriculum activity.”

Attendees were asked if this was their experience.

Attendees answered: yes 61%, no 24% and neither 15%.

**Evidence extract 3**

“The scope to undertake outdoor learning and trips can be limited by staffing levels, and time required for risk assessment paperwork.”

Attendees were asked if this was their experience.

Attendees answered: yes 71%, no 17% and neither 11%.

**Evidence extract 4**

“Before I came here today, I asked a lot of the local schools that I work with, “What’s the one thing you would like me to take to the inquiry?” The main thing that came back,
quite surprisingly, was that what would help them the most to deliver the curriculum is a working internet connection."

Attendees were asked whether their school’s internet connection was sufficient for STEM teaching?

Attendees answered: yes 27%, no 58% and neither 15%.
Post card comments

1. 'In the Council I work at, visiting STEM specialists were great because they had the knowledge and skill to teach the pupils. They were also available for teachers in school to go and ask for advice and guidance. Taking away the Visiting Specialists has made it harder to upskill current staff which has led to increasing teacher’s workload. Can we get them back please?'

2. Would like to see more joined up thinking between the Government and education areas. (Example: Widening access programmes run by institutions have examples of good practice of how some issues could be overcome) For disadvantaged / under-represented groups this will take a whole systems approach (Justice, Health etc). Needs to be more action and less cyclical conversation.

3. Through running the primary cluster science transition, it is clear there is a space for a specialist PT role to work more consistently with cluster schools.

4. Admissions to life science degrees have dropped across Glasgow possibly across Scotland. Lecturers want to promote their courses and engage / inspire younger years, how can we set up these collaborations? Secondary teachers have obvious time constraints to help primary schools, can we get teachers into universities for workshops in the summer? Are there specialised areas in science that teachers don’t feel comfortable in?

5. A lot discussion around gender, particularly getting girls into STEM. We need to remember about boys. Education Scotland recently reported a lack of boys in biology life sciences, this is reflective in those taking up higher education in this area.

6. The root of many of the issues is class contact time. If you want teachers to engage with the CPD necessary to deliver high quality STEM education you have to give them time. Cut class contact time!
Introduction

This paper details a consent notification sent by the Scottish Government in relation to—

• The EU Research and Development Programmes (Revocation) (EU Exit) Regulations 2019

The Committee is invited to consider the consent notification and agree whether it is content for the Scottish Government to give its consent for UK Ministers to lay the instrument.

Background

In anticipation of the UK leaving the EU, changes are required to devolved legislation by way of statutory instruments. Under the European Union (Withdrawal) Act 2018, and where the Scottish Government considers a UK-wide approach to the legislative changes would be appropriate (for example, to avoid duplication of effort, or where only technical or minor amendments are required), the UK Parliament can legislate on behalf of the Scottish Parliament.

For each UK statutory instrument which relates to a devolved matter, Scottish Ministers have undertaken to write to the Scottish Parliament setting out its proposed consent in a consent notification.

A protocol has been agreed which sets out the shared understanding between the Scottish Government and the Scottish Parliament on the process for obtaining the approval of the Scottish Parliament to the Scottish Ministers’ consent to the UK Parliament legislating on these devolved matters. The protocol states that the Scottish Parliament will normally have 28 days to consider a consent notification.

The protocol also categorises UK statutory instruments as category A (minor or technical amendments), category B (more significant policy decisions) or category C (matters which should be subject to the existing joint procedure (an SI laid in both the UK and Scottish Parliaments)).

Under the protocol, following its consideration of a consent notification, a committee can—

• Write to the Scottish Government confirming its agreement with the consent notification; or

• Report to Parliament and recommend that—
o it is content for consent to be given for a UK SI to be made in the UK Parliament only.

o It is not content with the Scottish Government granting its consent and that the proposals should be made by an SSI; or

o It is not content with the Scottish Government granting its consent and that the proposals should be included as a UK SI made under the joint procedure.

Where a different way of dealing with EU withdrawal, or a different policy outcome, is required in Scotland, the Scottish Government will pursue Scottish statutory instruments in the Scottish Parliament.

