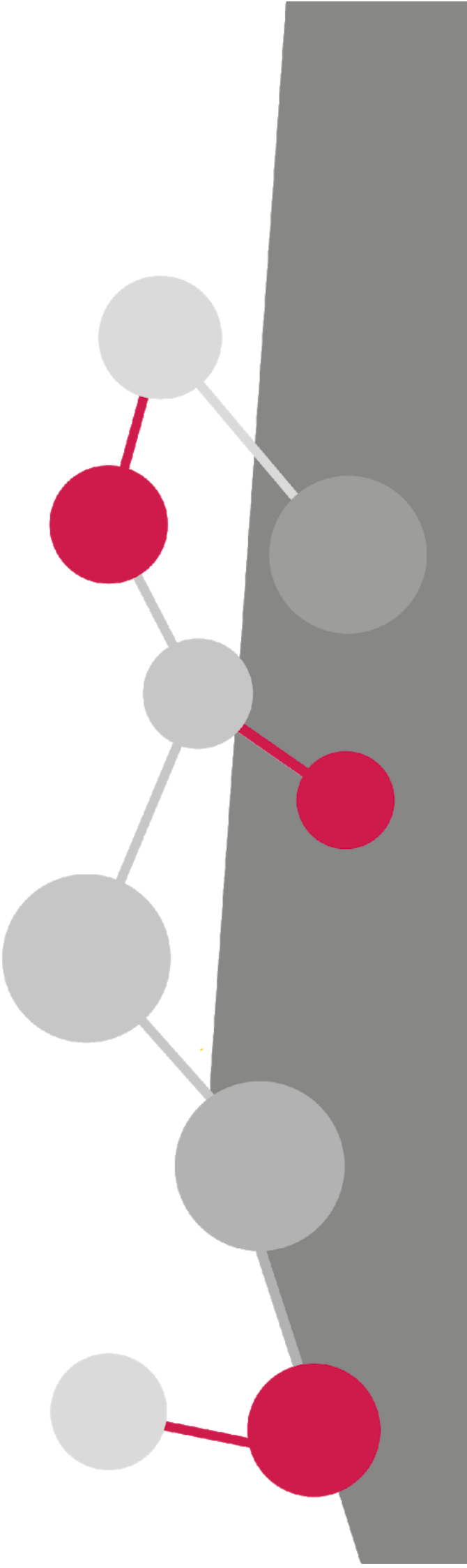
STEM LEARNING



STEM Ambassadors: Impact on Ambassadors and Educators 2020

Executive Summary

STEM Ambassadors are volunteers from a broad range of jobs and backgrounds who are passionate about inspiring young people to pursue science, technology, engineering and mathematics (STEM) studies and careers. With a community of over 30,000 volunteers, they are an important, free of charge resource for individuals and groups working with young people across the UK.

Independent analysis of the programme shows that:

- Activities occurring across the STEM Ambassador network are high quality – **100% of STEM Ambassadors consistently said their intended outcomes were met**.

STEM Ambassador activities led to highly impactful outcomes, rating on scale of 1 (very low) – 5 (very high):

STEM Ambassadors

- Felt a sense of achievement, reward and satisfaction – rating 4.4.
- Supported the local community – rating 4.5.

Educators

- Increased their confidence and enthusiasm for STEM – rating 4.9.
- Enhanced their passion for teaching STEM – rating 4.9.

Young People

- Increased their awareness and aspirations for STEM-related study and careers – rating 4.8.
- Showed increased attainment and progress in STEM – rating 4.8.
- Learned what the workplace is like, developing their employability skills – rating 4.8.

The report draws out some key **recommendations** to help drive forward the success of the STEM Ambassador Programme:

- Encouragement of repeated engagement through STEM Clubs is likely to be have the most impact in future. STEM Club engagement was rated as the highest activity, and positively impacted STEM Ambassadors and young people across almost all outcomes.
- More focus should be placed on STEM Ambassadors **supporting and informing parents about study options and job opportunities within STEM.** This was one of the least popular, and lowest achieving outcomes, however research (such as Science Capital) shows that parents are a key influencer in shaping aspirations of young people.

