

Employer engagement in education



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This report represents the culmination of a year's worth of work through a literature review, workshops and surveys looking at employer engagement in schools. It aims to draw out current best practice and make recommendations on next steps to share that more widely. It forms part of a strategic direction taken by STEM Learning Ltd, the Institution of Mechanical Engineers (IMechE) and the Institution of Engineering and Technology (IET) to improve the professional development support available to STEM Ambassadors.

The report presents an overview of current employer-school/college engagement, highlighting current levels of support, best practice, challenges and barriers experienced by employers and their STEM Ambassadors. Recognising that employers and STEM Ambassadors operate in a wide variety of organisations, their needs, issues and support for a corporate social responsibility agenda vary accordingly.

The findings show that STEM Ambassadors have positive reasons for engaging in young people's education, and some employers manage their engagements effectively. However, the majority of STEM Ambassadors agree that they require more support in order to make their practice more effective.

A review of evidence from research and best practice formed part of the report methodology. The review considered various theories around the aims and outcomes of employer engagement and looked at the effectiveness of employer engagement strategies, from the point of view of various stakeholders. The evidence confirmed that engaging STEM professionals in education can bring many social, educational and economic benefits to young people. The outcomes and impact on young people should be the main criterion of effective practice. Employer engagement in education also offers wider benefits to STEM educators, employers and society in general. However, the existence of certain gaps and barriers creates obstacles to good practice and may undermine the effectiveness and impact of employer engagement activities.

A number of areas have been identified from the data for STEM Learning and Professional Engineering Institutions (PEIs) to address in order to better support STEM Ambassadors, their employers and the schools they engage with, to ultimately improve the effectiveness and impact of the programme; ten recommendations are made based on this evidence.

The recommendations are:

STEM Ambassador engagement

1. Increase the importance of STEM Ambassador networking – at both the regional and national levels.
2. More fully recognised volunteering and especially early retired STEM Ambassadors as a flexible resource, to deliver support and resources.
3. More co-ordination of STEM Ambassador activities at a senior level within a school or college (at the Senior Management Team (SMT) or Multi Academy Trust (MAT) level), to maximise impact of employer engagement.

School-college/employer engagement

4. More engagement directly with employers, in collaboration with the PEIs, to increase the 'credit or recognition' they get for what they already do.
5. Develop online handbooks and support packs for employers, schools and colleges, to increase engagement and/or improve its effectiveness and impact.
6. PEIs and STEM Learning to facilitate school and employer workshops where senior leaders from schools and employers attend and discuss collaboration.
7. More engagement with schools on supporting their specific need to offer work placements for all pupils.

Collaboration at the national level in the UK

8. A campaign, together with government, IMechE, IET and other PEIs, such as Engineering UK and the Royal Academy of Engineering, to increase overall awareness of, and engagement with, STEM Ambassadors and their role in supporting the UK's Industrial Strategy.
9. Further collaboration between the key organisations to strategically support best practice regarding meeting the benchmarks in the Careers Strategy (sharing areas and ensuring there are no gaps).
10. Raising awareness of the growing range of professional development support available to STEM Ambassadors.

Employer engagement in education is not a new idea and its benefits for the education system, and especially for STEM subjects and career learning, have been well acknowledged in the UK and internationally (Lord Young report 2015; European Schoolnet 2017). In the last decade, employer engagement has been increasingly viewed as one of the top global priorities in education. The OECD research report, 'Learning for jobs' (OECD 2010), recognised that in most countries there is a gulf between learning and jobs and called for active involvement of employers to bridge this gap. Participation of the economic community in education is credited with the ability to provide valuable expertise and resources, bring new solutions to existing problems and make education experience more exciting and relevant to the lives of young people, needs of the economy and society in general.

In the US, the Harvard Graduate School for Education makes a compelling case for expanding the role of employers in education in the 'Pathways to prosperity' report (Symonds et al 2011). They want employers to become active partners in developing a new vision of school reform and in designing and supporting multiple educational and vocational pathways for young people to move from school to adulthood (ibid., p.24). In the UK, the Career Development Institute (CDI) calls for "businesses [to] have an important role to play in partnering with schools and colleges to raise ambition and achievement and improve performance" (CDI 2014, p.4).

The DfE's 2017 'The Careers Strategy: Making the most of everyone's skills and talents' report (DfE 2017), developed in partnership with the Gatsby Charitable Foundation, emphasises the importance of providing "careers guidance and encounters that are dynamic and link to the real employment opportunities available in future". The strategy adopts the eight Gatsby career benchmarks (Gatsby 2016), developed as part of an international study by Sir John Holman, which highlights the importance of good careers guidance to improve social mobility and increase aspirations for young people from low socioeconomic backgrounds.

To support these goals the strategy emphasises the need to ensure a dedicated careers leader will be accessible to all schools and colleges, with additional funding offered to provide training and support.

Secondary schools will be expected to provide pupils with at least one meaningful interaction with businesses every year, focusing on employers in the STEM arena. £5 million will be made available to develop 20 careers hubs, led by the Careers and Enterprise Company (CEC), strengthening links between schools, colleges, universities and local employers, expanding the co-ordinating role of the CEC.

A further £2 million will fund a pilot scheme in primary schools, trialling approaches to engage with children from an early age, broadening their understanding of the opportunities available to them in the future. Primary schools in some of the most disadvantaged areas will benefit from the pilots, through the government's Opportunity Areas Programme.

Employer engagement is of special importance to STEM education. STEM subjects, more than other subject areas, are affected by a rapid change in content knowledge, learning technologies and career paths available to individuals. The need for employers to support STEM education is further highlighted by a growing demand for STEM professionals and simultaneously declining number of graduates and apprentices in these disciplines (EC 2015a). This is aggravated by a decline in STEM competencies (EC 2015b) and career aspirations among young people and especially girls (Microsoft 2017).

