Making education your business

A practical guide to supporting STEM teaching in schools and colleges

THE ROYAL SOCIETY

CBI
THE VOICE OF BUSINESS

Making education your business: A practical guide to supporting STEM teaching in schools and colleges
Issued: May 2016 DES4026

Cover image:
Rolls-Royce at the Big Bang Fair 2016. © Rolls-Royce plc.

Foreword

We live in an increasingly complex, fast-paced and technologically driven world. Science and mathematics education is vital for developing people with the skills and knowledge to take advantage of the exciting opportunities this creates, to allow people to flourish and succeed in their careers, and in addressing some of the questions and challenges our modern world presents.

However, a shortage of science, technology, engineering and maths (STEM) subject knowledge among school leavers and graduates continues to pose a challenge for businesses and their continued growth. At the same time young people find themselves without the skills and knowledge they need to progress in their careers.[1] Business support for STEM teaching can help equip young people to take advantage of the opportunities ahead of them, help meet employers' needs for skills and knowledge and help the UK keep pace with international competitors.[2]

We know that business relationships with schools and colleges can play a crucial role in supporting STEM education. The aim of this guide is to support more employers, of all sizes and sectors, to work with teachers to help encourage and enthuse future generations about the value of STEM.

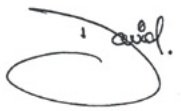
Teachers are a crucial part of inspiring pupils to pursue STEM subjects – in some cases the single biggest influence.[3,4] By collaborating with teachers, employers can help to ensure confident, well informed and inspiring teaching, which helps motivate young people to study STEM and see where these subjects can take them.

Our three organisations are committed to supporting teachers. We know that others across the business community share this commitment and are already working with teachers to make STEM education in the UK the best it can possibly be. Over 70% of companies already have links with at least one school or college,[2] including IBM whose teacher work placement schemes exemplify the sort of teacher-focused approach we advocate.

During the past year, the Royal Society and CBI have worked with businesses and teachers, including IBM, to explore how business-education relationships can be best developed and optimised, to ensure that these partnerships have high impact and are beneficial to both parties.

This guide contains these insights and expertise. It sets out a step-by-step process that can be easily followed by an organisation of any size, when setting up or expanding an education programme.

Education is everyone's business, so we all need to play a part. Whether your organisation is small, large or medium sized, whatever your motivation and case for working with schools and colleges, whether you are already involved or looking to get started, we hope that you find this guide useful in demonstrating the practical ways which you and your business can make a direct and lasting difference to the lives of young people and, through them, our own economic future.



David Stokes
Chief Executive, IBM
UK and Ireland

Neil Carberry
Director of Employment
and Skills, CBI

Professor Tom McLeish FRS
Chair of Education Committee,
Royal Society

Introduction

In its *Vision for science and mathematics education*[5] the Royal Society has called for collaboration between teachers, industry and academia to support excellence and professionalism in science and mathematics teaching.

Businesses supporting teachers to provide high quality science, technology, engineering and maths (STEM) education will allow young people to relate curriculum teaching to work-related examples. Many businesses recognise the positive role they can play in education. However, CBI and Pearson's most recent Education and Skills survey[2] highlights that while 73% of employers engage with school and colleges, just 7% of these provide industry secondment placements for teachers. Widening skills gaps and a fast-changing economy mean more needs to be done to support education – particularly in STEM subjects where there are acute workforce shortages.

This guide sets out five simple steps that can be followed by your company when planning to engage with schools or colleges. It describes the practicalities of setting up a programme, giving key advice at each stage to ensure that your programme supports inspirational STEM teaching. This guide is intended for businesses that want to begin a schools or colleges programme and have little experience in these activities, but also for those aiming to expand or improve schemes that are already in place.

The benefits of education engagement for your business can be significant, from staff development to community relations and brand positioning.[6] The collaborative approach that we advocate also benefits teachers. Since most young people attribute their decision to pursue STEM subjects to an inspirational teacher,[3,4] businesses should consider teachers a key audience when planning education programmes.

