

# Professional Learning in STEM Findings from the Annual STEM Practitioner Survey 2018/19

Early learning and childcare, primary, ASN and secondary

January 2021

For Scotland's learners, with Scotland's educators

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## **Executive summary**

### Introduction

This report presents the key findings from Education Scotland's Annual STEM Practitioner Survey covering academic year 2018/19.

Education Scotland has continued to gather and analyse this data since 2016/17 to inform and support the ongoing implementation of the STEM Education and Training Strategy (2017)<sup>1</sup>.

The findings from the surveys<sup>2</sup> provide valuable insights into the professional learning needs of practitioners; the challenges they face in accessing professional learning and their professional learning priorities. The survey findings have been used by Education Scotland to help shape the national professional learning offer, including the projects supported through the Enhancing Professional Learning in STEM Grants Programme. A wide range of partner organisations have also used the survey findings to help them align their professional learning programmes and strategies to the needs of practitioners.

Education Scotland will continue to measure progress against the following STEM Strategy key performance indicator:

Increased practitioner confidence in STEM learning in the early years, primary years and in community learning and development (CLD) settings and increased practitioner engagement in STEM professional learning opportunities.

• Increase the cumulative hours of STEM professional learning accessed by early years, schools and CLD practitioners annually.

Progress against this key performance indicator, and others, are reported on annually with detailed findings available through the First STEM Strategy Annual Report<sup>3</sup> and Second STEM Strategy Annual Report<sup>4</sup>.

### Key findings

*Number of responses* – The number of survey responses increased by 35.5% from 876 responses in the 2017/18 survey to 1187 responses in the 2018/19 survey. There were significant increases in responses from all sectors in the 2018/19 survey.

**Practitioner CLPL hours** – The total number of cumulative hours of career-long professional learning (CLPL) accessed by the 1187 survey respondents between 1 August 2018 and 31 July 2019 was 19,066 cumulative hours. This compares with 18,675 cumulative hours in 2017/18.

The average number of cumulative hours of STEM professional learning per practitioner between 1 August 2018 and 31 July 2019 was 16.1 hours, compared with 21.3 hours in 2017/18.

<sup>&</sup>lt;sup>1</sup> STEM Education and Training Strategy: <u>http://bit.ly/STEMstrategy</u>

<sup>&</sup>lt;sup>2</sup> <u>A summary of STEM resources | Learning resources | National Improvement Hub (education.gov.scot)</u>

<sup>&</sup>lt;sup>3</sup> First Annual Report of the STEM Education and Training Strategy <u>https://www.gov.scot/publications/stem-strategy-education-training-scotland-first-annual-report/</u>

<sup>&</sup>lt;sup>4</sup> Second Annual Report of the STEM Education and Training Strategy: <u>https://www.gov.scot/publications/stem-strategy-education-training-scotland-second-annual-report/</u>

In the 2018/19 survey, 18.4% of respondents stated that they had undertaken zero hours of STEM CLPL.

**Practitioner confidence** – The 2018/19 survey was changed to capture data relating to confidence levels within discrete areas of STEM. The findings are shown below for practitioners who responded 'agree' or 'strongly agree' with the statement 'I feel confident in delivering...':

•	science-based learning in my practice =	60.1% (713 responses)
•	technologies-based learning in my practice =	54.6% (648 responses)
•	digital-based learning in my practice =	53.6% (636 responses)
•	engineering-based learning in my practice =	31.0% (368 responses)
•	mathematics/numeracy-based learning in my practice =	77.8% (924 responses)
٠	gender balance, equity and equalities in my practice =	60.2% (714 responses)

In the 2017/18 practitioner survey, 63.5% of practitioners who responded 'agreed' or 'strongly agreed' with the statement 'I feel confident delivering STEM learning in my practice'.