A UK research into future employment opportunities, commissioned by EDF Energy (EDF 2016) as part of its 'Pretty Curious' programme, revealed that jobs in science, research, engineering and technology will grow at double the rate of other occupations, creating 142,000 extra jobs between 2017 and 2023. Moreover, they found that the nature of traditionally non-STEM jobs is also changing so that most of them will require STEM skills. According to the researchers, if things stay unchanged, the number of people entering STEM professions, as well as people in non-STEM jobs with STEM competencies, will fall far short of the numbers required to fill those roles. The situation is particularly acute in engineering, which faces compound problems such as an aging workforce, negative stereotypes and under-representation of specific groups. According to the 'State of engineering' report (Engineering UK 2017), by 2024 this is likely to result in an annual shortfall of 20,000 engineering graduates.

Despite the long history of practice and widespread recognition of the value of employer engagement in education, until recently, little was done to improve conceptual understanding of the experience and collect robust evidence of what works. In their recent review of the STEM education landscape in the UK, the Royal Academy of Engineering (2016) noted that while there are over 600 organisations supporting engineering education in the UK, including professional bodies, informal educators and enrichment providers, there is a "lack of consistent evaluation across providers – and in many cases, of any evaluation at all". A similar analysis of STEM initiatives on the European level reached an equally worrying conclusion:

...impact evaluation, especially with regard to pupil outcomes, remains a 'missing part' in most of the cases: only 27% of the initiatives reported some sort of impact evaluation and even then, most of the evaluation activities were reduced to counting participants and conducting satisfaction surveys.

(Kudenko et al 2017, p.351)

In response to current research and the needs of its STEM Ambassador members, IMechE commissioned STEM Learning to provide a benchmark of the current landscape for employer-school/college engagement in the UK. This review was built upon work undertaken previously by STEMNET (An analysis of employer-school interactions in STEM enrichment, IMechE and STEMNET 2016).

During 2017, STEM Learning, IMechE and the IET instigated a series of interactions with STEM Ambassadors, with a particular focus on employer-led engagement.

To better understand the needs of both STEM Ambassadors and employers more fully, a survey was circulated to STEM Ambassadors in the summer of 2017. Two hundred and thirty STEM Ambassadors responded to the survey and provided a useful insight into the current landscape, resulting in the report: 'Supporting employers to engage more effectively with UK schools and colleges'.

Survey respondents were also invited to express their interest in attending a workshop, providing an opportunity to explore the common themes raised in the survey responses and engage a number of facilitated discussions.

The two workshops took place at IMechE's headquarters in London and the IET's Austin Court venue in Birmingham, in December 2017. Seventy-three attendees, representing 69 employers, participated in the workshops, with active facilitated discussions focusing on the importance of employer-school/college engagement, best practice, barriers and the need to evidence impact. The feedback, evaluation forms and action plans from those workshops, along with the findings from the 'Supporting employers to engage more effectively with UK schools and colleges' report, form the basis of this report.

This report aims to provide employers and STEM Ambassadors with an overview of the current research. Evidence from national and international literature will be analysed, alongside data collected from recent STEM Ambassador survey and workshops. Evaluation data from associated programmes delivered by STEM Learning will be included, such as the STEM Insight programme and the wider STEM Ambassador programme.

Furthermore, the report aims to highlight the importance of employer engagement and provide a snapshot of current practices. A series of recommendations are offered with the intention of developing a longer term, strategic approach to employer engagement with UK schools and colleges. Among other things, this report also acknowledges that self-employed and retired STEM Ambassadors require support and access to resources and training.

Section 3 / What does research and best practice evidence tell us about effective employer engagement?

This chapter reviews research and policy literature on employer engagement in order to build a consistent understanding, scrutinising strategies that make such provision effective and efficient.

The review:

- considers their theories around the aims and outcomes of employer engagement and the implications for defining effective practices
- looks at the effectiveness of employer engagement strategies, from the point of view of various stakeholders (school educators, corporate world and policymakers)
- considers the gaps and barriers to successful practice, identified by the literature

3.1. Defining outcomes for young people

The main purpose of bringing in STEM professionals to enhance STEM education is to improve outcomes for young people. Many research efforts focus on mapping these outcomes, exploring their relationship with specific types of employer engagement strategies and activities.

This research provides important insight on:

- the nature of pupil outcomes achieved through school-employer partnerships
- the engagement strategies that are most effective in maximising benefits for young people

3.1.1. Student career awareness and motivation

Of all the potential benefits that employer engagement in education brings to young people, those related to career education and advice are arguably the most important and straightforward. As careers diversify, with more complex careers and more options in both work and learning opening up to young people, career guidance is becoming both more important and more challenging.

The situation is particularly acute in STEM industries, which have the highest number of innovative jobs and the most pressing needs for a steady supply of new talents and a skilled workforce.

In 2011, the European Round Table of Industrialists and the European Commission (EC), concerned with a growing shortfall of STEM workforce and STEM skills in general, launched a multi-stakeholder European initiative: ECB-inGenious. The project ran for three years (2011 to 2014), engaging over 1,500 classrooms across 24 European countries, in activities designed and supported by STEM employers. The project gathered comprehensive data on the existing policies and practices of employer engagement in Europe, which were analysed with the help of a conceptual model, exploring the STEM career aspirations of young people.

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The study identified four factors that influence the aspirations and career choices of young people, with regard to STEM subjects (Figure 1):

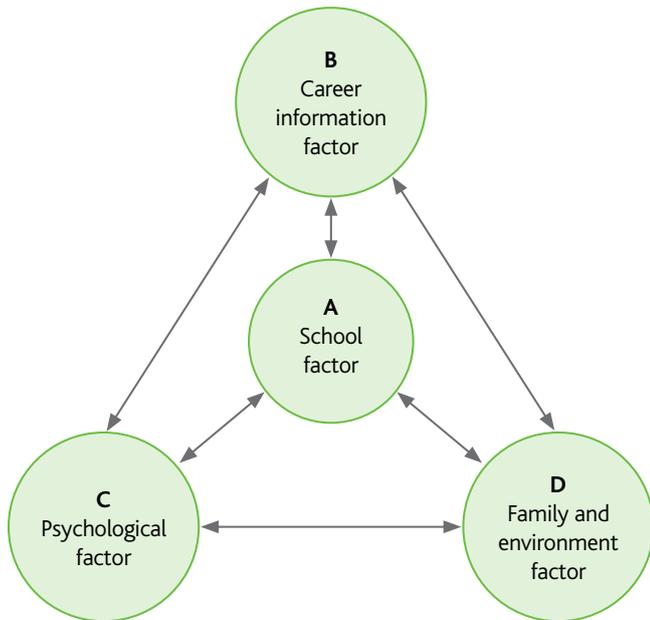


Figure 1 Factors affecting the career choices of young people (ECB-inGenious 2011)