The case studies presented throughout this guide highlight the key features of a successful, mutually beneficial, education scheme. A successful scheme should be:

- collaboratively planned;
- teacher-focused;
- curriculum relevant;
- sustained through long-term, committed partnerships; and
- considerate of local needs.

The advice in this guide has been informed by a series of roundtable discussions held throughout 2015 with businesses and teachers. These explored what teachers would find most useful to support their STEM teaching, and what support business were motivated to provide. The themes identified from these discussions were then explored within the literature; here we present the findings as practical suggestions for businesses looking to work with schools and colleges.

Although this guide focuses on business support for STEM, this collaborative approach is applicable to other subject areas. The recent publication by Project ENTHUSE, *Why your business should go back to school*, also contains useful guidance on STEM focused business-school partnerships.[7]

Summary

We have identified **five steps** which can be followed to promote a high quality, mutually beneficial education programme. These are:

1. WHY ENGAGE?

Clearly set out your aims and motivations.

- Decide your motivations for supporting schools and colleges.
- Define clear aims.
- Establish how the scheme will benefit your organisation.
- Ensure that, wherever possible, your aims are measurable.

2. COMMUNICATE AND COLLABORATE

Communicate with teachers from your target schools from day one and work together to plan a mutually beneficial scheme.

- A successful business-education scheme needs buy-in from teachers, so it is important to align your programme with their needs.
- Take account of the operational differences between businesses and schools.
- Try to make your programme curriculum-relevant.

3. WHAT TO DO?

Decide which type of activity to pursue.

- Be realistic about the amount of personnel time and financial resource you can commit.
- Consider focusing on teacher professional development, which can have a bigger impact than working directly with young people.
- Where possible, aim to ensure the long-term sustainability of your scheme.

4. WHO TO WORK WITH?

Consider working through an external delivery partner or supporting an existing scheme.

- External brokerage organisations can provide support in building relationships with schools and colleges.
- There are a large number of experienced national organisations with which you can collaborate and whose aims and objectives may be well aligned to your own.
- Local providers can be particularly attuned to the needs of local pupils and economies.

5. EVALUATE AND IMPROVE

Collect relevant data and use this to systematically improve the programme.

- All schemes should be evaluated – results can be motivating for both partners and can help ensure the sustainability and effectiveness of the scheme.
- Evaluation can be conducted very simply and a number of organisations have produced guidelines to help you.
- Evaluate your scheme against the original aims and use this information for continual feedback and improvement.

1. Why engage?

Clearly set out your aims and motivations

- Decide your motivations for supporting schools and colleges.
- Define clear aims.
- Establish how the scheme will benefit your organisation.
- Ensure that, wherever possible, your aims are measurable.

There are a number of reasons for supporting STEM education. You may have been asked to do so by a local school or college, you might be looking for new ways to develop your staff or it might be part of your Corporate Social Responsibility work. Whatever the reason is, try to develop a clear set of aims, justifying why your company's time and resources should be invested in education. It is helpful to set out the business case.

This section outlines some common motivations for employers who want to work with schools and colleges. You will find links to resources and research that may be useful in developing your aims and objectives and articulating the benefits of employer-education programmes to both businesses and to schools and colleges.

BOX 1 Developing measurable objectives

- Lay out your aims and motivations clearly and precisely. You might want to use the SMART framework[8] in which each of your objectives should be: Specific, Measurable, Attainable, Relevant and Time-bound.
- Think about which qualitative and quantitative indicators may be used to demonstrate the success of your scheme. Indicators need not be complicated – for example, you might consider using the number of pupils who participated or employee personal development targets met.
- Develop tools to collect this information. Again, these can be as simple as a short questionnaire, or could involve a follow-up interview or task.

What are you trying to achieve?

Defining clear aims and laying out how the scheme will benefit your organisation is an important first step. The examples presented in this chapter might help you to clarify your own objectives.