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Introduction

STEM Ambassadors are volunteers from a broad range of jobs and backgrounds who are passionate about inspiring young people to pursue science, technology, engineering and mathematics (STEM) studies and careers. With a community of over 30,000 volunteers, they are an important, free of charge resource for individuals and groups working with young people across the UK. As well as getting involved in a number of activities both in and outside of the classroom they help to bring real-life industry experience into context.

STEM Learning commissioned Qa Research to analyse the data from 26,638 STEM Ambassador activities occurring from 1st August 2019 to 31st July 2020. The data consists of activities that have been scheduled via the online STEM Ambassadors service.

Aims

The analysis and subsequent report aimed to:

- Explore trends in the distribution of types of activities across the programme and by STEM Ambassador Hub
- Identify trends in the intended outcomes selected by activity organisers and STEM Ambassadors, both across the programme and by activity type.
- Understand differences in outcomes ratings of STEM Ambassadors and organisers, across the programme and by activity type and STEM Ambassador Hub.
- Surfacing areas of high performance, and areas for development by understanding the extent to which intended outcomes had been achieved, for both organisers and STEM Ambassadors.

Analysis

Qa Reseach analysed[1] 26,638 STEM Ambassador activities occurring between 1st August 2019 and 31st July 2020. STEM Learning commissioned Qa Research to analyse all data collected from STEM Ambassadors and activity organisers, including the location of the activity (STEM Ambassador Hub), the type of activity, the intended outcomes for both STEM Ambassadors and organisers, and the achievement of outcomes.

This report outlines the key findings from the analysis, including conclusions and recommendations to support the progress of the STEM Ambassador Programme.

[1] Technical Report from Qa Research is available here. [https://www.stem.org.uk/sites/default/files/pages/downloads/Qa_STEM_Ambassador_Data_Analysis_report.pdf]

Findings

Activity Type – across the programme

Fourteen different activity types are available for selection, with a fifteenth type – "Other" – available for activities not covered by the current options.

Table 1 shows the spread of activity types across the period of interest. The most popular activities are supporting an exhibition or event and hands on practical each representing approximately 15% of overall engagement, and the least popular activities are Information and advice for senior leaders and hosting a visit to a STEM workplace, which account for 1-2% of overall activities.

Activity Type	Percentage
Support an exhibition or event	15%
Hands on practical	15%
STEM careers talk and/or advice session	11%
Employability skills session e.g. mock interviews/CV writing	11%
Other	11%
Interactive STEM session e.g. speed networking or Q&A session	9%
STEM presentation e.g. assembly or learning	7%
Mentoring or support e.g. for STEM projects	6%
Judging a STEM competition/challenge	4%
STEM Clubs	4%
Professional development of educators	3%
Hosting a visit to a STEM workplace	2%
Information and advice for senior leaders e.g. head teachers, governors	1%

Table 1. Distribution of activity types across the period 01 August 2019 to 31 July 2020.

Activity Type – by STEM Ambassador Hub

Qa Research analysed activity types by STEM Ambassador Hubs (SAH) to better understand the distribution of activity types around the country[2]. Particular areas of interest include:

- London (30%) and Trans Pennine (19%) accounted for almost half of the CPD for Educators occurring across the network.

[2] Page 4 of the technical report shows the full distribution by STEM Ambassador Hub.

- Lancashire and Cumbria accounted for almost one-fifth (19%) of all activities categorised as judging a STEM Competition.
- Whilst Information and advice for senior leaders is one of the least popular activities (see Table 1), Trans Pennine accounted for 21% of these activities.
- West Midlands had the highest proportion of STEM Club activities (13%).
- East England (12%), Northern Ireland (7%) and South East England (7%) accounted for a significant proportion of STEM workplace visits.

On the whole, all STEM Ambassador Hubs engaged in almost all different types of activities, showing the diversity and breadth of the activities provided across the UK. In terms of understanding better the spread of engagements across the UK, analyses should control for various population factors such as number of active STEM Ambassadors, number of schools (as a proxy for potential engagement locations) and population of young people.

Intended Outcomes

Prior to engaging with activities, STEM Ambassadors and activity organisers consider the outcomes they aim to achieve as a result of the activity. Tables 2 and 3 show the distribution of intended outcomes selected by STEM Ambassadors and activity organisers.