#### *Types of professional learning accessed by practitioners* – The three most popular responses were:

•	Professional reading/engaging independently with research	68.8% (817 responses)
•	Collegiate working within centre/school	64.0% (760 responses)
•	Online learning.	56.5% (671 responses)

#### *Main barriers to accessing STEM CLPL* – The top three barriers were:

•	Difficulty finding cover	46.7% (554 responses)
•	Difficulty attending professional learning due to other commitments	36.2% (430 responses)
٠	Lack of funding to pay for professional learning.	33.9% (403 responses)

Professional learning priorities for 2019/20 – The top three priorities were listed as:

•	Pedagogies/teaching approaches to deliver STEM learning effectively	50.5% (600 responses)
•	Skills progression in STEM subjects	37.2% (441 responses)
٠	Development of the curriculum for STEM.	33.6% (399 responses)

**STEM partner or partners** – In the 2018/19 survey, 42.1% of respondents confirmed that their setting had a STEM partner(s). This is a significant increase from the 25.9% in 2017/18 survey who confirmed that they had a STEM partner(s).

## **Annual STEM Practitioner Survey 2018/19**

**Findings** 

## About the survey

### Background

The aim of the Annual STEM Practitioner Survey is to track enhancements in STEM career-long professional learning (CLPL) undertaken by practitioners in early learning and childcare, primary, secondary and additional support needs sectors. The survey covers aspects such as:

- Number of cumulative hours of STEM CLPL accessed
- Practitioners' confidence in delivery of STEM learning
- STEM professional learning priorities of practitioners
- Barriers to accessing CLPL.

The scope of the 2018/19 survey was extended slightly to also gather views of other practitioners involved in delivering aspects of STEM learning including classroom assistants, school librarians and practitioners of other curriculum areas. In addition, separate surveys were issued to:

- Community and learning development (CLD) practitioners
- Organisations that provide STEM professional learning
- School-based technical support staff.

### Structure and purpose

The survey was available on-line to all practitioners within early learning and childcare, primary, secondary and additional support needs sectors. It was promoted widely via Education Scotland and Scottish Government communication channels. The survey comprised four sections:

- About you
- STEM in your setting
- Your professional learning
- STEM in your practice.

The survey findings have played, and will continue to play, a crucial role in shaping the implementation of the CLPL actions in the STEM Education and Training Strategy (<u>http://bit.ly/STEMstrategy</u>).

The findings have directly influenced the framing of Round 2 of the Enhancing Professional Learning in STEM Grants Programme which saw £1.9 million allocated to 140 professional learning programmes. The ambition of the grants programme is to ensure that practitioners in relevant sectors, and in various geographical locations, have access to high-quality professional learning which meets their needs. The survey highlights priority areas for action and gaps that need to be addressed. The evidence provided by the surveys are also directly informing the work and CLPL offer of Education Scotland's regional teams. These teams will play a key role in supporting and coordinating professional learning in STEM. In addition, the survey data allows Education Scotland to track progress against the following key performance indicator (KPI) in the STEM Education and Training Strategy:

II. Increased practitioner confidence in STEM learning in the early years, primary years and in CLD settings and increased practitioner engagement in STEM professional learning opportunities. - Increase the cumulative hours of STEM professional learning accessed by early years, schools, college and CLD practitioners annually.

## Section A – About you

### Number of responses

2016/17 Practitioner CLPL Survey	788 responses
2017/18 Practitioner CLPL Survey	876 responses
2018/19 Practitioner CLPL Survey	1187 responses

Table 1: Number of responses to the 2016/17, 2017/18 and 2018/19 Annual STEM Practitioner Surveys



Figure 1: Number of responses by sector for 2018/19 survey

Sector	2016/17 survey	2017/18 survey	2018/19 survey	% increase from 2017/18 to 2018/19
Additional support needs	1.1% (9)	1.7% (15)	5.1% (61)	306.7%
Early learning and childcare	3.5% (28)	16.6% (145)	17.4% (206)	42.1%
Primary	34.8% (274)	43.6% (382)	40.9% (485)	27.0%
Secondary	58.5% (461)	38.1% (334)	36.6% (435)	30.2%
Total number of completed responses	788	876	1187	35.5%

Table 2: Number of completed survey responses by sector

The number of responses increased by 35.5% from 876 responses in the 2017/18 survey to 1187 responses in the 2018/19 survey. There were significant increases in responses from all sectors especially additional support needs.

Important: The significant shift in responses from sectors between the 2016/17 and 2017/18 practitioner surveys should be considered when analysing 2018/19 comparative data in this report.

#### **Response by role**



Figure 2: Breakdown of survey responses by role

#### **Respondents' work pattern**



Figure 3: Respondents' work pattern

Note that only 1184 respondents confirmed work pattern.