The success of your programme will be judged against your initial aims, so spend some time to ensure that these are a) relevant and b) measurable. You might want to use the New Philanthropy Capital 'Theory of Change' approach[9], which guides you through the process of establishing clear goals and outlines a strategic approach to achieving and evaluating them. Of course it is not always possible to easily assess whether your goals have been met, but developing some initial indicators will be valuable (**Box 1** ***Developing measurable objectives***). Chapter 5, *Evaluating your scheme*, will guide you through the evaluation process.

Defining clear aims and laying out how the scheme will benefit your organisation is an important first step.

What are the benefits to your company?

Employee personal development

The employee development benefits of volunteering in schools and colleges mean that encouraging volunteering can make good financial sense. Working with schools and colleges is a cost-effective way of developing many core competencies, as the City of London report, *Volunteering – The Business Case*[6] makes clear. As well as increasing job satisfaction, staff morale, retention and motivation, working with schools and colleges can help staff develop business-relevant skills, including communication skills, adaptability, influencing and negotiating.

Securing a skilled future workforce

In the 2015 CBI/Pearson Education and Skills Survey, 26% of respondents reported current difficulties in recruiting STEM graduates and 41% said they expect to have trouble in the next three years.[2] Many businesses see working with schools and colleges as a way of ensuring young people develop the skills their company will need in the future – a way of securing the future talent pipeline.

Brand positioning, community relations and Corporate Social Responsibility

Supporting STEM education can contribute positively to how a company is viewed within the local community and more widely. If local people have a positive experience of engaging with a company while at school or college, this is likely to enhance that company's reputation.[6]

Challenging stereotypes

Research shows that young people often perceive scientists as male, white and middle class. This perception puts many young people off pursuing careers in STEM related fields.[10] Many STEM-related companies are committed to challenging the gender, ethnic and socioeconomic stereotypes that exist around STEM subjects and STEM careers. By presenting positive, diverse role models in schools and colleges, companies can help address the underrepresentation of some groups. The British Chambers of Commerce and Government Equalities Office have produced a 'model for school and business partnership' which aims to promote female participation in STEM subjects and careers.[11]

Teachers welcome involvement from a broad range of companies to give their pupils a good understanding of the variety of opportunities available to them, both locally and nationally.

What are the benefits to the school or college?

Up-to-date careers information for young people

Many young people are not aware of the wide range of career options that studying STEM subjects can open up.[10] Companies can support greater careers knowledge in many ways. They can assist teachers to deliver high-quality, business-relevant and up-to-date careers information, by giving teachers opportunities to experience a range of business environments and understand the opportunities available and skills required. Providing development opportunities for teachers is a particularly sustainable, long-term way to offer support. Teachers are extremely supportive of businesses engaging directly with school or college careers education provision, as many feel they do not have the broad workplace expertise to deliver high-quality careers advice themselves. Teachers welcome involvement from a broad range of companies to give their pupils a good understanding of the variety of opportunities available to them, both locally and nationally.

Young people are inspired by STEM subjects

Both businesses and teachers want young people to be inspired by STEM subjects. For businesses, this helps them secure future STEM qualified employees. For schools and colleges, a greater confidence and understanding of STEM subjects among students is beneficial to teaching.

Young people understand the relevance of STEM to the real world

We know that 40% of pupils have difficulty relating the science they learn in the classroom to everyday life.[12] STEM-related businesses can help teachers to build contextual, work-related examples into their curriculum teaching. Teachers should feel supported and able to approach business contacts for contextual examples when required.

2. Communicate and collaborate

Communicate with teachers from your target schools from day one and work together to plan a mutually beneficial scheme

- A successful business-education scheme needs buy-in from teachers, so it is important to align your programme with their needs.
- Take account of the operational differences between businesses and schools.
- Try to make your programme curriculum-relevant.

Understand how schools work

Schools and colleges may well have changed since you or your family were in full time education. It is important to understand how they operate (see **Box 2** as a starting point). You could also visit a local school, or shadow a teacher for a day if the school is able to accommodate you.