A. Students' engagement in learning STEM subjects in school

B. Available information about careers, career pathways and job opportunities

C. Self-efficacy beliefs of students, ie awareness of how one's own knowledge, skills and personality traits fit requirements for STEM study and careers

D. Perception of STEM careers as displayed in society and in one's own immediate environment (eg family, peers or neighbours)

Good subject knowledge, competence in STEM disciplines and students' engagement in learning (group A) are commonly recognised as essential prerequisites to positive attitudes to STEM learning and careers. However, on their own, these factors are often not enough to stimulate career aspirations of students (The Royal Society 2004) and researchers point to:

- the importance of students' knowledge of STEM-related careers (group B)
- their personal beliefs, values and self-perceived abilities to accomplish education and career-related tasks (group C) (Fouad 2007)
- social views and popular stereotypes of STEM industries and careers (group D) that are also acknowledged as influential. Especially with regard to a damaging role of negative stereotypes (Sjøberg and Schreiner 2010).

According to the model, to maximise the outcomes for young people, employers need to support educational interventions which address all the factors specified in the model.

The researchers applied this framework to the analysis of over 150 educational initiatives and policies collected from project partner organisations representing employers, policymakers, education researchers and providers of educational services. They found that most educational initiatives supported by employers focus on curriculum learning (group A, 62%) and careers education (group B, 41%).

At the same time, the reviewed initiatives were significantly less likely to target personal and social attitudinal issues, eg by offering role models and long-term interactions with STEM representatives (groups C and D, 25%). This lack of balance in priority areas reduced the overall effectiveness of the support provided by employers to schools and young people.

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Finally, using rich evidence from the project evaluation, inGenious suggested a list of 'best practice' attributes that make educational activities, developed or facilitated for schools by employers, easier to implement and more likely to succeed.

Engagements are more successful and achieve more sustainable impact on students, teachers and schools, when they:

- are well integrated with other activities and linked to school curriculum
- support different types of learning – and most essentially hands-on or practical activities and interactive learning, to engage and challenge students of different abilities and backgrounds
- are flexible and inclusive (ie could be easily adapted to use with a variety of abilities and age ranges)
- challenge stereotypes
- stimulate creativity and inquiry
- include clear guidance on objectives, context, resources required, technical specs and prior knowledge and skills required from the students

3.1.2. Connecting engagement strategies to student outcomes

In the UK, much of the research and conceptual work on employer engagement has been driven by a London-based charity, Education and Employers. Since their establishment in 2009, they have conducted a number of research projects, engaged with international experts and most recently published a comprehensive research and evidence review of the field. Commissioned by the Education Endowment Foundation, this review focuses on understanding and evidencing the impact of employer engagement activities on pupil educational and economic outcomes. The report, published in

January 2018, which targets school practitioners, focuses on the earlier theoretical work of the organisation (Mann et al 2014), offering a conceptual model of:

- how employer engagement activities can benefit young people; and
- factors that influence or mediate the success of such activities

After reviewing the evidence from 42 international and UK studies, the researchers conclude that: "employer engagement can often be expected to provide beneficial educational and economic outcomes for young people" (p.7). The analysis also suggests that the main benefits are due to young people receiving authentic experiences of the labour market.

The report defines four broad outcome areas in which young people are impacted by employer engagement.

Benefits to young people from engaging with employers:

1. Enhancing understanding of jobs and careers (and broadening or raising career aspirations).
2. Providing the knowledge and skills demanded by the contemporary labour market (ie employability skills).
3. Providing the knowledge and skills demanded for successful school-to-work transitions (including the knowledge of progression routes and of how contemporary workplaces operate).
4. Enriching education and underpinning pupil attainment (by providing authentic context and showing connections between education inputs and employment outcomes).

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Importantly, different forms of employer engagement have different levels of effectiveness in bringing particular types of outcomes for young people. When selecting how to engage with employers, school educators must consider what outcomes they want to achieve.

It is also possible to speak about three distinct ways employer engagement can support teaching and learning in school. It can:

- supplement the conventional teaching and learning processes
- complement them by offering alternative ways of learning, eg mentoring
- add additional value by offering learning outcomes in addition to conventional learning outcomes, as recognised by qualification, eg employability skills

A drawback of the approach is that it uses a narrow definition of employer engagement which is seen as a direct interaction between employers and young people. Consequently, it excludes a whole range of other activities through which employers can support education, including teacher professional learning, curriculum or resource development and other forms of collaboration with educators and policymakers. Although measuring the impact of such indirect activities is harder, they often result in wide and sustained improvements in the quality of young people's education.

3.2. Employer engagement as CSR

Models that approach employer engagement in terms of educational and economic outcomes for young people, discussed in the previous section, offer useful insights into best practice, yet they do not provide all the information that employers need. Although they help employers understand the impact of their outreach work, they do not reflect on other concerns and considerations of employer organisations and individual volunteers.

For instance, these models do not take into account personal, corporate and wider societal objectives that employers may pursue through their education engagement activities; nor do they consider various circumstances and contexts of employer organisations and individual representatives. Equally, employers and individual volunteers need information on the strategic, tactical and operations support that they can get from other social actors and institutions (eg policymakers, education providers, professional bodies, recognition schemes and financial incentives).

Starting from the second half of the 1990s, employers' contributions into education are increasingly defined as part of their corporate social responsibility (CSR). On a general level, CSR is seen as the responsibility of businesses and enterprises for their impact on society and a company-led commitment to responsible and sustainable business (ICRS 2018). This implies a multi-faceted nature of CSR, which requires companies to integrate social, environmental, ethical, consumer and human rights concerns into their business strategy and operations.

A peer review on CSR best practice, commissioned by the EC in 2014, concluded that many businesses do not have sufficient understanding and knowledge of the area and need support with developing CSR policies and actions. Addressing this concern in relation to CSR work in education, the European champion of corporate social responsibility, CSR-Europe, developed a special map of priority areas (see Figure 2 on the following page). This map shows a broad mix of outcomes for various stakeholders, including companies and their staff, school educators and intermediary organisations.

