

STEM Professional Learning Survey

June 2017

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Introduction

In June 2017, Education Scotland issued an online survey to the early years, primary and secondary sectors to find out more about the STEM career-long professional learning (CLPL) landscape and to identify the needs and priorities of practitioners and school-based technical support staff.

The survey findings provided important information and evidence which helped to shape the development of the national STEM Education and Training Strategy. This was published in October 2017 and is available from the following link: <http://bit.ly/STEMstrategy>

The information provided by practitioners and technicians through the survey responses has been extremely valuable. The findings have helped to inform decisions about the 'coherent national offer' of professional learning that is being planned in relation to STEM subjects.

Education Scotland has continued to liaise with key partner organisations through 2017-18 to share these findings and discuss ways in which the professional learning offer in STEM can be extended and enhanced. We have also issued other surveys to the mathematics and community learning and development communities to increase the response rate from these sectors and to get further information about their needs. A similar exercise is being considered for the early years sector to enhance the return rate and SSERC is currently undertaking a more detailed survey of the needs of technicians.

The timing for discussions about professional learning in STEM is fortuitous. In June 2017, the *Education Governance: Next Steps* document signalled that Education Scotland would have an enhanced role in relation to professional learning and leadership development. As part of this, the Scottish College of Educational Leadership has now been incorporated into Education Scotland and has shaped work to develop a new national model for career-long professional learning which is to be launched in autumn 2018. This provides us with an important opportunity to align the new STEM offer with the new national model which is being developed.

Education Scotland is excited about the potential for increasing support in relation to STEM over the course of this academic year and beyond. We are already in the process of recruiting a team of new STEM Education Officers and Numeracy officers to support this. We are also just about to recruit a new team of Improving Gender Balance and Equalities officers to provide further support within the new Regional Improvement Collaboratives.

We'll be releasing further details in the months ahead as plans are finalised and approved and as new resources and programmes go live. In the meantime, we'd like to give a sincere 'thank-you' to all those who promoted and completed the survey. In doing so, you have played a significant role in shaping the plans and decisions that will help to make Scotland a STEM nation.

Survey findings

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| 1. Who replied? | <p>Total respondents: 788</p> <p>Sector</p> <ul style="list-style-type: none">• Secondary 59.79%• Primary 35.54%• Early years 3.50%• Additional support needs 1.17% <p>Role</p> <ul style="list-style-type: none">• Classroom teacher 51.85%• Principal Teacher 22.09%• Technician 9.77%• Other 6.45%• DHT/Headteacher 6.39%• Probationer 1.79%• Early years practitioner 1.40%• Classroom assistant 0.26% <p>Subjects taught</p> <ul style="list-style-type: none">• All curriculum areas 41.56%• Sciences 35.53%• Technologies 17.56%• Mathematics 5.35% |
| 2. What are the professional learning priorities? | <ul style="list-style-type: none">• Early years<ul style="list-style-type: none">- numeracy and raising attainment through STEM- awareness of STEM careers- understanding of concepts within the science and technologies curriculum. |