Identify your allies

Teachers should be your number one audience and ally. Your first point of contact with a school or college may be through a teacher, as a parent, or through a recognised brokering scheme. An enthusiastic head of science or maths, or an engaged teacher, is a good starting point. You can use a brokerage service (see **Box 6**) to help you find one. You might want to consider supporting all STEM teachers within a local school, or a cluster of schools. For example, schools can be linked through academy chains.

Establish shared goals

Ensure that your objectives tally with those of teachers in target schools early on. Aim from the outset to establish a collaborative and mutually beneficial project. School leadership support will ultimately be important, so make sure to keep head teachers, senior management teams and governors informed as your plans develop. However, be aware that a lot of information passes across school leaders' desks, so what you are offering needs to be clear and relevant to their priorities.

Be curriculum aware

Any scheme that enriches STEM subject teaching within the curriculum will be valuable to teachers, and more easily justifiable. Schools in England are measured against benchmarks set by government, including the quality and curriculum relevance of their teaching, through Ofsted inspections. Teachers want to give their pupils a high quality and well-rounded STEM education and welcome help from employers to extend and enrich curriculum topics.

Nominate a reliable point of contact to foster long-term relationships

Building a relationship with a school or college takes time, so it can make sense to work with the same establishments for several years. Schools and colleges want a single point of contact within a company that they can communicate with year on year. Depending on your scheme this may or may not be possible. Although small and medium sized companies will not have the resources to have a single person dedicated to working with local schools and colleges, this does not need to be a barrier. One person could still act as the point of contact alongside their other duties. See **Box 2** for key considerations, including yearly planning cycles within schools.

Raise awareness

There are existing STEM related brokerage services and web resources designed to support business-education partnerships. These networks can help you to promote your own scheme. See **Box 3** to find out how to raise awareness of your plans within the teaching community.

CASE STUDY

The James Dyson Foundation

As well as being at the forefront of engineering, both in the UK and worldwide, Dyson has a forward-thinking approach to education engagement.

The James Dyson Foundation is a registered charity, funded by Dyson profits. Its mission is to inspire the next generation of engineers, primarily through education engagement. Activities include free resources for primary and secondary schools, prototyping workshops, university scholarships and an annual student design competition: the James Dyson Award.

In 2012, the James Dyson Foundation pioneered an education programme with five secondary schools in the Bath area, close to Dyson's headquarters. The Bath Schools project was built on the hypothesis that a design and technology (D&T) curriculum based on iterative design and problem-led learning would be more relevant and engaging to students. As a result, students would enjoy design and technology more, their perception of engineering would improve – and more students would opt to study D&T at GCSE and A-level.

While the Dyson design process cannot be replicated exactly in the classroom (James Dyson iterated 5127 prototypes before he finally perfected the DC01 vacuum cleaner!), the James Dyson Foundation can instil the same project-based, problem-led learning approach within schools. The Foundation works with schools to develop new D&T curriculum content based on 10 week projects involving an iterative process of designing, testing, evaluating and redesigning. The solutions are not predetermined: instead, students are given the freedom to identify and create their own ideas.

The James Dyson Foundation also works closely with five 'champion' D&T teachers

©James Dyson Foundation.

across its target schools. As well as working together to develop schemes of work, teachers visit the Dyson business on open days and receive mentoring and equipment training to support their professional development.

The James Dyson Foundation approaches its education engagement with the Bath schools as a research project, and has implemented a programme of evaluation from day one. Long-term monitoring allows the Foundation to evaluate the impact of the scheme upon pupil outcomes effectively. Positive early results show that in the first two years of the programme there has been a 41% increase in D&T GCSE uptake among boys at target schools, and a 150% increase among girls.