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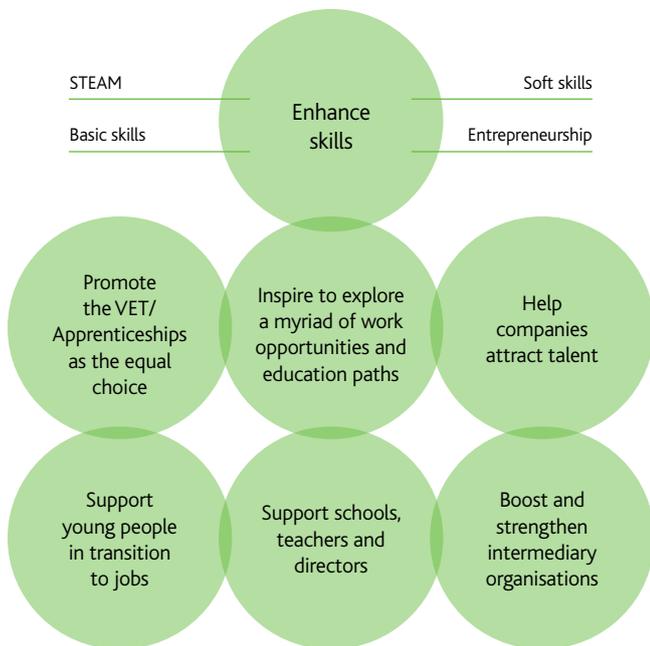


Figure 2 Source: Amended from - CSR-Europe 2016, p.5

There is also an expectation that to be effective employers have to work in partnership with policymakers, professional organisations and education providers. This collaboration is essential for building an infrastructure and social climate, conducive to employers' support for education. This message is echoed in the OECD report which calls for "effective partnership between government, employers and unions to ensure that the world of learning is connected at all levels with the world of work" (OECD 2010, p.11). Research identified a number of success factors for engaging and supporting businesses in CSR work, including their engagement in education:

- making CSR 'easy' and 'simple' to do – by using simple and clear messages, providing tools and guidance
- disseminating best practice
- multi-stakeholder dialogue and partnerships at all levels
- promoting the business benefits – such as consumer loyalty, employer pride, international competitiveness, partner trust and investor preference

- training and education at the individual, company and society levels (EC 2013, p.6)

In the UK, the work of the Institute for Corporate Responsibility and Sustainability (ICRS) also shows that companies want to manage their education engagements effectively and sustainably and are keen to seek advice on how this can be achieved. In response to this demand professional bodies and think tanks, like [Education and Employers](#), the [Career Development Institute](#) (CDI) and the [Careers & Enterprise Company](#) develop guidelines and toolkits to support companies and schools wishing to work in partnership.

One of the first publications from the then newly formed Education and Employers Taskforce reviewed the existing evidence and set out to provide a clear definition of what makes employer engagement effective from a school or school partnership point of view (Education and Employers Taskforce 2009). They defined **four principles** that underpin effective employer engagement and that should be used to gauge impact over time:

1. Employers collectively need to offer a breadth of activities and opportunities to engage with schools and colleges.
2. Effective employer engagement is measured by positive impact on the aspirations and achievements (qualifications, attitude and skills) of young people.
3. Effective employer, school and college partnerships are mutually beneficial, meeting the needs of all parties.
4. Engagement opportunities offered by employers need to be flexible and diverse, recognising the differing needs of learners, schools, special schools, national challenge schools, colleges, secondary and primary audiences.

More recently, the Careers & Enterprise Company (CEC) and the Confederation of British Industry (CBI) have jointly produced a practical guide for employers who want to engage with schools, together with a compendium of case studies from businesses themselves (CEC & CBI 2017). The guide focuses on four key areas: the reasons employers engage with schools; who should be engaged in the process; deciding which activities to run; and ensuring their effectiveness.

3.3. Existing gaps and barriers

Research on the current practice in school-employer partnerships suggested a number of shortcomings and gaps, which undermine their effectiveness and impact.

For example, the voluntary nature of such partnerships, which can be positive in terms of flexibility and innovation, may also entail lack of commitment (Marriott and Goyder 2009). Initiatives can also suffer from a lack of clarity between educators and business partners regarding their joint objectives and process implementation (Burge et al 2012).

The main areas of inefficiency are summarised in the list below:

- Unclear objectives: unspecified aims lead to uncertain outcomes and low efficacy of employer engagement initiatives.
- Inadequate support to primary school: children, and especially girls, make 'negative' career choices by the age of 10 to 11, hence it is important to engage with primary pupils to keep their interest in STEM kindled.
- Short-term nature of engagements: short interventions are significantly less likely to have a long term impact than repeat engagements.
- Absence of evaluation: process and impact evaluation are paramount to achieving high and sustainable outcomes.

Finally, it is possible to identify four major barriers that prevent effective collaboration of schools and employers:

- **structural**, ie limited availability of resources, support and infrastructure
- **motivational**, ie fragmented or even contradictory interests, goals and motivations of the education and business parties involved
- **procedural**, eg lack of established organisational and networking links
- **cultural**, ie different ways in which schools and businesses work and approach STEM education as well as misunderstanding or lack of knowledge of each other's aims and cultural settings (Kudenko et al 2017).

4.1. Reasons for engaging (SAs and their employer organisations)

For STEM Ambassadors (SAs), responses to the online survey show that the main reason for volunteering is to inspire children about STEM (Figure 3), with 63.5% of respondents stating this was their main reason. This was consistent for both SAs identifying as engineering and other STEM specialists as well as those working for large companies and small and medium-sized enterprises (SMEs). Whilst this was echoed in the workshops, SAs also stated that challenging stereotypes (with particular reference to gender imbalances in STEM careers) and providing career advice were prominent motivators for volunteering. It was also noted that, when providing careers advice, SAs claimed that they promoted STEM apprenticeship routes and university routes equally.