For young people:

- Increasing the **engagement, interest and enjoyment in STEM subjects** and **awareness and aspirations for STEM-related study and careers** for were the most popular intended outcomes amongst activity organisers.
- **Inspiring and informing about STEM** and **challenging stereotypes about STEM careers** were the most popular intended outcomes amongst STEM Ambassadors.

For themselves:

- Improving their **ability to link curriculum learning with STEM careers and real-life contexts** and **building confidence and enthusiasm around STEM** were the most popular intended outcomes for activity organisers.
- STEM Ambassadors were most interested in feeling a **sense of achievement, reward and satisfaction** and improving their own **communication skills**.

Wider outcomes:

- Activity organisers were interested in improving their **relationships with employers and HEIs to provide STEM encounters for young people**, and **building links across the local**

community. Organisers were less interested in **supporting other providers of youth activities**.

- STEM Ambassadors were more likely to want to **support their local community** and less likely to want to improve their **organisational or leadership skills**, or increase the **profile of their organisation**.

Intended Outcome	STEM Ambassador
Sense of achievement, reward and satisfaction	87%
Inspire and inform young people about STEM	79%
Support local community	64%
Communication skills	49%
Challenge stereotypes about STEM careers	44%
Support my organisation to develop links with schools/community	40%
Increase my organisation's profile/recognition	33%
Organisational/leadership skills	32%

Table 2. Distribution of chosen intended outcomes amongst STEM Ambassadors across the period 01 August 2019 to 31 July 2020.

Intended Outcome	Organiser
Engagement, interest, enjoyment in STEM subjects	69%
Awareness and aspirations for STEM-related study and careers	56%
Ability to link (curriculum) learning with STEM careers and real-life contexts	54%
Work with employers and Higher Education institutions to provide STEM encounters with young people	52%
Build our confidence and enthusiasm for STEM	52%
Building links across local community, including other schools and colleges	52%
Support and enhance our passion for what we do	50%
Building STEM identity e.g. by challenging stereotypes about STEM careers	42%
Learning what the workplace is like and developing employability skills	38%
Attainment and progress in STEM subjects	37%
Increase our knowledge of STEM subjects	30%
Informed parents / carers about study options and job opportunities in STEM	28%
Support other providers of youth activities and STEM enrichment (e.g. science museums, Scouts)	24%

Table 3. Distribution of chosen intended outcomes amongst activity organisers across the period 01 August 2019 to 31 July 2020.

Intended Outcomes – by Activity Type

Identifying which intended outcomes were most and least popular across different activity types will help inform future activity delivery by improving understanding of exactly what organisers and STEM Ambassadors aim to achieve as a result of their engagement[3].

- The key outcome for STEM Ambassadors was about feeling a **sense of achievement, reward and satisfaction** –this was consistently high across all activity types, with at least 80% of STEM Ambassadors selecting it for each activity type.
- STEM Presentation, careers talk / advice session and interactive STEM session all aimed to **inspire and inform young people about STEM** more than other activity types.
- STEM Ambassadors were unlikely to select **increasing their organisation's profile / recognition** as an intended outcome. This outcome was most popular when hosting a workplace visit, however even then it was only selected by 45% of STEM Ambassadors.
- For activity organisers, increasing the **engagement, interest, enjoyment in STEM subjects for young people** was a popular outcome across all activities – as expected, this outcome is least popular for activities relating to information and advice for SLT**.**
- Whilst CPD for educators was a relatively unpopular activity, it rated as the most popular activity type when educators aimed to **build links across local community, including other schools and colleges**.

Achieved Outcomes

STEM Ambassadors and activity organisers are asked to rate their achievement of intended outcomes on a scale of 1 (low) – 5 (high). All but one intended outcome rated 4 or above on average – with one rating 3.97 (see Table 5 below). There are also a selection of outcomes asked to all organisers, regardless of the intended outcomes chosen (Table 4).

- The highest outcomes achieved for STEM Ambassadors were **support the local community** (mean = 4.46) and **sense of achievement, reward and satisfaction** (mean = 4.42).
- The lowest achievement of outcomes for STEM Ambassadors were improving **organisational / leadership skills** (4.08), **support my organisation to develop links with schools / community** (4.08) and **increase my organisation's profile / recognition** (4.04).
- The highest achievement of outcomes for activity organisers were **build our confidence and enthusiasm for STEM** (4.90) and **support and enhance our passion for what we do** (4.88).