For more information, visit jamesdysonfoundation.co.uk

Key features

- ☑ Collaboratively planned
- ☑ Teacher-focused
- ☑ Curriculum relevant
- ☑ Sustained through long-term, committed partnerships
- ☑ Considerate of local needs

BOX 2 Understanding the differences in the way that schools and colleges and businesses operate

Schools and colleges and businesses are subject to different pressures and operate within different structures, but this need not be a barrier to a successful and valuable relationship. There are some key things to consider that can help to smooth the pathway to creating sustainable relationships:

1. Timing

- There are certain times of year when teachers find it easier and more fruitful to work with you.
  i. Good times to engage include: early July, to plan activities for the coming Autumn term; or mid-December, to plan post-exam activities for the summer.
  ii. Bad times to engage include: May and June, during the exam season, when teachers are likely to be extremely busy.
- When contacting teachers, email is preferable. Reaching teachers by telephone will be easier after 4 pm.

2. Planning cycles

- The pressures of the school/college timetable and curriculum mean that lesson and activity planning happen well in advance.
  i. Be aware that teachers may not be able to accommodate your offer of support at short notice, be sure to ask upfront how much notice they will require.
- Try to plan your activities or support to occur during STEM lesson times or outside the normal school/college day hours.

3. Curriculum

- The curriculum sets out what teachers need to cover within a particular time-frame and is the basis upon which pupils and schools/colleges are assessed. You can find the National Curriculum content online.[13]
- Teachers welcome businesses' help in extending and enriching curriculum content – liaise with teachers on how best to link your programme to the themes, topics and outcomes prescribed.

BOX 3 Raising awareness of your plans within the teaching community

To ensure the teaching community, either in your area or nationwide, is aware of your scheme:

- Contact your local schools and colleges. A list of all schools in England is available on the EduBase portal.[14]
- Promote the scheme through teacher unions and existing networks of teachers. Consider attending a teacher professional development conference run by organisations such as the Association for Science Education,[15] Association of Teachers of Mathematics,[16] or the Mathematical Association.[17]
- Get your programme listed on the STEM Learning website[18] e-library of teacher resources and in the Royal Institution's National STEM Directories.[19]
- Use local business networks. Your local Education Business Partnership[20] (EBP) or Chambers of Commerce may be able to help raise awareness within schools and colleges.

Image:
Partnership Grants conference at the Royal Society.

3. What to do?

Decide which type of activity to pursue

- Be realistic about the amount of personnel time and financial resource you can commit.
- Consider focusing on teacher professional development, which can have a bigger impact than working directly with young people.
- Where possible, aim to ensure the long-term sustainability of your scheme.

Considerations

Whatever you choose to do, obtain cross company buy-in

Cross company buy-in should help to ensure that a scheme is viable and sustainable in the longer term – as well as getting it off the ground in the first place (**Box 4** ***Making the case***).

What resources do you have available?

There are many different ways you can support STEM education. Before approaching a school, consider the different options available and determine what you are willing and able to provide. When properly planned, all schemes, even small ones, can contribute to better outcomes for groups of teachers and young people.

Which phase of education?

You will also need to decide whether you want to work with primary, secondary or further education, or with multiple phases of education. See **Box 5** to help inform your decision.

While many types of interactions with businesses are valuable, teachers emphasise the importance of sustained interaction.

BOX 4 Making the case: how to achieve whole company buy-in

Whole company buy-in is important when establishing a new education engagement programme, or extending or changing an existing scheme.

- Where relevant, first establish who is responsible for education engagement.
- Think about how education engagement aligns with the company strategy.
- Clearly present the potential benefits to all parties – your organisation, the schools/colleges, the teachers and the young people.
- Whatever your level, ensure that middle and senior level management are on board.
- Identify enthusiastic and committed employees who will be vital for successful engagement.
- Consider whether it is possible to embed your education scheme as a personal development performance indicator within your company. Management are more likely to be supportive where this is the case and it may improve the sustainability of the scheme.