Reasons for volunteering compared between business size and subject specialism

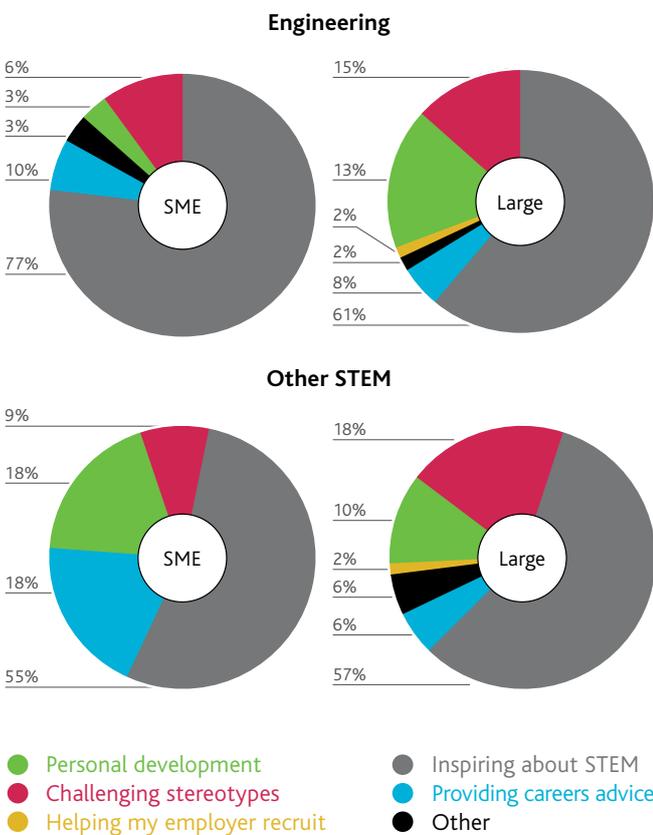


Figure 3 Proportion of engineering vs other STEM specialists' reasons for volunteering; compared by company size

Employer recruitment was not cited as a main reason for volunteering, but many SAs recognised that their engagements, particularly with secondary level children, could lead to increased interest in working for a particular employer.

The minority of employers who encourage volunteering cite having a positive impact on their potential future workforce as the main reason for doing so. This is done by challenging stereotypes, inspiring young people about STEM and increasing aspirations. In at least one case it was mentioned that an employer had systematically built up relationships with local schools in order to monitor children's progression. This positively affected the recruitment of apprentices from the local area. SAs also mentioned that companies will encourage volunteering as part of their corporate social responsibility (CSR). In some cases, employers were keen to show support for the SA programme, but SAs argued that the individual volunteers were not always supported by their employers in the most effective ways.

4.2. How employers plan and manage their engagements with schools and educators

When planning and managing engagements with schools and educators, STEM Ambassadors take different approaches dependent on whether they receive support from their employer. Some of those who work for large companies state they have a volunteering allowance – a number of days, usually ranging from one to six, in which they are given paid time away from work for volunteering engagements. Indeed, survey data shows that 68% of STEM Ambassadors working for a large employer are encouraged to volunteer in their paid work time, compared to only 39% of those working for an SME. However, Ambassadors have suggested that requesting (further) time for volunteering can in some cases be sanctioned by a manager or foundation board. Some of those Ambassadors who work for companies without volunteering allowances, and therefore volunteer in their own time, find that their volunteering engagements may be supported in other ways, such as being supplied with resources.

Section 4 / Workshop feedback on experiences of STEM Ambassadors, with reference to STEM Ambassador survey 2017 outcomes

Large employers are more willing to provide resources or equipment for Ambassadors to use than SMEs, where just 45% do so. Smaller companies find it harder to support their employees' volunteering engagements due to lack of resources or time.

It was also noted that companies can lack a strategic approach when engaging with schools and non-school groups. This issue is discussed further in the gaps and barriers section below. However, a number of SAs provided examples of how their organisations strategically planned and managed their engagements with young people.

Building a relationship with a school is agreed to be a key factor in ensuring the success of an engagement. Many SAs stated that contacting the right person at the school increases both the uptake and effectiveness of engagements. This could be a challenge as it will often be different for different schools. Predominantly, SAs should contact the STEM coordinator (if a school has one), otherwise contact can be made with the head of science or technology, or the business manager, or indeed others in the Senior Leadership Team.

Knowing what an SA should do once the relationship with a school has developed, was cited as a challenge. This was in particular reference to SAs being equipped to deliver impactful STEM activities and what support is available to help them. Larger employers with multiple sites fed back that training and development opportunities differed depending on the location of the site and that the support for SAs was not universally the same.

Examples of best practice for engaging with young people:

Transport for London (TfL) have a thriving volunteer base, with many of the volunteers being active STEM Ambassadors. Internal networking events are run three times per year for SAs, including invitations to SAs working for partner and supplier organisations. These events benefit SAs both in terms of networking and support. TfL SAs also use the support of other staff, for example administrative staff who may not have the STEM expertise to deliver engagements, to help organise and support their volunteering.

Thorntons run factory tours and outreach work for young people, ranging from primary to postgraduate. They are oversubscribed with requests and hence do not advertise. In their company there is a special educational specialist working part-time who organises outreach work with schools, with a focus on careers and engineering in food science.

The Royal Air Force (RAF) have a Defence Engineering Strategy Team and have developed strategic partnerships (eg with BA Systems). They designed and support the implementation of an engagement strategy integrated in their services. Each service takes a different operational approach, but overall they have 45,000 people who volunteer with a 'do what you are comfortable with' ethos. SAs have three days for volunteering, and the organisation covers travel expenses and sustenance. The RAF are keen to increase the amount of SAs and encourage their staff to actively engage with the SA programme. However, they are also actively involved in national programmes, such as RAF 100 and Year of Engineering, as well as producing their own resource packs.

4.3. Range of engagements (who with, how, how long)

STEM Ambassadors come from a range of different STEM organisations and either currently work for, or in the case of retirees have previously worked for, a STEM employer. Generally, employed STEM Ambassadors fall into two categories – Ambassadors who have the support and recognition from their employers and volunteer in paid work time; and 'stealth' Ambassadors who work for large employers and volunteer in their own time, without the support or recognition of their employer.