**The EU Research and Development Programmes (Revocation) (EU Exit) Regulations 2019**

The Minister for Further Education, Higher Education and Science wrote to the Committee on the 4 September 2019. This letter and the accompanying consent notification is attached at Annexe A for members’ information.

The notification highlights that as a result of the UK exiting the EU, the Regulations revoke provisions relating to 12 EU programmes and initiatives that form part of the EU’s Horizon 2020 Framework Programme for Research and Innovation all UK.

The notification states that the Scottish Government categorises the significance of the proposal as Category A, the lowest level of significance, describing it as “Removing redundant legislation from law; and ensuring continuity of law; and clear there is no significant policy decision for Ministers to make.”

**For decision**

The Committee is invited to consider the consent notification and agree whether it is content for the Scottish Government to give its consent for UK Ministers to lay following statutory instruments in the UK Parliament—

**The EU Research and Development Programmes (Revocation) (EU Exit) Regulations 2019**

If the Committee is content the Convener will write to the Minister for Further Education, Higher Education and Science to inform the Scottish Government of the Committee’s decision.
Dear Clare

THE EU RESEARCH AND DEVELOPMENT PROGRAMMES (REVOCATION) (EU EXIT) REGULATIONS 2019

EU EXIT LEGISLATION - PROTOCOL WITH SCOTTISH PARLIAMENT

I am writing in relation to the protocol on obtaining the approval of the Scottish Parliament to the exercise of powers by UK Ministers under the European Union (Withdrawal) Act 2018 in relation to proposals within the legislative competence of the Scottish Parliament.

As you know, the Cabinet Secretary for Government Business and Constitutional Relations, Michael Russell MSP, wrote to the Conveners of the Finance & Constitution and Delegated Powers and Law Reform Committees on 11 September 2018 setting out the Scottish Government’s views on EU withdrawal. That letter also said that we must respond to the UK Government's preparations for a No-Deal scenario as best we can, despite the inevitable widespread damage and disruption that would cause. It is our unwelcome responsibility to ensure that devolved law continues to function on and after EU withdrawal.

I attach a notification which sets out the details of the above SI which the UK Government proposes to make and the reasons why I am content that Scottish devolved matters are to be included in this SI. Please note, we are yet to have sight of the final SI and it is not available in the public domain at this stage. We will, in accordance with the protocol, advise you when the final SI is laid and advise you as to whether the final SI is in keeping with the terms of this notification.

I should highlight that the UK Government’s view is that the subject matter of this SI is reserved, as it relates to international agreements. However, the UK Government has sought the Scottish Government's consent to the SI in recognition of its impact on the devolved matters of education and research. The Scottish Government considers the subject matter of the SI to be devolved and therefore agrees that the normal protocol should be followed.
It is important to note that the Scottish Government has made clear its position that we would wish to continue to benefit from the EU's Horizon 2020 Framework Programme for research and Innovation. However, in the event the UK leaves the EU, UK engagement in the programmes and initiatives cannot continue in its present form and will be subject to applicable EU rules post-Brexit. This instrument therefore reflects the reality of that situation.

The Department for Business, Energy & Industrial Strategy is the lead UK department for this SI, which is due to be laid in the UK Parliament in October or November 2019 (final date to be confirmed).

The Prime Minister's announcement on 28 August that he has approached the Queen to request an end to the current Parliamentary session may impact on those EU Exit SIs that are still to be laid or are still to complete their parliamentary passage. The Cabinet Office are considering this at the moment and we will provide an update when it becomes clear if this will impact the legislative timetable or procedure that relates to this SI.

I am copying this letter to the Convener of the Delegated Powers and Law Reform Committee.

I look forward to hearing from you within 28 days from the date of this letter.

Regards

RICHARD LOCHHEAD
NOTIFICATION TO THE SCOTTISH PARLIAMENT

Name of the SI (if known) or a title describing the policy area

The EU Research and Development Programmes (Revocation) (EU Exit) Regulations 2019

A brief explanation of law that the proposals amend

The Regulations revoke provisions relating to 12 EU programmes and initiatives that form part of the EU's Horizon 2020 Framework Programme for Research and Innovation, which have been retained in domestic law as retained EU law under the European Union (Withdrawal) Act 2018 ("the Act").