#### **Response by subject**



Figure 4: Respondents' subject taught

## Section B – STEM in your setting

#### STEM featured in improvement plan



Figure 5: STEM featured on improvement plan

- 55.3% (656 responses) confirmed that STEM features in their school/setting improvement plan. This is an increase from 41.6% (364 responses) in the 2017/18 survey.
- A further 11.3% (134 responses) stated that STEM would be included in their school/setting improvement plan in the following academic session (2019/20). In the 2017/18 survey, 8.8% of respondents (77 responses) said that STEM would be included in their school/setting improvement plans in the following academic session (2018/19).



#### STEM featured in cluster improvement plan

- 31.8% (377 responses) confirmed that STEM features in their cluster improvement plan. This is an increase from 23.1% (202 responses) in the 2017/18 survey.
- A further 42.0% (499 responses) stated that STEM would be included in their cluster improvement plan in session 2019/20. This is an increase from 2.9% (25 responses) in the 2017/18 survey.

Figure 6: STEM featured in cluster improvement plan

#### Engagement with STEM self-evaluation framework



Figure 7: Engagement with the STEM self-evaluation framework

- 24.0% (285 responses) confirmed that they have engaged with Education Scotland's STEM selfevaluation framework. This is an increase from 20.5% (180 responses) in the 2017/18 survey.
- A further 40.9% (486 responses) stated that they would be engaging with the framework in session 2019/20.



#### **STEM co-ordinator in setting**

Figure 8: STEM co-ordinator in setting

- 45.4% (539 responses) confirmed that their school/setting had a STEM coordinator in 2018/19. This is an increase from 40.0% (350 responses) in the 2017/18 survey.
- A further 20.4% (242 responses) stated that their school/setting intended to have a coordinator in session 2019/20. This is an increase from 4.7% (41 responses) in the 2017/18 survey.

#### STEM partner(s) from private, public or third sector



- 42.1% (500 responses) confirmed that their school/setting had a STEM partner(s) from the private, public or third sector. This is an increase from 25.9% (227 responses) in the 2017/18 survey.
- A further 26.5% (315 responses) stated that their school/setting hoped to have a STEM partner(s) in session 2019/20. This is an increase from 2.6% (23 responses) in the 2017/18 survey.

Figure 9: STEM partner(s) from private, public or third sector



#### Finding STEM partner organisations

Figure 10: Finding STEM partner organisations

The top three ways (excluding the response 'not sure') in which practitioners found out about partner organisations were through:

- 1. STEM ambassadors
- 2. Personal contact
- 3. Networking/collegiate events.

## **Section C – Your professional learning**

#### Number of cumulative hours of STEM CLPL accessed

The **total number of cumulative hours** of practitioner professional learning in STEM accessed by the 1187 survey respondents between 1 August 2018 and 31 July 2019 was **19,066 hours**. This is an average of **16.1 cumulative hours per practitioner per annum**.



Figure 11: Number of hours of STEM professional learning accessed by sector

Sector	2017/	18 survey	<b>2018/19 survey</b>		
	Total number of hours of CLPL	Average number of hours of STEM CLPL per practitioner	Total number of hours of CLPL	Average number of hours of STEM CLPL per practitioner	
Additional support needs	135.0	9.0	583.0	9.6	
Early learning and childcare	2,798.5	19.3	1,368.0	6.6	
Primary	5,185.5	13.6	5,865.0	12.1	
Secondary	10,556.0	31.6	11,250.0	25.9	
Total	18,675.0		19,066.0		

Table 3: Number of STEM professional learning hours per sector

More than half of 2018/19 respondents said the professional learning they accessed in 2018/19 was about the same as in 2017/18.

Number of CLPL hours in 2018/19 compared to 2017/18 survey period	% of responses	Number of responses
A lot more	6.2%	74
More	22.2%	263
About the same	51.5%	611
Fewer	9.9%	117
A lot fewer	4.4%	52

Table 4: Comparison of number of professional learning hours in 2018/19 and 2017/18 surveys

In the 2018/19 survey, a total of 28.4% of respondents confirmed that the number of hours of CLPL they had undertaken was either *'More'* or *'A lot more'* than they had undertaken in 2017/18. A total of 51.5% of 2018/19 respondents indicated that the number of hours of STEM CLPL they had undertaken was *'About the same'* as in 2017/18. This is broadly similar to the results from the 2017/18 survey which were 30.4% and 47.7% respectively.