Retired SAs agreed that they have time to volunteer, but can in some cases lack the resources and support that could be supplied by an employer. These SAs state that more support is required from PEIs and STEM Learning, such that they are aware of the best way to become or remain SAs. This was mentioned both at the workshops and in the survey:

"Most STEM Ambassadors I know are retired so employers could do well to have a pre-retirement process to ensure that those who retire are aware of the opportunity to maintain their professional interest. The recruitment of STEM Ambassadors who are retired via the professional institutions is a vital area that needs more support."

Survey respondent

A number of SAs mentioned the need to build a relationship with schools that would lead to continuous engagements. Currently, engagements are often one-off and therefore some SAs feel they are of low impact. There is a perception that schools view one-off engagements as an 'extra' to curriculum learning, rather than embedding the SAs' knowledge and expertise into curriculum learning, and building upon it beyond the engagement. This issue was highlighted by survey respondents:

"Schools need both incentives and opportunities to discover what the Ambassador programme has to offer, as well as build relationships with providers (businesses and Ambassadors) over a period of time."

Survey respondent

"School staff need to perceive STEM Ambassadors as a positive influence on their students (linked to aspiration). I have come across teachers and senior school staff who fail to understand the STEM Ambassador programme. Some teachers see STEM Ambassadors as a threat as they often lead to the cause of extra work."

Survey respondent

Some large employers have strategic engagement processes in place for their staff, for example:

the **RAF** provide their staff with a clear idea of what a STEM Ambassador is and give them a 'kit' of resources and activities linked to different areas of the curriculum. They focus on disadvantaged and unengaged schools and work with their local SA Hubs to organise engagements. They also have a touring theatre show that visits secondary schools and is refreshed annually.

Rolls-Royce have global and national strategies and targets, but also do activities at regional, local and very local levels. They offer their volunteering staff specific training tailored to specific events, eg The Airshow (which is always oversubscribed). They aim to have a mix of different people with diverse skills.

4.4. Gaps and barriers

For organisations:

SAs noted that employers (particularly at senior management level) find the STEM engagement landscape fragmented and overwhelming. There are a significant number of education enrichment programmes that aim to attract STEM industry volunteers, however, many SAs agreed that senior managers lacked information and understanding about being involved with, and the impact of, the SA programme.

Many SAs noted that their employer would be more likely to support the SA programme if they were to better understand the positive impact engagements have on employees and the company as well as on pupils, teachers and schools. Indeed, a number of discussions at the workshops focused on addressing the barrier of employers not allowing enough time for SAs to volunteer. Large employers would potentially be more open to providing time for volunteering if they were aware of the positive impact it has on the SAs and the company.

Some SAs mentioned that large employers often have difficulty managing and co-ordinating their employees' volunteering, and therefore struggle to maintain consistency. Rolls-Royce are an exception in mediating their SA engagements, so that together they are working towards bigger aims. Over 80% of survey respondents agreed that employers would benefit from support in developing company-wide messages or policies for effective volunteering.

For Ambassadors:

Employed SAs agree that a main barrier preventing engagements is being allowed time away from work. This is a bigger problem for those working for SMEs, but was also cited as an issue for those working with large employers.

SAs noted that communicating with schools can be problematic, many found that contacting schools directly (ie not via a STEM Ambassador Hub (SAH)) could lead to a number of issues. In some cases, no response was received, however, SAs noted that they may undertake a single engagement arranged directly with a classroom teacher but this often meant there was no prospect of continuing the relationship with the school. It was suggested that communicating with senior leaders in schools, such as a STEM coordinator (if a school has one), business manager or head of subject, otherwise contact can be made with head or others in the Senior Leadership Team, was a more fruitful approach.

'Stealth' Ambassadors agreed that employers can lack the willingness or ability to support their engagements, hence engagements were undertaken as an individual rather than as an ambassador for a company. However, there were also SAs from SMEs who noted that whilst their employers were morally supportive of their STEM Ambassador activity, they were not able to support them in the way that some larger organisations can. Often this was regarding not allowing time away from work to volunteer, a lack of employer-specific resources and activities, or no strategic approach to volunteer engagements.

The majority of SAs agreed that having the ability to evaluate the impact of their SA engagements and provide feedback to senior management would increase the buy-in of their employers and address some of the aforementioned barriers. Furthermore, some SAs stated that provision of a programme-wide evaluation aimed at employers, highlighting the impact, would positively affect senior management attitudes towards the STEM Ambassador programme.

For schools:

As part of the government's new Careers Strategy (DfE 2017), schools are required to provide young people in Years 7 to 13 with at least one meaningful encounter with employers each year, with a high emphasis on encounters with STEM industries. Schools should be made aware of how the STEM Ambassador programme can help to meet this requirement, by offering meaningful encounters for young people. Similarly, SA training should make Ambassadors aware of schools' requirements and the ways in which they can support.

"These activities could include work experience or shadowing, workshops or talks run by employers, or other activities that develop the skills needed to deal with business challenges."

Careers Strategy: making the most of everyone's skills and talents (DfE 2017)

Schools often undervalue the engagement of SAs. Engagements can be tailored to meet the needs of the school, rather than be viewed as standalone extras to schools' work. For example, engagements can meet different areas of the curriculum, support schools in meeting the Careers Strategy requirements and be embedded into the learning occurring outside of the engagement. A number of SAs agreed that this could potentially be addressed by providing schools, particularly senior leaders, with impact data on how the SA programme can positively affect teachers and young people.

It was mentioned that this issue was exacerbated in schools which are underachieving; some SAs stated that their offers of engagement had been turned down by such schools as teachers and senior leaders did not see engagement with an SA as a priority.

Other issues:

STEM Ambassador Hubs have pre-existing relationships with schools in the local area and some SAs felt that these should be capitalised on more effectively, particularly with regards to the aforementioned communication issues between SAs and schools.

The work undertaken by SAHs is not seen as consistent across the country, and some SAs have found that interactions with local Hubs can be ineffective. SAs noted that there are other competing organisations that promote their own solutions and this creates inefficient working practices; both school and company leaders need to be aware of the best ways to initiate school-industry engagements.

"Our STEM team (Hub) keeps changing staff, making consistent communication impossible! One simple point of contact available and advertised both in schools and Hubs."