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|---|---|---|---------------|--------------------------------------|---------------|---|---------------|--------------------------------------|---------------|
| | <ul style="list-style-type: none"> • Primary <ul style="list-style-type: none"> - STEM pedagogies - confidence with maths/numeracy - using STEM to raise attainment - skills progression - embedding career skills across the curriculum. • Secondary <ul style="list-style-type: none"> - support for newly-qualified teachers - pedagogies in STEM - skills progression - gender balance in STEM • Technicians <ul style="list-style-type: none"> - understanding the concepts that underpin the sciences and technologies curriculum - support for content in National Qualifications - skills progression - awareness of STEM careers and relevance of STEM to world of work - awareness of STEM resources and professional learning opportunities | | | | | | | | |
| <p>3. What are the main barriers to accessing STEM CLPL?</p> | <ul style="list-style-type: none"> • Finding staff cover • Too many demands on my time • Lack of money for training | | | | | | | | |
| <p>4. How do practitioners access their CLPL?</p> | <table border="0" style="width: 100%;"> <tr> <td style="padding-bottom: 10px;">Attending an externally-provided course outside of my setting</td> <td style="text-align: right; padding-bottom: 10px;">49.42%</td> </tr> <tr> <td style="padding-bottom: 10px;">Collegiate working within my setting</td> <td style="text-align: right; padding-bottom: 10px;">43.06%</td> </tr> <tr> <td style="padding-bottom: 10px;">Professional reading/engaging independently with research</td> <td style="text-align: right; padding-bottom: 10px;">40.08%</td> </tr> <tr> <td>Collegiate working across my cluster</td> <td style="text-align: right;">28.40%</td> </tr> </table> | Attending an externally-provided course outside of my setting | 49.42% | Collegiate working within my setting | 43.06% | Professional reading/engaging independently with research | 40.08% | Collegiate working across my cluster | 28.40% |
| Attending an externally-provided course outside of my setting | 49.42% | | | | | | | | |
| Collegiate working within my setting | 43.06% | | | | | | | | |
| Professional reading/engaging independently with research | 40.08% | | | | | | | | |
| Collegiate working across my cluster | 28.40% | | | | | | | | |

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|---|--|
| | <p>Online learning 25.81%</p> <p>Support/training organised by my local authority 21.66%</p> <p>Social media – Twitter/Facebook etc 17.25%</p> <p>External company/organisation coming into my setting 17.12%</p> <p>Other (please give further details) 12.84%</p> <p>Online network of practitioners 12.84%</p> <p>I do not have any access to professional learning in STEM 11.28%</p> <p>STEM GLOW communities; including the National Numeracy & Mathematics Hub 8.95%</p> <p>Formal learning through a university/ college course 8.30%</p> <p>GLOW Yammer network 4.41%</p> <p>Online course such as a Massive Open Online Course (MOOC) 3.76%</p> |
| <p>5. Which organisations do practitioners go to most for professional learning and support?</p> | <p>SSERC 50.00%</p> <p>Local authorities 25.63%</p> <p>STEM Ambassadors 23.35%</p> <p>Education Scotland 21.85%</p> |

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|--|---|--------|
| | Learned Societies: e.g. Institute of Physics, Association of Science Education, Royal Society of Chemistry etc. | 21.01% |
| | Other (please specify) | 17.51% |
| | SQA | 15.55% |
| | Universities | 13.45% |
| | Science centres | 12.61% |
| | Colleges | 9.80% |
| | Local employers/business partners | 7.58% |

6. What did practitioners think would have the most impact on their professional learning?

| Early Years | None | Some | Medium | High | Very high |
|---|------|------|--------|------|-----------|
| A partnership with a STEM employer leading to STEM initiatives/activities for staff and learners | 15% | 7% | 15% | 48% | 15% |
| A programme of online tutorials that could be watched live or on catch up | 4% | 22% | 30% | 37% | 11% |
| Access to an online network of practitioners to share practice, ideas and resources | 7% | 26% | 30% | 22% | 19% |
| An online course tailored to the Scottish curriculum - such as a Massive Open Online Course | 4% | 22% | 44% | 26% | 7% |
| An online professional learning resource for practitioners tailored to the Experiences and Outcomes including videos, examples & case studies | 4% | 11% | 26% | 41% | 22% |
| Local and national showcase events to share ideas and practice | 0% | 19% | 30% | 33% | 22% |
| More hands-on/face-to-face professional learning from a specialist organisation | 11% | 0% | 22% | 33% | 37% |
| Open day visits to other schools with interesting practice | 4% | 19% | 19% | 37% | 26% |
| Opportunity to pursue further academic study in science including Master's Level | 30% | 19% | 11% | 26% | 15% |
| Professional learning provided by a university | 26% | 7% | 26% | 26% | 15% |
| Professional learning provided by my local college | 26% | 7% | 19% | 33% | 11% |
| Taking part in authority network events | 4% | 11% | 22% | 37% | 26% |
| Taking part in national network events | 19% | 22% | 15% | 30% | 11% |
| Time to work collegiately in my cluster | 7% | 0% | 15% | 48% | 22% |
| Time to work collegiately in my school | 4% | 11% | 7% | 48% | 33% |

