



Education and Skills Committee

SCDI consultation response

STEM in Early Years Education

The Scottish Council for Development and Industry (SCDI) is Scotland's Economic and Social Forum. We are an independent and inclusive economic development network representing all sectors and all geographies of the Scottish economy. Our mission is to convene our members, partners and stakeholders across the private, public and third sectors to deliver inclusive and sustainable economic growth for Scotland.

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STEM in Early Years Education

Young Engineers and Science Clubs

SCDI's **Young Engineers and Science Clubs** (YESC) Scotland programme has played a key role in inspiring young people towards STEM (Science, Technology, Engineering, Maths) careers since 1987.

There are now more than 1,500 clubs in our network, with an estimated membership of over 30,000 boys and girls across Scotland. We operate a flexible model, actively encouraging schools to use our resources widely within the curriculum as well as at extra-curricular clubs.

The network continues to expand rapidly and is funded by a wide range of industry and public sector partners, as outlined in Appendix 1.

The key aims of YESC are:

- To enthuse young people about STEM through engaging them in exciting, fun, hands-on STEM projects;
- To encourage young people to make the subject choices that keep open the routes into a career in STEM;
- To better inform young people and teachers about the range of STEM careers available and possible career pathways; and,
- To encourage more girls to study STEM subjects and pursue STEM careers.

We do this by:

- Providing schools with free, topical STEM resources;
- Inspiring them with exciting competitions;
- Building teachers' confidence and capacity by delivering high quality CPD training courses on our range of STEM projects and providing on-going support and advice through our team of Regional Coordinators and STEM Ambassadors;
- Working in partnership with Local Authorities, in particular Quality Improvement Officers, to target our resources most effectively; and,
- Engaging, and working in partnership with, employers, further/higher education establishments and other key stakeholders.

Our strategy is:

- To strategically grow our network across Scotland so that as many schools as possible can benefit from our high quality, topical STEM projects with a focus on targeting rural/remote schools and those in areas of socio-economic disadvantage.
- Current school engagement is outlined in Appendix 2.

Each year we review our activities to develop a streamlined programme with an offer for every level within the Scottish Curriculum for Excellence for 3–18 year olds. We work with our partners to ensure our ambitions are aligned to continue to support both the Scottish Government's STEM and Digital Learning & Teaching strategies.

For example, we are delighted to support **BT's Tech Literacy Campaign** and help 5 million young people get a better tech education, through our support to embed tech literacy within our programme and commitment to deliver Barefoot workshops to Scottish primary schools.

2018 saw us become the Scottish delivery partner for **VEX Robotics** and **TE EEP Robotics** and a series of successful competitions were delivered across Scotland, with plans to expand the reach of both in the 2019/20 school year.

With support from the **Digital Xtra fund**, we were able to continue to expand the number of primary schools taking part in Little Lighthouse, this year reaching seven additional remote schools in both Angus and Aberdeenshire. Little Lighthouse is a first level STEM investigation resource kit for P1-4 using the context of lighthouses; with topics introducing electricity, sound, weather, food chains and coding with micro:bits. Activities using CodeBugs and Scratch provide opportunities to explore coding and programming in a fun context by making games for a lonely Lighthouse Keeper and other themed challenges. Pupils can also see the relevance of digital skills, for example by using the CodeBugs within other STEM activities such as to test conductivity of materials. Through a range of practical activities, the project is designed to enthuse and inspire pupils about STEM and introduces computer science at first level. Little Lighthouse is a direct result of requests from schools for STEM resources for early years.

We will continue to move towards what is proven to be an effective and sustainable model of working with local authorities to develop a programme to complement their education plans for the area. We will continue to deliver teacher CPD courses and provide resource kits to schools, but these will be intended for full classes to use; recognising the opportunity to influence a wider audience than just those who self-select to attend an extra-curricular club who tend to have a higher science capital from the outset.

New YESC projects in development for 2019/20 school year include My Bottle Garden, which is an early level project (Nursery and Primary 1) helping our youngest audience to be inspired by STEM subjects by building a terrarium, exploring the water cycle and investigating seed development through a series of songs, books and hands-on activities.

To support our programme we deliver a series of Regional Celebrations of STEM and these take place during March in Aberdeen, Ayrshire, Dundee, Inverness and new for 2020 the South of Scotland (location to be determined); engaging circa 10-15 teams at each event (approximately 400 pupils and 130 teachers in total).

Our end of school year **National Celebration of STEM event**, held at the Glasgow Science Centre each June, hosts the final of our competitions and provide schools an opportunity to showcase their STEM projects as well as participate in a range of STEM challenges set by our industry partners; enabling them to learn more about the range of STEM career opportunities available.

Teachers skills, confidence and resources

SCDI's *Automatic... For the People?* (2018) report recommended that Scotland redesign education, skills, training, lifelong learning and employment for the new world of work – which is being disrupted and transformed by the Fourth Industrial Revolution in digitisation, automation, AI, robotics and so on – to equip children from early years onwards and to re-equip the current workforce. It is essential that teachers must have the skills, confidence and resources to deliver this ambition.

However, it is clear from the engagement which YESC has with teachers that some teachers lack confidence in delivering science, engineering and digital projects. This is consistent feedback from our teacher training sessions. Feedback from teachers in attendance at these sessions suggest that they appreciate the learning outcomes from these sessions and the resource kit which is provided to support them in delivering future projects with children and young people.

The Scottish Government, Education Scotland and local authorities should expand opportunities for young people to engage with real world AI technologies and data applications in schools, and support teachers with digital training. The Scottish Government must continue to invest in and pilot routes to attract people with the necessary digital skills to teach computing science.