The UK and UK organisations are involved in several large scale, EU research partnership programmes known as Article 185 and Article 187 joint undertakings, and in the Knowledge and Innovation Communities (KICs) designated by the European Institute of Innovation and Technology (EIT).

The research & innovation programmes and initiatives which are the subject of this instrument are:

- EU Programmes under TFEU Article 185 on public-public joint undertakings.
  - European and Developing Countries Clinical Trials Partnership 2 (EDCTP 2) aims to accelerate the development of new or improved drugs, vaccines, microbicides and diagnostics against HIV/AIDS, tuberculosis and malaria as well as other poverty-related infectious diseases in sub-Saharan Africa, with a focus on phase II and III clinical trials.

  - Active and Assisted Living (AAL 2): aims to create better conditions of life for older adults using innovative ICT-based solutions (ICT -information and communication technology). The overall objective is to enhance the quality of life of older adults while strengthening the industrial base in Europe through the use of information and communications technology.

  - Eurostars-2: supports research and development in SMEs, targeting development of new products and services, and helping international markets (SMEs - small and medium-sized enterprises). Project applications are accepted from any technological sector, for any market, giving companies full control over project content. The only restriction is that the project outcome must be destined for civilian purposes. Eurostars is a joint programme between pan-European EUREKA and the European Commission, co-funded from the national budgets of 36 Eurostars members and by the European Union through Horizon 2020.
- European Metrology Programme for Innovation and Research (EMPIR): funds collaborative research in metrology (the science of measurement) focusing on projects to address major challenges such as health, industry, energy and environment, and to progress fundamental measurement science throughout Europe and the rest of the world.

EU Programmes under TFEU Article 187 public-private joint undertakings.

- Bio-Based Industries (BBi): uses renewable natural resources and innovative technologies for greener everyday products. It focuses on: feedstock; bio refineries; and, markets, products and policies.

- Clean Sky 2: develops cleaner, quieter aircraft with significantly less CO2 and NO (Nitric Oxide) emissions. In order to achieve this, the programme includes a range of Integrated Technology Demonstrators that test and demonstrate the feasibility of emerging technologies within aircraft.

- Electronic Components and Systems for European Leadership (ECSEL): boosts Europe’s collaborative research & innovation in electronics. In particular, manufacturing capabilities in state-of-the-art electronic components and systems (both industrial and consumer).

- European High-Performance Computing (EuroHPC): develops a world-class supercomputing infrastructure and a competitive innovation ecosystem in supercomputing technologies, applications and skills.

- Fuel Cells and Hydrogen 2 (FCH2): accelerates market introduction of clean and efficient technologies in energy and transport by supporting research, technological development and technology demonstration in fuel cell and hydrogen energy technologies in Europe.

- Innovative Medicines 2 (IMI2): develops next generation vaccines, medicines and treatments, such as new antibiotics. Brings together universities, the pharmaceutical industry, small and medium sized businesses, patient organisations and regulators. Aims to accelerate development of, and patient access to, innovative medicines and treatments.

- Shift2Rail: develops better trains and railway infrastructure that will reduce costs and improve capacity, reliability and punctuality.

- EU initiative under TFEU Article 173

- The European Institute of Innovation and Technology (EIT): brings together business, education and the research base and works through Knowledge and Innovation Communities (KICs). These aim to create innovative products and services, new businesses and train a new generation of entrepreneurs.
These are supported through the EU's Horizon 2020 Framework Programme for Research and Innovation. These programmes and initiatives are governed by EU legal provisions, which will continue to operate once the UK exits the EU. The legal provisions are not required in domestic law once the UK exits the EU.

**Summary of the proposals and how these correct deficiencies**

This instrument revokes retained EU law deriving from 13 EU instruments (both regulations and decisions) for the setting up and operation of 11 Article 185 and Article 187 EU programmes and initiatives and the European Institute of Innovation and Technology (EIT) initiative, which has two instruments.

The instruments are being revoked in order to address deficiencies in this retained EU law as a result of the withdrawal of the UK from the EU. The deficiencies arise as a result of the provisions in question being redundant or concerning arrangements relating to the EU which are no longer appropriate after exit day. This is because if there were no UK-EU Withdrawal Agreement he UK would be a third country in relation to the EU programmes and initiatives from exit day. It would not be appropriate for the UK to have legislation concerning the operation of EU programmes and initiatives after exit day.