SA evaluation form, Birmingham workshop

Professional Engineering Institutions (PEIs) have great experience of techniques to "harness the power of volunteers" which could increase the reach and reduce the cost of planned interventions.

4.5. Individual action plans
(committed to on the day)

Content analysis of evaluation forms and action plans collected at both the London and Birmingham workshops highlight a number of key learning outcomes in which STEM Learning and PEIs can support SAs in the future. Full, anonymised action points are provided in [appendix 1](#).

Section 4 / Workshop feedback on experiences of STEM Ambassadors, with reference to STEM Ambassador survey 2017 outcomes

Actions related to STEM Learning focused around four main areas:

- engaging with the digital platform
- accessing and using online resources
- accessing online training
- reporting on impact

Future support required from PEIs:

- changing practice (ie the way in which PEIs engage with employers or schools)
- SA training

Moreover, many actions stated by SAs were related to their organisations, including:

- improving how the organisation interacts with schools
- improving the internal processes for engaging with educational programmes
- gaining support from the senior management team
- provision (or improvement) of internal SA training

4.6. Needs analysis

(what support SAs asked for)

Qualitative analysis of the data collected from both the evaluation forms and the workshop discussions highlighted six main categories of support requested by SAs. The table opposite shows the categories, along with short descriptions, outlined in the evaluation form data. Discussions at the workshops identified more specific areas of support, most of which fall into the information and guidance category, and are highlighted separately on the following page.

Category	Description
Information and guidance	Would like more information and advice regarding what and how to do in order to make our employer engagement (EE) effective and impactful
Coherent infrastructure to facilitate EE with schools	Would like to see more structured and coherent support for employer engagement at the national/regional/local level
Impact evaluation	Require support with measuring the impact of individual and organisation-wide employer engagement
Networking	Would like more opportunities to network and share best practice
SA training opportunities	Require more training to improve our understanding and practice. Need to enrol, arrange and improve training for SAs or recognition that SAs require special training
STEM Ambassador Hub	Need to work (more closely) with the local Hub

Specific areas of support outlined during the workshop discussions:

Information and guidance: Some SAs agreed that provision of information on schools (or where to find this information) would be useful when targeting schools to work with. In particular, these SAs mentioned proportion of free school meals (FSM) children, identification of disadvantaged or opportunity areas and schools who have not previously engaged with the SA programme as key factors when identifying target schools.

Information and guidance: One SA mentioned her positive experience of working with a school, with a focus on how the school had created a full-day timetable in order to maximise the use of her expertise. With this, it was suggested that schools should receive guidance about the best way to engage with an SA in order to make the most of the engagement.

Information and guidance: A number of SAs agreed that either they or their organisations are unfamiliar with the requirements of schools for engaging with employers. This is particularly relevant given the aforementioned requirements for meaningful employer engagements as laid out in the DfE Careers Strategy.

STEM Ambassador Hubs: Retired SAs were unaware of the support they could receive from their local SAH. A key concern of many SAs from the retired community was the lack of resources available to them and it was stated that SAHs can help with the acquiring and lending of relevant STEM resources.

4.7. Evaluation and impact measurements

Previously, there have been impact-gathering measures in place in the form of an online survey. This has recently changed and impact gathering is done in part by STEM Learning's digital platform¹. A small number of SAs mentioned internal impact-gathering procedures, such as giving a presentation to senior management about their engagement, or collecting feedback from teachers and young people. However, there is a need for a structured impact-gathering process, which can inform impact reporting tailored to both school and company leaders.

STEM Learning, supported by the IMechE, is looking to introduce a student evaluation tool for STEM Ambassador activities. This tool will allow SAs to gather data on the impact of their individual engagements; furthermore, STEM Learning can collate this data to provide a programme-wide evaluation of the impact on young people.

¹ <https://www.stem.org.uk/new-stem-ambassador-digital-platform>

5.1. Upskilling STEM Ambassadors to better understand the world of education and to provide effective and high quality support

STEM Learning already provides STEM Ambassadors with some training and development opportunities to broaden their understanding of education and enhance the impact of their engagement with young people, schools, colleges and community organisations. STEM Ambassadors can already access support through online courses, face-to-face training, teacher-Ambassador networking events and information via e-newsletters. More needs to be done to ensure all STEM Ambassadors are aware of this support.

STEM Learning analyses national trends, sets standards, develops resources to meet needs and champions consistent quality support across the network, for example, creating an online course, 'Inspiring young people in STEM', designed to support STEM Ambassadors with practical activities.

Work continues to greatly expand the STEM Ambassadors resources collection – both online via the www.stem.org.uk eLibrary and physical resources, held at the Centre in York and at regional Hub locations. In November 2017, STEM Learning consulted widely to better understand what further resources STEM Ambassadors would benefit from. Additional physical resources are now available directly from STEM Ambassador Hubs, and SAs will be supported through a series of activity plans and training where needed.

5.2. Training educators to better understand what SAs and employers can offer them and how to maximise their impact

STEM Learning revised their network structure on 1 November 2017, with one clear outcome expected to be to drive collaborative working between STEM Ambassador Hubs (SAHs) and the Science Learning Partnerships (SLPs) to maximise impact. Six new regional areas have been created, each benefiting from the support of a Network Regional Lead. This delivery model will make it easier for SLPs and Hubs to work together to promote the STEM Ambassadors' offer to educators as well as the benefits of engagement to employers, schools, colleges and all other interested parties.

For example, the use of STEM Ambassadors to support CPD courses and events is proving to be an effective way to increase understanding among educators. The STEM Ambassadors programme and its benefits are promoted in the communications materials sent out to teachers, such as magazines and e-newsletters. Exemplary case studies of educators that involve STEM Ambassadors are regularly featured to convey benefits and increase understanding. In addition, STEM Learning is developing a suite of videos to promote the programme and articulate to different users how STEM Ambassadors can support them. These videos will highlight what STEM Ambassadors do, the importance of the STEM Ambassador programme, and how to get involved. It is hoped that this will further raise awareness of the programme and its benefits in order to increase engagement.