The curriculum guidance for technologies was refreshed in 2017 and it is being implemented in partnership with teachers. Computing science is critical in teaching the core concepts and disciplinary skills for technologies which are key to an understanding of how they work and, therefore, creativity and adaptability. There continues to be an urgent need to recruit and retain computing science teachers and to upskill existing computing science teachers for the new curriculum, for example in coding. The Scottish Qualifications Authority and partners are currently developing a new National Progression Award to be offered in Data Science from August 2020.

Inter-disciplinary learning will be 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.

Barriers to success for initiatives

There are two significant barriers to the success of STEM initiatives in this space. Firstly, many teachers are unable to set aside time to engage with initiatives during the school day due to workload issues. Secondly, and relatedly, it is challenging for teachers to source supply cover to enable them to engage with initiatives due to the cost and lack of availability of supply cover. Local authorities and schools have been impacted by a decade or more of constrained fiscal policy in the public sector. In response to these challenges, YESC delivers two-hour twilight training sessions where possible and is exploring opportunities for the remote delivery of training.

Digital skills are a key component of [Scotland's STEM Strategy](#). It includes long-term initiatives like the new Digital Schools Programme and the Digital Xtra Fund to

support the teaching of digital skills in schools and beyond. With tech developing so rapidly and heavy workloads, teachers can find it difficult to develop the knowledge, skills and confidence to teach digital literacy, but the Scottish Government is expanding the professional learning which the Scottish Schools Education Research Centre offers to include more digital learning. It is welcome that the **Edinburgh and South East Scotland City Region Deal** will deliver and support significant activity on data skills in schools as part of its objective to make Scotland's capital the data capital of Europe.

Moreover, local authority policies may be risk-averse around data security and software authorisations. Excellent AI technologies are being made available but tend to be used in extra-curricular clubs rather than classrooms, because there are not enough of them. This raises issues of teacher workload and pupil equity. 'Unplugged resources', such as **BT's Barefoot programme** – which can be downloaded free-of-charge and used without hardware – are highly regarded, but teachers still need to be trained in them.

Sharing best practice

Our Celebration of STEM events give teachers the opportunity to network, discover new projects and share best practice. It is important that there is greater collaboration and sharing of best practice between existing initiatives to ensure that activities at the national, regional and local levels, and across the public, private and education sectors, are joined-up.

The **Science, Technology, Engineering and Mathematics Education Committee** (STEMEC), of which SCDI was a member, was established by the Scottish Government made detailed recommendations specifically in relation to schools on the questions being examined in this inquiry.

Appendix 1 – YESC Partners

Lead Partners

Chevron
OPITO
Scottish Government
Shell U.K. Limited
wood

Principal Partners

BAE Systems Naval Ships
BP
BT Scotland
Oil & Gas Technology Centre
TAQA
Tomorrow's Engineers
Total E&P UK

Associate Partners and Event/Project Partners

Anglian Water Business / Wave
Balmoral Group
Caledonian MacBrayne
Crown Estate Scotland
ECITB
Falck Renewables
Institute of Physics
Institution of Engineering and Technology
Institution of Mechanical Engineers
Leonardo
LifeScan Scotland
Lloyd's Register EMEA
Merck
Morrison Construction
National Grid
Royal Navy
Science Skills Academy
ScottishPower
Vattenfall
VEX Robotics
Wave

Many more organisations assist the programme, for example by setting STEM Challenges and judging at our events, volunteering STEM Ambassador support, advising on projects, offering site visits.

Appendix 2 – Registered Schools by Local Authority

Local Authority	Primary Schools		Secondary Schools		% registered with YESC	
	Total	Registered with YESC	Total	Registered with YESC	Primary Schools	Secondary Schools
Aberdeenshire	151	64	17	17	42%	100%
Aberdeen City	48	30	12	12	63%	100%
Angus	51	33	8	8	65%	100%
Argyll & Bute	81	22	10	7	27%	70%
Borders	61	35	9	8	57%	89%
Clackmannanshire	18	11	3	3	61%	100%
Dumfries & Galloway	99	69	16	13	70%	81%
Dundee City	34	25	8	8	74%	100%
East Ayrshire	42	41	9	9	98%	100%
East Dunbartonshire	35	19	9	8	54%	89%
East Lothian	35	20	6	6	57%	100%
East Renfrewshire	23	16	7	7	70%	100%
Edinburgh City	88	37	23	19	42%	83%
Falkirk	50	25	8	4	50%	50%
Fife	135	68	18	16	50%	89%
Glasgow City	138	72	30	27	52%	90%
Highland	171	110	29	28	64%	97%
Inverclyde	20	20	6	6	100%	100%
Midlothian	32	7	6	6	22%	100%
Moray	45	45	8	7	100%	88%
North Ayrshire	49	54	9	9	100%	100%
North Lanarkshire	120	46	23	22	38%	96%
Orkney Islands	19	15	5	4	79%	80%
Perth & Kinross	71	54	10	10	76%	100%
Renfrewshire	49	26	11	11	53%	100%
Shetland Islands	28	22	7	7	79%	100%
Stirling	39	26	7	7	67%	100%
South Ayrshire	41	39	8	7	95%	88%
South Lanarkshire	125	105	17	17	84%	100%
West Dunbartonshire	33	18	5	5	55%	100%
West Lothian	67	28	11	10	42%	91%
Western Isles	22	21	4	4	83%	100%
Total	2020	1223	359	332	83%	92%

Other registered schools/clubs (including private schools and those run out with mainstream school): 65