| Primary | None | Some | Medium | High | Very high |
|---|------|------|--------|------|-----------|
| A partnership with a STEM employer leading to STEM initiatives/activities for staff and learners | 2% | 14% | 17% | 46% | 22% |
| A programme of online tutorials that could be watched live or on catch up | 5% | 20% | 24% | 34% | 15% |
| Access to an online network of practitioners to share practice, ideas and resources | 4% | 24% | 28% | 0% | 11% |
| An online course tailored to the Scottish curriculum - such as a Massive Open Online Course | 3% | 17% | 28% | 32% | 17% |
| An online professional learning resource for practitioners tailored to the Experiences and Outcomes including videos, examples & case studies | 2% | 11% | 23% | 31% | 29% |
| Local and national showcase events to share ideas and practice | 6% | 27% | 28% | 30% | 7% |
| More hands-on/face-to-face professional learning from a specialist organisation | 1% | 8% | 12% | 48% | 31% |
| Open day visits to other schools with interesting practice | 5% | 19% | 28% | 33% | 13% |
| Opportunity to pursue further academic study in science including Master's Level | 25% | 22% | 23% | 17% | 8% |
| Professional learning provided by a university | 16% | 24% | 28% | 20% | 7% |
| Professional learning provided by my local college | 14% | 25% | 32% | 17% | 6% |
| Taking part in authority network events | 5% | 25% | 37% | 22% | 8% |
| Taking part in national network events | 10% | 26% | 33% | 19% | 7% |
| Time to work collegiately in my cluster | 4% | 6% | 26% | 38% | 22% |
| Time to work collegiately in my school | 4% | 7% | 23% | 36% | 28% |

| Secondary | None | Some | Medium | High | Very high |
|---|------|------|--------|------|-----------|
| A partnership with a STEM employer leading to STEM initiatives/activities for staff and learners | 4% | 18% | 21% | 33% | 17% |
| A programme of online tutorials that could be watched live or on catch up | 7% | 25% | 29% | 20% | 12% |
| Access to an online network of practitioners to share practice, ideas and resources | 4% | 19% | 25% | 29% | 17% |
| An online course tailored to the Scottish curriculum - such as a Massive Open Online Course | 5% | 16% | 27% | 27% | 18% |
| An online professional learning resource for practitioners tailored to the Experiences and Outcomes including videos, examples & case studies | 4% | 16% | 21% | 29% | 22% |
| Local and national showcase events to share ideas and practice | 7% | 19% | 26% | 26% | 16% |
| More hands-on/face-to-face professional learning from a specialist organisation | 2% | 7% | 18% | 37% | 29% |
| Open day visits to other schools with interesting practice | 5% | 17% | 25% | 30% | 16% |
| Opportunity to pursue further academic study in science including Master's Level | 23% | 21% | 23% | 13% | 12% |
| Professional learning provided by a university | 12% | 19% | 28% | 20% | 13% |
| Professional learning provided by my local college | 12% | 24% | 29% | 18% | 10% |
| Taking part in authority network events | 8% | 18% | 29% | 26% | 11% |
| Taking part in national network events | 8% | 21% | 25% | 28% | 10% |
| Time to work collegiately in my cluster | 5% | 12% | 21% | 28% | 27% |
| Time to work collegiately in my school | 3% | 10% | 16% | 30% | 34% |