5.3. Improved online platform, offering the ability for employers, STEM Ambassadors and schools or colleges to make connections

STEM Learning launched a new digital platform for the STEM Ambassadors programme in mid-January 2018. The enhanced website will enable key users, such as STEM Ambassador Hubs, employers, STEM Ambassadors and teachers, to engage more easily with the programme. A self-service element will be built into the digital platform to automate part of the matching process and improve the gathering of feedback. STEM Ambassador Hubs will continue to provide support within their region, building relationships which reach out to those most in need. The impact of the digital platform will be monitored closely, both from the perspective of schools and employers.

5.4. Providing evaluation and access to impact data and case studies

Agreed with the BEIS (Department for Business, Energy and Industrial Strategy), a set of national key performance indicators demonstrates the positive impact the STEM Ambassadors programme has on stakeholders. STEM Learning has developed a model of change for the STEM Ambassadors which conveys desired outcomes and the impact of the programme.

Both quantitative and qualitative methods are used to evaluate the programme. For example, surveys are distributed to STEM Ambassadors and educators to assess the quality of the engagement.

STEM Learning is not solely reliant on the impact data provided by the feedback surveys. This information complements other data being collected across the STEM Learning network and, centrally, to support the evaluation of the programme. For example, impact guidance packs have been developed to support SAHs to produce quality studies that evidence impact. It is expected that over 90 detailed impact studies of STEM Ambassador engagement will be available by March 2018.

Work is ongoing to identify best practice around impact and how this can be expanded across the network. An external evaluation of the programme will be undertaken to carry out a comprehensive evaluation of the STEM Ambassadors programme, further helping to identify best practice and recommend areas for improvements. A key aspect will be the dissemination of the report and its findings.

5.5. Working in partnership with employers

STEM Learning values opportunities to work in partnership with employers, through the STEM Ambassador programme and other programmes supported via the network of STEM Ambassadors.

The STEM Insight teacher placement programme aims to increase STEM career learning and awareness amongst students and enhance schools' careers provision.

Placements provide a unique opportunity for education staff to experience life in a modern industry or a leading university. The experience equips teachers, technicians and support staff with real-life knowledge and experience, helping to bring careers to life in the classroom.

The increased STEM careers awareness amongst teachers and more contacts with employers also results in improved STEM careers support outside the classroom, which enhances overall careers provision in school.

The scheme is highly valued by teachers and other educators, their schools and their placement host employers. The programme increases the range and extent of schools' engagement with STEM employers, particularly when placement hosts are locally based and are also interested in follow-up engagements. Since October 2016, 111 placements have taken place at a range of SMEs and larger organisations.

STEM Learning also supports the BP Ultimate STEM Challenge (USC) by promoting the opportunity to our network and providing participating schools with access to a STEM Ambassador. Aimed at younger secondary school students yet to make their GCSE choices, the BP USC encourages UK students aged 11 to 14 to put their science, technology, engineering and maths (STEM) skills to the test, by tackling real-world energy problems. Ambassadors are available to guide and mentor students through the process of designing solutions to real-world problems.

Further examples of STEM Learning Ambassador Hubs working in partnership with local employers are:

- In the south-east the regional Hub is working with EDF Dungeness B Power Station, with STEM Ambassadors supporting STEM 'Pretty Curious' days for female students and teachers. EDF Energy Pretty Curious aims to inspire teenage girls to imagine a future where they use STEM.
- The North Midlands Hub is partnering with Veolia in Sheffield to create a project for primary schools based around recycling plastics, which highlights the harm discarded plastics can cause to the natural environment.
- The South West Hub has developed relationships with Babcock International. In September 2017, 40 Babcock STEM Ambassadors supported a Big Bang event on a warship attended by ten primary schools. This was the first event of Plymouth City Council's Primary Strategy, which the Hub supported.

The STEM Ambassador programme has the foundations in place for a highly successful employer-school/college engagement platform that can help to close the STEM skills gap by inspiring young people to undertake a career in STEM. In order to build on these foundations, STEM Learning should work closely with the Professional Engineering Institutions and highlight the benefits and impact of being involved in the programme for employers, schools and STEM Ambassadors. Furthermore, it is important to highlight the role the programme has in supporting the UK's Industrial Strategy and the recently published Careers Strategy.

Based on the data collected and subsequently presented in this report, ten strategic recommendations are made regarding how to improve the STEM Ambassador programme in the future. These recommendations focus on how the programme can maximise the impact STEM Ambassadors are having, improve the engagement between employers and schools and colleges, and also identify how collaboration between institutions can help raise awareness of the programme.

Building upon the extensive research on effective employer engagement, and following the employer events held in December 2017 involving STEM Learning, IMechE, IET, employers and STEM Ambassadors, with a particular focus on employer-led engagement, the following recommendations are highlighted.

STEM Ambassador engagement

1. Increase the importance of STEM Ambassador networking – at both the regional and national levels.
2. More fully recognise volunteering and especially early retired STEM Ambassadors as a flexible resource, to deliver support and resources.
3. More co-ordination of STEM Ambassador activities at a senior level within a school or college (at the Senior Management Team (SMT) or Multi Academy Trust (MAT) level), to maximise impact of employer engagement.

School-college/employer engagement

4. More engagement directly with employers, in collaboration with the PEIs, to increase the 'credit or recognition' they get for what they already do.
5. Develop online handbooks and support packs for employers, schools and colleges, to increase engagement and/or improve its effectiveness and impact.
6. PEIs and STEM Learning to facilitate school and employer workshops where senior leaders from schools and employers attend and discuss collaboration.
7. More engagement with schools on supporting their specific need to offer work placements for all pupils.

Collaboration at the national level in the UK

8. A campaign, together with government, IMechE, IET and other Professional Engineering Institutions, such as Engineering UK and the Royal Academy of Engineering, to increase overall awareness of, and engagement with, STEM Ambassadors and their role in supporting the UK's Industrial Strategy.
9. Further collaboration between the key organisations to strategically support best practice regarding meeting the benchmarks in the Careers Strategy (sharing areas and ensuring there are no gaps).
10. Raising awareness of the growing range of professional development support available to STEM Ambassadors.

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1 Birdcage Walk | Westminster | London | SW1H 9JJ



2 Savoy Place | London | WC2R 0BL



The University of York | Heslington | York | YO10 5DD