[3] Page 7 of the technical report shows the full distribution of intended outcomes by activity type.

- The lowest achieved outcomes for activity organisers were **inform parents / carers about study options and job opportunities in STEM** (3.97) and **support other providers of youth activities and STEM enrichment** (4.15).

It is interesting to note that the two least popular intended outcomes amongst activity organisers, were also the two achieving the lowest average rating. This could be a potential area for development within the STEM Ambassador programme – ensuring both the opportunity and capability exists within the current infrastructure to achieve these outcomes.

Similarly, there is a clear relationship between the popularity of intended outcomes for STEM Ambassadors and the achievement of these outcomes – the least popular outcomes were also more likely to be the lowest rated responses.

The relationship between chosen intended outcomes and the extent to which they were achieved is less clear for the most popular and highest achieving outcomes. Those achieving the highest ratings were not necessarily those that were the most popular. For example, whilst 'ability to link (curriculum) learning with STEM careers and real-life contexts' was one of the most popular intended outcomes, achievement of this outcome was lower than other outcomes – however the extremely close distribution of the average ratings should be noted, with a rating of 4.76 from a possible 5 still representing a significantly high level of achievement.

STEM Ambassador Ratings (n)	Mean Score
Support local community (3,149)	4.46
Sense of achievement, reward and satisfaction (4,416)	4.42
Inspire and inform young people about STEM (3,829)	4.39
Communication skills (2,386)	4.37
Challenge stereotypes about STEM careers (2,072)	4.24
Organisational/leadership skills (1,371)	4.08
Support my organisation to develop links with schools/community (1,946)	4.08
Increase my organisation's profile/recognition (1,557)	4.04

Table 4. Mean outcome ratings amongst STEM Ambassadors across the period 01 August 2019 to 31 July 2020.

Four outcomes are rated by all activity organisers (see shaded rows in Table 5). These 4 outcomes are very highly rated, scoring 4.90 or above.

- **Overall enjoyment** and **interactivity and engagement** for the young people rate extremely highly.
- With a mean score of 4.91, activity organisers are in strong agreement that **the intended outcomes of an activity are met**.

- Finally, **preparation and organisation** scores extremely highly, suggesting that activities and STEM Ambassadors are ensuring that the time spent engaging with young people is maximised.

Organiser Ratings - Overall	Mean Score
Success in achieving intended outcomes (8,561)	4.91
Interactivity and engagement (8,561)	4.90
Overall enjoyment (8,561)	4.90
Preparation and organisation (8,561)	4.90
Build our confidence and enthusiasm for STEM (4,958)	4.90
Support and enhance our passion for what we do (5,030)	4.88
Building STEM identity e.g. by challenging stereotypes about STEM careers (3,834)	4.85
Awareness and aspirations for STEM-related study and careers (5,197)	4.84
Engagement, interest, enjoyment in STEM subjects (6,646)	4.84
Attainment and progress in STEM subjects (3,570)	4.84
Work with employers and Higher Education institutions to provide STEM encounters with young people (4,996)	4.82
Building links across local community, including other schools and colleges (4,852)	4.80
Increase our knowledge of STEM subjects (1,975)	4.76
Learning what the workplace is like and developing employability skills (3,203)	4.76
Ability to link (curriculum) learning with STEM careers and real-life contexts (4,661)	4.76
Support other providers of youth activities and STEM enrichment (e.g. science museums, Scouts) (2,321)	4.15
Informed parents/carers about study options and job opportunities in STEM (2,201)	3.97

Table 5. Mean outcome ratings amongst activity organisers across the period 01 August 2019 to 31 July 2020. Rows shaded grey indicate that these are answered by all organisers, regardless of the selected intended outcomes.

Achieved Outcomes – by activity type

Qa Research analysed achieved outcome ratings by activity type for both activity organisers and STEM Ambassadors[4]. The data is well distributed, suggesting that each activity type is adaptable enough to successfully meet the intended outcomes, however there are also some notable trends.

[4] Pages 9 and 10 of the technical report shows the full distribution for activity organisers and STEM Ambassadors by activity type.