### Types of professional learning accessed and impact

Responses indicate that there has been a significant increase from the 2016/17 survey to the 2017/18 and 2018/19 surveys in relation to the following professional learning formats: collegiate working in settings and across clusters, professional reading/engaging independently with research and also support from online networks and social media.

Types of professional learning in STEM that have been accessed by	2016/17 survey	2017/18 survey	2018/19 survey	2018/19 Survey
practitioners	Response %	Response % (Response Count)	Response % (Response Count)	Impact of type of professional learning – 'valuable' and very valuable'
Attending an externally-provided course outside of my school	<mark>49.4%</mark>	53.5% (469)	45.3% (538)	<mark>87.7%</mark> (472)
Collegiate working across my cluster	28.4%	<mark>53.9%</mark> (472)	41.4% (491)	74.7% (367)
Collegiate working within my centre/school	<mark>43.1%</mark>	<mark>74.5%</mark> (653)	<mark>64.0%</mark> (760)	<mark>81.6%</mark> (620)
External company/organisation coming into my school	17.1%	37.9% (332)	36.6% (435)	<mark>83.4%</mark> (363)
Formal learning through a university/college course	8.3%	24.8% (217)	*	*
Online learning	25.8%	37.9% (332)	<mark>56.5%</mark> (671)	68.3% (458)
Online network of practitioners	12.8%	49.2% (431)	*	*
Webinars	*	32.6% (286)	*	*
Attending local, regional and national events to share STEM ideas and practice	*	45.8% (402)	39.3% (467)	73.0% (341)
Attending open day visits to other schools/settings/organisations with interesting STEM practice	*	33% (289)	27.9% (332)	76.8% (255)
Professional reading/engaging independently with research	<mark>40.1%</mark>	<mark>78.5%</mark> (688)	<mark>68.8%</mark> (817)	75.5% (617)
Social Media – Twitter/Facebook etc	17.3%	45.8% (401)	48.0% (570)	54.2% 309
Other	12.8%	15.9% (139)	9.6% (114)	*

Table 5: Types of professional learning accessed by practitioners and the impact on learning

Note: Indicates top 3 responses, \* Indicates question not in survey



Figure 12: Types of professional learning accessed by practitioners

The 2018/19 survey responses indicate that the top three types of professional learning that had *'valuable'* and *'very valuable'* impact, in order of value, are:

- 1. Attending an externally provided course outside of my setting
- 2. External company coming into my setting
- 3. Collegiate working within my setting.

### Organisation(s) that provided STEM professional learning

In the 2018/19 survey, 38.2% (453) respondents indicated that they had accessed professional learning through their local authority. This compared with 49.2% (431) respondents in the 2017/18 survey.



Figure 13: Organisations providing practitioner STEM professional learning

The table below outlines the top three responses from the last three surveys.

2016/17	2017/18	2018/19
1. SSERC	1. Local authority	1. Local authority
2. Local authority	2. SSERC	2. SSERC
3. STEM Ambassadors	3. STEM Ambassadors	3. Education Scotland

Table 6: Organisations that provided STEM professional learning

### Ease of accessing professional learning in STEM

A total of 30.1% (349) of respondents in the 2018/19 survey confirmed that it was 'Easy' and/or 'Very easy' to access STEM CLPL. In the 2017/18 survey this figure was 30.0% (263).



Figure 14: Ease of accessing professional learning in STEM

Note only 1161 respondents replied to this question.

### Main barriers to accessing professional learning in STEM

The 2018/19 practitioner survey highlighted a number of barriers to accessing professional learning in STEM.



Figure 15: Main barriers to accessing professional learning in STEM

The table below lists the top three barriers to accessing professional learning in STEM over the last three surveys.