| Technical support staff | No impact (%) | Some impact (%) | Medium impact (%) | High impact (%) | Very high impact (%) |
|---|---------------|-----------------|-------------------|-----------------|----------------------|
| A partnership with a STEM employer leading to STEM initiatives/activities for staff and learners | 6 | 16 | 25 | 21 | 6 |
| A programme of online tutorials that could be watched live or on catch up | 8 | 18 | 23 | 21 | 4 |
| Access to an online network of practitioners to share practice, ideas and resources | 5 | 19 | 19 | 23 | 6 |
| An online course tailored to the Scottish curriculum - such as a Massive Open Online Course | 8 | 12 | 23 | 25 | 6 |
| An online professional learning resource for practitioners tailored to the Experiences and Outcomes including videos, examples & case studies | 4 | 19 | 18 | 22 | 6 |
| Local and national showcase events to share ideas and practice | 8 | 17 | 22 | 19 | 6 |
| More hands-on/face-to-face professional learning from a specialist organisation | 4 | 5 | 17 | 29 | 21 |
| Open day visits to other schools with interesting practice | 8 | 14 | 18 | 23 | 13 |
| Opportunity to pursue further academic study in science including Master's Level | 14 | 13 | 18 | 14 | 14 |
| Professional learning provided by a university | 12 | 10 | 25 | 13 | 14 |
| Professional learning provided by my local college | 5 | 16 | 27 | 14 | 13 |
| Taking part in authority network events | 9 | 13 | 27 | 18 | 5 |

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|---|----|----|----|----|---|
| Taking part in national network events | 10 | 19 | 17 | 19 | 5 |
| Time to work collegiately in my cluster | 8 | 21 | 22 | 17 | 4 |
| Time to work collegiately in my school | 6 | 22 | 19 | 19 | 5 |

7. What's the best STEM CLPL that practitioners have engaged with?

- Working with STEM undergraduates and support from university
- National STEM Project and work with Education Scotland
- Collegiate sharing, team teaching and visiting other establishments and working with other schools
- Collaborative developments across my cluster and authority
- Training in computing/digital/STEM provided by industry
- On the job training – running STEM clubs, STEM activities for various year groups
- Local authority professional learning
- Significant proportion said they had no training
- Not enough training opportunities for technicians
- SSERC courses, residentials, SSERC Meets and Glow Cookalongs
- Professional learning by providers such as SCDI YESC, Primary Engineer, EDT/Go4SET, CREST
- SQA marker training and understanding standards
- Single-Steps learning
- STEM Ambassadors
- Annual Scottish Mathematical Council Conference
- SSERC Primary Cluster Programme and mentor training
- FutureLearn Online Course – Assessment in STEM and also MOOCs
- Maths Challenge Teacher as part of Raising Attainment Team
- IoP Training and Stirling Meeting
- SEAL Maths Training
- Big Maths/Numicon
- Association of Science Education Conference
- EduTech, CodeClub, Barefoot Computing

- Royal Society of Biology Meetings
- Microsoft, Google training, Micro-bit training
- Plan C/CASS training
- Dumfries House
- Teaching in Nature – Grounds for Learning

8. What are practitioners' big, bold ideas for STEM CLPL?

General

- Training accessible to all at all levels.
- Have a focus to CLPL – not lots of different things running at one time.
- Teachers need period of stability to bring about improvements.
- Guidance on national STEM competitions and activities.
- Need consistent, long-term approach so we can build capacity for improvement.
- Make STEM a requirement for all teachers e.g. 15 hours per year.
- Need proper resources and space in primary schools for woodworking, experiments etc.
- A STEM app where everything about STEM can be accessed by anyone on any device.
- Programme of professional learning during the holidays.
- Frequently run courses, delivered locally.
- Introduce the concept of makerspaces to allow creativity and tinkering to flourish.
- Need a national STEM Group – experienced teachers from all sectors (ELCC, PS, Sec, FE/HE) to develop CPD strategy for Scotland.
- Need a national programme of CPD events.
- Need someone to coordinate activities at a local authority level.
- Need a national centre for CPD in Scotland.
- Ensure events and support are available all across Scotland and not just the Central Belt –more support for small rural schools who struggle, with staffing, budgets and location.
- Make it quick and easy for teachers to find out what CPD is available.