For STEM Ambassadors:

- Supporting STEM Clubs was one of the highest rated activities, scoring particularly high for **inspiring and informing young people about STEM**, **supporting the local community** and feeling a **sense of achievement, reward and satisfaction**.
- Whilst **support my organisation to develop links with schools / community** was one of the least popular intended outcomes (30%) for mentoring / supporting, those STEM Ambassadors who did select it achieved highly – with an average score of 4.57.
- Providing Information and advice for SLT rated as the lowest activity, with feeling a **sense of achievement, reward and satisfaction**, **challenging stereotypes about STEM careers** and **inspiring and informing young people about STEM** rating as the lowest of the achieved outcomes.

For activity organisers:

- STEM Ambassador activities providing CPD for educators and hosting a visit to a STEM workplace were the highest rated and most impactful activities for organisers, with almost all ratings scoring significantly highly.
- Of note, hosting a visit to a STEM workplace helped to **inform parents / carers about study options and job opportunities in STEM** and **build young people's STEM identity**. Whereas providing CPD for educators was more successful in **increasing educator knowledge of STEM subjects** and **improving their ability to link (curriculum) learning with STEM careers and real-life contexts**
- Having a STEM presentation was the least impactful type of activity, with almost all ratings scoring less than 4.50. However, they were impactful in **building educator confidence and enthusiasm for STEM** and increasing the opportunity to **work with employers and HEIs to provide STEM encounters with young people**.

Achieved Outcomes – by STEM Ambassador Hub

Achievement of intended outcomes is high across the network of STEM Ambassador Hubs, with differentiation in ratings following the national trends outlined above. All STEM Ambassador Hubs had an average rating above 4 for STEM Ambassador outcomes and above 4.4 for organiser outcomes.

- All STEM Ambassador Hubs were rated 4.80 or above by activity organisers with regards to **success in achieving intended outcomes**, suggesting that high quality provision of activities is consistent throughout the national network.

- For STEM Ambassadors, the Staffordshire and Shropshire Hub had the highest average rating across all outcomes (4.47). Notably, there were high ratings for **supporting the local community** and improving **STEM Ambassador communication skills**.
- For activity organisers, East Scotland and South East England Hubs both scored extremely high across all outcomes (4.97 and 4.96 respectively). Notably, **learning what the workplace is like and developing employability skills** and **awareness and aspirations for STEM-related study and careers** were extremely highly rated.

Conclusions and Recommendations

This report shows how the STEM Ambassador programme has performed according to the STEM Ambassadors and the activity organisers. Key areas of the data show that:

- **Achievement of intended outcomes across the programme is extremely high** – all but one intended outcome achieved a rating of 4 or above from a possible 5. Supporting the local community and building educator confidence and enthusiasm for STEM were particularly high for STEM Ambassadors and organisers respectively.
- **Certain types of activities seem to be more beneficial in achieving certain types of outcomes** – for example, STEM Clubs are best placed in inspiring and informing young people about STEM. Whereas STEM careers talk / advice session is best in supporting organisations to develop links with schools / community.
- **Certain activities seem to be less impactful than others** – for example, providing advice and guidance for SLT is rated as less impactful for STEM Ambassadors; however, this type of activity was valued by organisers and is therefore still serves an important function.
- **The amount that certain activity types are delivered varies** – for example, hands on practical and supporting an exhibition or event are popular, whilst hosting workplace visits and providing information to SLT are less popular.
- **There is little variation in the quality of activities developed nationally** – across all STEM Ambassador Hubs, activities scored very high amongst STEM Ambassadors and activity organisers, suggesting a consistently high level of support is being delivered nationally.

Recommendations

Interpretation of the data shows areas for both operational and strategic improvement of the programme moving forward.

- Activity types and outcomes should be reassessed to ensure they are still relevant and fit for purpose. 11% of activities were categorised as 'other', suggesting there may be a high proportion of STEM Ambassador engagements that do not align to the current activity types.
- More focus should be placed on STEM Ambassadors **supporting and informing parents about study options and job opportunities within STEM**. This was one of the least popular, and lowest achieving outcomes, however research (such as Science Capital) shows that parents are a key influencer in shaping aspirations of young people.
- Encouragement of repeated engagement through STEM Clubs is likely to be have the most impact in future. STEM Club engagement was rated as the highest activity, and positively impacted STEM Ambassadors and organisers across almost all outcomes.