2016/17 survey	<b>2017/18 survey</b>	2018/19 survey
1. Too many demands on staff time	1. Difficulty finding staff cover	1. Difficulty finding staff cover
2. Lack of funding to pay for professional learning	2. Difficulty in attending professional learning due to other commitments	2. Difficulty in attending professional learning due to other commitments
3. Difficulty finding staff cover	3. Lack of funding to pay for professional learning	3. Lack of funding to pay for professional learning

Table 7: Main barriers to accessing professional learning in STEM

# STEM professional learning priorities for this academic year (1 August 2019 – 31 July 2020)



Figure 16: STEM professional learning priorities for academic year 2019/20

The key points to note from 2018/19 survey responses regarding STEM professional learning priorities for 2019/20 are:

- **Pedagogies/teaching approaches to deliver STEM learning effectively** is one of the top three responses across all sectors
- **Understanding of the concepts that underpin mathematics** is important across early learning and childcare, primary and additional support needs sectors
- **Skills progression in STEM subjects** is one of the top three priorities for additional support needs, primary and secondary sectors
- Development of the curriculum for STEM is important for secondary sector practitioners.

## **Section D – STEM in your practice**

### **Practitioner confidence**

In the 2018/19 survey, the question relating to confidence was changed to determine the confidence levels of practitioners in relation to each discrete area of STEM.



Figure 17: Practitioner confidence in delivering discrete areas of STEM

2018/19 practitioner survey statements	(% of practitioners responded 'agree' or 'strongly agree' with the statement)	Number of responses (1187)
I felt confident in delivering science-based learning in my practice	60.2%	714
I felt confident in delivering technologies-based learning in my practice	54.6%	648
I felt confident in delivering digital-based learning in my practice	53.7%	637
I felt confident in delivering engineering-based learning in my practice	31.0%	368
I felt confident in delivering mathematics/numeracy-based learning in my practice	77.8%	924
I felt confident in addressing gender balance, equity and equalities in my practice	60.2%	714

Table 8: Practitioner confidence levels in areas of STEM

Sector 
Additional support needs
Early learning and childcare
Primary
Secondary



Engineering (ASN): 11 responses

Figure 18: Respondents who agree and/or strongly agree with the statement 'I am confident in delivering discrete areas of STEM'

Confidence levels per sector by statement are shown below.

Practitioner survey statement – "I felt confident in"	% of practitioners responded 'agree' or 'strongly agree' with the statement (Number of responses)			
	ASN (61)	ELC (206)	Primary (485)	Secondary (435)
science-based learning in my practice	50.8%	55.3%	72.6%	49.9%
	(31)	(114)	(352)	(217)
technologies-based learning in my practice	47.5%	43.7%	63.1%	51.3%
	(29)	(90)	(306)	(223)
digital-based learning in my practice	55.7%	35.4%	59.8%	55.2%
	(34)	(73)	(290)	(240)
engineering-based learning in my practice	18.0%	30.1%	37.1%	26.4%
	(11)	(62)	(180)	(115)
mathematics/numeracy-based learning in my practice	73.8%	70.9%	90.3%	67.8%
	(45)	(146)	(438)	(295)
addressing gender balance, equity and equalities in my practice	54.1%	58.7%	64.9%	56.3%
	(33)	(121)	(315)	(245)

Table 9: Practitioner confidence levels in each aspect of STEM by sector

- Confidence levels in mathematics/numeracy are consistently high across all sectors.
- Confidence levels in engineering are consistently low across all sectors.
- Confidence levels in digital-based learning is low in the early learning and childcare sector.

Note: the respondents from the secondary sector were from a range of subject specialisms. The responses to this question have to be understood in this context. For example, a secondary technology teacher may not express a high level of confidence in delivering science-based learning in their practice.

In relation to the confidence levels of practitioners, there is no direct comparison with the responses from the 2017/18 survey. This is because the question asked in that survey was only in relation to STEM, and not the discrete areas of STEM. The question was broken down by discrete area of STEM in the 2018/19 survey to provide further insight and granularity of data.

In the 2017/18 survey, an average of 63.5% (556 responses) of practitioners across the sectors 'agreed' or 'strongly agreed' with the statement 'I feel confident in delivering STEM in my practice'.