BOX 5 Choosing which type(s) of educational institution to work with

Business interaction can be very valuable at all levels of education. Whether you choose to partner with schools or colleges, your decision should be based on your overall aims and informed judgement. In making this decision, consider the following:

Primary: age 4 – 11

- Primary school is where children's aspirations and attitudes towards STEM subjects are first developed. Businesses working with children earlier in their education can help to inspire and enthuse young people about science and mathematics, developing a positive attitude towards these subjects.[20]
- Employers are currently less likely to work with primary schools: the CBI/Pearson 2015 Education and Skills Survey[2] showed that 24% of the employers surveyed engage with primary schools, highlighting the potential for more businesses involvement at this stage.
- At primary level, there are few science and mathematics specialist teachers. In 2010, just 3% of primary teachers had a science degree and 5% of primary teachers had a mathematics degree.[38] Businesses can play an important role in supporting subject-specific professional development at the primary level, raising the confidence of primary teachers in STEM subjects.
- Knowledge about careers and the potential opportunities and pathways available to young people is important while they are building their identities. Research from King's College London shows that if 10 year olds cannot visualise themselves as a future scientist or an engineer, then they are unlikely to be able to do so by the time they're 14.[9] This highlights the importance of positive STEM business interactions at primary level.
- Similarly, perceptions at primary are important for gender and ethnic diversity in STEM subjects and careers, so positive role models are important at this stage of development.

Secondary: age 11 – 19

- Most businesses tend to target their education schemes at secondary level, with 55% of businesses having connections with secondary schools.[2]
- By secondary level, many young people will already have ideas about the types of careers they are interested in pursuing. Providing work experience placements and a number of interactions with different types of businesses is beneficial, as this helps young people to firm up their ideas.
- Subject specialist teaching is an important feature of the secondary school curriculum. This makes STEM-specific schemes particularly relevant to secondary education.

Sixth form and further education colleges: age 14 – 19

- Business involvement with the Further Education sector is well established, especially in supporting the teaching of vocational training courses, which are often partly taught by industry professionals and tend to include a work experience element.
- However, business interactions with academic science and mathematics subjects are less common. Teachers at our roundtables noted that though A-level pupils have tight timetable commitments, they would welcome businesses before or after school.
- There are a large number of pupils studying STEM-related qualifications in colleges. This makes colleges an attractive partner for businesses. In particular, businesses might want to work with teachers in colleges to highlight the different routes and pathways to STEM careers including apprentice and technician, as well as graduate, routes.
- For those businesses with apprentices already attending a college, supporting different teachers or groups of pupils in that institution might be a simple way to begin a programme.

A teacher focused approach

The impact of teachers on the aspirations of young people should not be underestimated. The factor most young people cited when asked why they chose to pursue STEM subjects is an inspirational teacher,[3,4] so however you choose to engage, the value of supporting teachers should be at the heart of your considerations. By working with a teacher you can indirectly inspire and benefit a much larger number of pupils.
One way to support teachers is to directly provide assistance for professional development courses. Project ENTHUSE is a collaboration of organisations, including businesses, that supports high-quality STEM teaching through the provision of proven, subject-specific professional development to teachers throughout their careers. It has worked with teachers to understand what they most value in terms of business support – their findings are described in *Why your business should go back to school: How you can inspire the next STEM generation*[7].
Other national teacher organisations, such as the Association for Science Education, the National Centre for Excellence in the Teaching of Mathematics (NCETM), and learned societies (including the Royal Society of Chemistry, Institute of Physics and Royal Society of Biology) also provide high quality, effective teacher CPD (continuing professional development).

Work collaboratively where required

Teachers and pupils benefit from having a wide range of business interactions from small and large companies across a range of sectors. This gives them a greater understanding of the breadth of STEM related careers. Education and Employers research found that the 7% of young adults who recalled four or more business interactions while at school were five times less likely to be a NEET (Not in Education, Employment or Training) and earned, on average, 16% more.[21] Find out about other companies' activities in a school and be willing to work collaboratively if required.

Sustained or one-off support

While many types of interactions with businesses are valuable, teachers emphasise the importance of sustained interaction. By sustained interaction, we mean interaction at least once a year, so that as a minimum, the teaching for each year group benefits from the business partnership.

Regular and predictable engagement is key if a scheme is to support excellent STEM teaching, and contribute to ongoing improvement.