School/cluster/authority

- Collegiate/network time.
- Need dedicated time for cluster working.
- Regular showcase events nationally and regionally to share ideas. School leaders should also attend and there should be an opportunity to rotate around different workshops.
- Create STEM schools where other people who are interested can attend to see their approaches and learn from them.
- Creating opportunities for teachers to visit other schools to see their practice.
- A touring programme of open days.
- Greater collaboration in Scotland to share resources including PPTs, notes, course materials etc.
- More support and CLPL for infants and primary practitioners.
- More support for computing teachers.
- Each school to have a STEM Coordinator who works with other coordinators in cluster.
- Each primary school to have an EXTRA Principal Teacher for STEM.
- Programme of twilights in clusters – 5 to 6 per year.
- Experienced STEM teachers working alongside others to support them.
- Quality CPD produced by practicing teachers who are currently teaching and are aware of the issues we are facing.
- Dedicated INSET day for STEM per year.
- Teacher advisors in school to support team teaching, building confidence of practitioners, provide advice and guidance.
- How to effectively deliver STEM IDL in secondary sector with maths embedded.
- Support to help set up school STEM hubs.
- Provide funding and opportunities for teachers to engage in action learning and professional enquiry (with support from universities) to develop their pedagogies in their own contexts.

Online resource/training

- Online resource with video tutorials, case studies and videos about STEM careers and skills.
- One stop shop for STEM CLPL like Numeracy and Mathematics hub.
- Central resource guide linking to EOs.
- Compulsory MOOCs for teachers like in Finland. A good MOOC that could count towards professional update.
- BGE online resource guide for Early Level to Fourth Level linking to benchmarks, H&W, literacy and numeracy, careers and with lessons, ideas for practicals, home learning, assessment opportunities etc.
- Digital online classroom for learners so they can find teachers/lessons that suit them.

- A central website that teachers can use to train in their own time.
- Online video tutorials like Glow meets, cookalongs.
- YouTube Channel giving tutorials and online learning.
- Case studies of how a line of development could be delivered from Early Level to Fourth Level and how this could work in a classroom facilitated by a teachers and also linked to assessment and moderation.
- We need access to modularised learning that is manageable to engage with.
- Use Glow to its fullest to support professional learning – Glow meets, Yammer etc.
- Central bank of resources provided by Education Scotland.
- Out CLPL online so it is available to everyone at any time and support virtual networking.

External training

- More access to SSERC training – possibly in different locations.
- Find ways for SSERC training to be accessed by ALL schools in Scotland – ELCC, Prim, Sec.
- More centres across Scotland where training can be provided.
- Funding and opportunities for teachers to study MSc or Med.

Colleges and universities

- Free taster courses at colleges.
- Networking opportunities for teachers to make contact with colleges, universities and employers to develop local partnerships.
- Give us time to undertake placements in universities to get up to date with developments, learn about new technologies and discoveries and develop resources for the classrooms.
- Day release programme for teachers to work collegiately hosted by university.

Employers

- Time to work with employers to experience STEM industries first-hand.
- Opportunities for STEM Ambassadors to spend more time in schools.
- Regular opportunities for teachers to spend time in industry to update their knowledge.
- Provide contextualised learning from industry to connect learning to real-life situations.
- Teacher sabbaticals in industry.

Time and resources

- Reduce class contact time to allow teachers to study, work and learn from colleagues.

- More money for resources, equipment and to introduce new courses such as engineering science.
- We need to replace outdated equipment and make sure we have the latest equipment such as notebooks, laser cutters, 3D printers etc, not equipment from the dark ages.
- Need Wi-Fi and digital infrastructure that is fit for purpose.
- Equip schools with software and equipment used industry so they are better prepared for these careers.