Sector	(% of practitioners responded agree or strongly agree with the statement 'l feel confident in delivering STEM in my practice')
Additional support needs	46.7%
Early learning and childcare	42.8%
Primary	63.4%
Secondary	73.4%

Table 10: Confidence levels in delivering STEM (2017/18)

Note: Education Scotland promoted the STEM surveys through a wide variety of channels to ensure a representative response from practitioners. This was particularly the case with the 2018/19 survey, as demonstrated by the significant increase in the number of responses. However, as with all surveys, it is more likely that respondents have an interest or high level of engagement in STEM learning. The levels of confidence expressed, therefore, are likely to reflect this. As a result, the levels of confidence expressed may be higher than that of the general practitioner population.

## **Education Scotland response**

Academic year 2018/19 marked the second year of implementation of the STEM Education and Training Strategy. In relation to Education Scotland's work, the focus for this period has been to continue to put in place the key national infrastructure and resources to address the priorities and needs identified by practitioners.

**Engaging with partners** – Education Scotland has disseminated the findings from the 2017/18 Annual STEM Practitioner Survey to a wide range of partners and STEM providers. This has helped many organisations to plan and shape their professional learning offers to align more closely to the needs of practitioners and to the new national model of professional learning.

**RAiSE Programme** – The Raising Aspirations in Science Education (RAiSE) programme aims to build the capacity of practitioners, particularly in primary school settings, to deliver inspiring and engaging learning in science and STEM. The programme is led by Education Scotland and funded by The Wood Foundation, Scottish Government and participating local authorities. The programme was established in 2016 and is now being extended nationally, following its successful pilot. The local authorities that are participating, or have participated, in the programme to date include:

- Angus Council
- City of Edinburgh Council
- Clackmannanshire Council
- Comhairle Nan Eilean Siar
- Dumfries and Galloway Council
- Falkirk Council
- Fife Council
- Glasgow City Council
- Moray Council
- North Ayrshire Council
- North Lanarkshire Council
- Orkney Islands Council
- South Ayrshire Council
- The Highland Council
- West Dunbartonshire Council
- West Lothian Council

More information about the RAiSE programme can be found on the National Improvement Hub: <u>https://education.gov.scot/improvement/learning-resources/Raise</u>

**Enhancing Professional Learning in STEM Grants Programme** – Education Scotland awarded a total of £1.9 million of STEM professional learning grants in financial year 2019-20, supporting 162 projects. This funding was aligned to the priorities and findings from the annual STEM practitioner surveys. For example, through the STEM grants we continued to invest in online learning and projects which build opportunities for leadership and collegiate professional learning at a school/setting/cluster level.

Online professional learning opportunities available for practitioners as a result of the grants include:

- University of Aberdeen Biology: Online STEM Training for Teachers
- Larbert High School <u>STEM Family Learning Programme</u>
- Royal Highland Education Trust Food, STEM and Sustainability: From farm to fork
- Clackmannanshire Council <u>Numeracy Champions Collaborative in Clackmannanshire</u>
- SWGfL <u>Safe and Empowered: Responding to a Digital Generation</u>

Round 2 Grants projects continuing into Phase 2 in 2020-21 have continued to provide practitioners with further opportunities for professional learning. More information about the grants supported is available from the <u>STEM summary page</u> on the National Improvement Hub.

**Professional learning** – Education Scotland's regional STEM, Numeracy & Mathematics and Digital Skills teams provided a range of face-to-face STEM professional learning opportunities across Scotland over the course of session 2019/20. The offer moved online as a result of the COVID-19 pandemic in 2020.

STEM professional learning opportunities continue in session 2020/21 providing a blend of national and regional webinars across the STEM subjects. For more information please see the <u>Webinar page</u> on the National Improvement Hub. Further practitioner support for <u>online remote learning</u> can be found on the National Improvement Hub.

Education Scotland also worked with Scottish Government to support development of a <u>STEM in ELC</u> <u>Module</u> in collaboration with University West of Scotland. This is part of a package of training for ELC practitioners.

**Education Scotland's Regional Teams** – throughout this period, Education Scotland's Improving Gender Balance and Equalities (IGBE), Numeracy & Mathematics and Digital/Technology officers supported local and regional provision of CLPL. STEM professional learning was also supported through the Scottish Learning Festival.

In academic year 2018/19, Education Scotland provided over 228 professional learning sessions in STEM, Digital and Improving Gender Balance and Equalities resulting in 5,084 practitioner engagements and 9,151 cumulative hours of professional learning.

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