However both short and long-term interventions can have benefits for STEM teaching. If a long-term programme is not feasible, you should work with the school and teachers to assess how a short term or one off programme can add the most value. Your scheme could be part of a wider school STEM support strategy. You may not be able to commit to sustained support when starting out, but you should not be put off trialling a scheme and seeing how it evolves.

Try to build relationships with the senior leadership within a school or college and with more than one teacher. This will help ensure your partnership with the school continues even if a teacher leaves. Supporting several teachers will also help you indirectly benefit an even larger number of pupils.

Possible activities

Business led continuing professional development (CPD) courses

Subject-specific CPD courses can improve the confidence of teachers, especially since many science teachers are required to teach outside their particular specialism.[5] Subject-specific CPD, alongside contextual examples from businesses, can help build confidence and promote excellence in all disciplines. In a survey of 260 primary school teachers conducted for the CBI report *Tomorrow's World*, subject-specific CPD was ranked as the best way to help build teachers' confidence in teaching science, with 62% of respondents highlighting this.[22] The Science Learning Network, which runs the National STEM Learning Centre in York, specialises in business support for teacher CPD through Project ENTHUSE.[23] The National Centre for Excellence in Teaching of Mathematics (NCETM) runs similar courses for maths teachers and supports them through its *Maths Hubs* scheme.[24]

Teacher placement schemes in industry

Work placements give teachers invaluable insight into your company and sector, and the skills your industry requires. They also help teachers to relate curriculum subjects to the world of work and provide 'real world' examples to use in the classroom. Placements may also lead to teachers developing more long-term relationships with a

company, or specific employees, who they can contact in the future for additional examples and subject-specific support. The National STEM Learning Centre and Network's STEM Insight programme is a good example of this type of scheme.[25]

Mentoring and subject-specific support
Your company could also consider supporting teachers by providing access to company employees to act as subject-specific mentors. This might be a valuable way of offering support if your company has employees with very specific STEM knowledge, such as computer science, lab based science, maths or engineering.

Helping teachers provide careers information
Employers are closer to the labour market, understand changing skills demands and know what they are looking for in potential recruits. Hearing the skills demands of modern businesses directly from employers can be valuable for both teachers and young people. Businesses can help by either supporting teachers to provide high-quality careers advice, or providing up-to-date, relevant information on careers to students directly. This can be through talks, skills workshops (such as CV writing), site visits or one to one careers advice. The new Careers and Enterprise Company[26] will help to facilitate these kind of relationships between schools and businesses.

Business employees as school or college governors
The City of London found that, while taking up more employee time compared to other options, acting as a school governor was the most beneficial volunteering activity for staff skills development.[6] The CBI report *Leading the Way*[27] sets out in more detail the professional development benefits of being a governor. Engaged and informed governors can contribute substantially to a school or college and its teachers and this is an effective way to contribute to the quality of local education. The Wellcome Trust and the National Governors' Association have recently published a framework for governance, a useful guide for governors.[28] The Wellcome Trust has also produced *Questions for Governors*.[29] Both these resources are designed to help governors to enhance STEM subject teaching and achievement within their school or college.

Supporting and/or assisting to run after school STEM clubs
After-school science, maths and computing clubs can be a very effective and rewarding way to inspire pupils about STEM subjects. Supporting teachers to plan and run these can enhance teacher professional development, as well as inspire pupils. These should be open to all pupils and not just targeted to the most able or interested. Teachers have said that support from businesses for content or staff resource would be very valuable. There is a helpful step-by-step guide available on how to successfully run a STEM club.[30] The Royal Society runs Partnership Grants,[31] a scheme offering funding of up to £3000 to UK schools or colleges to buy equipment to run a STEM investigation project in partnership with a STEM professional (research or industry).