Technicians

- Additional support and training for technicians.

Next steps

Under the theme of Excellence, the STEM Education and Training Strategy commits national agencies to a number of actions relating to career-long professional learning including:

E4: Education Scotland will work with partners and, in particular, practitioners, to develop a coherent national approach to STEM professional learning from early 2018. This will include the development of a new national online resource for STEM and an online professional learning offer for early learning practitioners, primary and secondary teachers, technicians and community learning and development practitioners. New opportunities will become available during academic year 2018/19.

E5. As part of this Skills Development Scotland will lead work to provide professional learning to help practitioners contextualise STEM learning, from early 2018. This will ensure learners are able to relate their learning and skills to real-life situations, their future careers, and the economy.

E6. As part of a wider programme of career long professional learning designed to support the expansion of funded early learning and childcare, we will work with partners and key stakeholders including science centres and science festivals to deliver STEM training that will ensure that ELC practitioners have appropriate skills, knowledge and confidence to deliver STEM learning in ELC settings. This will also form part of the coherent national offer for STEM CLPL set out above.

E8. We will provide on-going funding and support for improvements to STEM learning in the classroom through the Scottish Schools Education Research Centre (SSERC), the National Numeracy and Mathematics Hub, the Scottish Attainment Challenge, the Digital Schools programme and the RAISE programme.

Progress

Regional STEM Advisors – Education Scotland is in the process of recruiting a new team of six Regional STEM Advisors. The new team will be aligned to the work of the Regional Improvement Collaboratives and will play a lead role in coordinating and leading the provision of STEM CLPL. The new officers are due to be in post by December 2018.

College STEM Hubs – in line with the STEM Strategy commitment, new college STEM Hubs are in the process of being established in the college regions. They will have a key role to play in supporting professional learning and creating opportunities for practitioners and technicians to meet STEM employers and learn about STEM-related pathways and careers.

Improving Gender Balance and Equalities – following a successful three-year pilot, the learning from the Improving Gender Balance Programme is now being extended to all school clusters in Scotland. Education Scotland hopes to shortly begin recruitment for six new officers to lead and support this work.

Partnership discussions – Education Scotland has been meeting with science centres and festivals, the Learned Societies Group, colleges, Skills Development Scotland, Scottish College of Educational Leadership, Science Skills Academy, the Deans of Science and Engineering and other higher education groups and research pools to discuss opportunities for partnership working to enhance and extend provision of professional learning in STEM.

RAiSE – the Raising Aspirations in Science Education (RAiSE) Programme is a £1 million pilot programme funded by the Wood Foundation, Scottish Government and local authorities. Eleven Primary Science Development Officers are now in place in the eight participating local authorities. Following a successful evaluation of the initial phase the programme is now being extended to a further five local authorities.

Scottish Learning Festival – SLF 2018 will have a strong focus on STEM with a variety of stimulating keynotes, seminars and exhibitors on offer. We are also delighted to be hosting a STEM Live even on Thurs 20th September which gives delegates a chance to engage with fantastic STEM keynotes and STEM demonstration sessions. Visit this page for more information about the programme and to register: <https://education.gov.scot/what-we-do/Scottish+Learning+Festival>

CLPL Strategy – Education Scotland has developed a STEM CLPL Strategy based on the findings of the consultations and STEM CLPL survey conducted in 2017. A paper outlining the CLPL Strategy has been presented to the STEM External Advisory Group and will be presented to the national STEM Implementation Group on 29 August 2018. Further details will become available once plans and budgets have been approved by Ministers.

SSERC – Scottish Government has confirmed a grant of £860,000 for SSERC in financial year 2018/19. In addition, SSERC has been awarded a further £62,760 to support the development of their digital skills programme.