The 12 EU programmes and initiatives will continue to operate in the EU. UK engagement in these programmes and initiatives will be subject to the applicable EU provisions post-exit. Revocations made by this instrument will not affect that. If there is no UK EU Withdrawal Agreement, UK entities would be able to participate in these EU programmes and initiatives, where third country participation is permitted under the provisions setting them up.

Third country participation in partnerships designated by the European Institute of Innovation and Technology (EIT) as Knowledge and Innovation Communities is permitted where certain criteria are fulfilled. Third country participation is permitted under the provisions setting up the Electronic Components and Systems for European Leadership (ECSEL), which is an Article 187 public-private joint undertaking.

Eligibility for third country participation in other Article 187 and Article 185 joint undertakings is less clear: they may contain requirements relating to the place of establishment of new members but may not have express provisions relating to existing members. In any event, eligibility to participate will be dependent on the provisions establishing the relevant EU programme or initiative, and not domestic law.

The revocations made by this instrument therefore do not in themselves affect UK eligibility for participation in any of the EU programmes and initiatives concerned in the event of no-deal.
An explanation of why the change is considered necessary

It would be inappropriate for the UK to have legislation concerning the operation of EU programmes and initiatives after exit day. The UK will no longer be an EU member state and in the event of a no deal, the UK will become a third country participant in the Horizon 2020 programme.

Scottish Government categorisation of significance of proposals

Category A, with the following characteristics:

Removing redundant legislation from law; and ensuring continuity of law; and clear there is no significant policy decision for Ministers to make.

Impact on devolved areas

The Scottish Government has devolved responsibilities within research policy. As the UK will no longer be an EU member state after exit day it will no longer be appropriate to retain legislation in domestic law regarding the operation of the 12 EU programmes and initiatives in Horizon 2020. The regulations merely reflect this position.

Summary of stakeholder engagement/consultation

UK Government Officials engaged with UK members of Article 187 Joint Undertakings on whether their joint undertaking or the EU Commission had indicated that retaining in domestic law any provisions relating to the joint undertaking was relevant to the ability of UK entities to remain members post-exit. The members of the Article 187 Joint Undertakings had not received any such indication. They did not believe this instrument would impact their ability to participate in the Joint Undertakings in the future and had no concerns with the statutory instrument being made.

Officials did not engage with members of Article 185 Joint Undertakings as the UK as a country is a participant rather than UK-based entities. Officials did not engage with the European Institute of Innovation and Technology (EIT) as the provisions concerned the creation and functioning of an EU body.

Summary of reasons for Scottish Ministers’ proposing to consent to UK Ministers legislating

Scotland's participation in Horizon 2020 is part of a UK-wide basis for participation, and the deficiencies this proposal seeks to fix (redundant legislation as a by-product of the UK's withdrawal from the EU) will be applicable to each of the four nations that constitute the UK in a no deal scenario.

It would not be appropriate for the UK to have legislation concerning the operation of EU programmes and initiatives after exit day.
Intended laying date (if known) of instruments likely to arise

Intended date is yet to be confirmed but is predicated to be in October or November 2019.

If the Scottish Parliament does not have 28 days to scrutinise Scottish Minister’s proposal to consent, why not?

We believe the Scottish Parliament will have the full 28 days to scrutinise the proposal however, the Prime Minister’s announcement on 28 August that he has approached the Queen to request an end to the current Parliamentary session may impact on those EU Exit SIs that are still to be laid or are still to complete their parliamentary passage. The Cabinet Office are considering this at the moment and we will provide an update when it becomes clear if this will impact the legislative timetable or procedure that relates to this SI.

Are there any broader governance issues in relation to this proposal, and how will these be regulated and monitored post-withdrawal?

As this instrument removes the retained EU legislation and there is, therefore, no ongoing legislation to review, there are no plans to monitor this legislation.

As this instrument is made under the EU Withdrawal Act 2018, no review clause is required.

Any significant financial implications

No significant financial implications have been identified or are foreseen.