Providing work experience placements for pupils
Work experience or work-related learning at around age 14 or 15, followed by extended work experience between ages 16 and 18, has been shown to cement pupils' ideas around their career aspirations and identity, as well as developing relevant employability skills.[32,33] The age at which work experience takes place should be considered carefully and activities for different ages planned. Teachers are extremely keen for businesses to provide more work experience placements for pupils. Business organisations, including the CBI[34] and the British Chambers of Commerce,[35] have called on business leaders to make work experience a priority. Tomorrow's Engineers has developed materials that can help you to easily set up and run work experience within your company.[36] Many businesses cite concerns about health and safety as a barrier to providing work experience; guidance from the Health and Safety Executive will help you to identify and manage any risks.[37]

CASE STUDY

The Federation of Small Businesses and Mark Rutherford School: Business Breakfast Meetings

Mark Rutherford School in Bedford invites local businesses of all sizes into its school for breakfast around six times a year. These meetings have successfully established sustained relationships between the school and a range of local employers. Teachers, students and businesses can chat informally over a bacon roll and cup of tea, before a talk, workshop or discussion.

By raising awareness of the local labour market, Mark Rutherford School aims to improve the quality of its careers advice and work experience. These events allow teachers and students to have good knowledge of the employment opportunities and growing sectors within Bedford. Students gain up-to date, informed and tailored careers advice from teachers and careers advisers as well as direct contact with local businesses.

This is a programme that is simple, collaborative and tailored to the needs of the school. Business representatives include those from a wide range of companies, from sole traders and small firms, to larger national firms. Teachers have been keen to engage with local businesses, and now use their knowledge of industry examples to supplement their teaching. Each breakfast has a different topic, which attracts different businesses, teachers and students to each session. Recent examples include employability skills, apprenticeships and careers in sport. Topics can be proposed by anyone and the students are surveyed to understand their interests and needs.

The simplicity and inclusivity of this partnership is its strength. Anyone and any size business can be involved. The flexibility of the setup allows businesses to engage with the school in a way which best suits the topic.

© Mark Rutherford School.

Local networks were key to initially establishing these relationships. School staff have links with the local Federation of Small Businesses, Rotary Clubs and Chambers of Commerce. These organisations are excellent ways for interested smaller businesses to meet contacts from local schools.

For more information see the school website markrutherford.beds.sch.uk

Key features

- ☑ Collaboratively planned
- ☑ Teacher-focused
- ☑ Sustained through long-term, committed partnerships
- ☑ Considerate of local needs

CASE STUDY

IBM support for teachers

IBM is committed to supporting STEM education and to inspiring the next generation of STEM professionals. One of the ways it is achieving this is through support for STEM Insight, formerly the Teacher Industrial Partners' Scheme (TIPS).

While IBM has a long-standing work experience programme to motivate and inspire young people about careers in the tech sector, it also sees a clear need to do the same for teachers, many of whom may not have first-hand experience of industry.

STEM Insight brings teachers into businesses on a two-week long placement to help them develop a better understanding of STEM industries, followed up by a course of professional development delivered by the National STEM Learning Centre and Network. Participants then bring this knowledge back into the classroom to support their teaching and their ability to inform and inspire young people about potential STEM career pathways.

Supporting teachers in this way gives them the opportunity to gain an up to date, informed picture of what a STEM based business does, and what careers in these areas are available. By linking the 'teacher work experiences' to areas of the business with growth potential and future job opportunities such as analytics and cyber security, IBM is helping to raise teachers' awareness of emerging labour market needs and skills that will be in high demand. A recent teacher on placement with IBM commented: "Participating in TIPS has been an amazing opportunity to experience the working environment within an international high tech organisation. Working with IBM has enabled me to identify the skills needed by students who would like to pursue a career in a similar type of company. TIPS has empowered me and given me the confidence to encourage, prepare and support students wanting to apply for entry into a modern STEM industry."

IBM's rationale is simple: engaging directly with teachers means that the number of pupils who can be reached can be very efficiently amplified in a cost-effective way, increasing the positive impact of business support for STEM. It also helps engage employees across the business, who in turn often become more involved in other STEM education activities.

For more information, visit stem.org.uk/stem-insight

Key features

- ☑ Teacher-focused
- ☑ Sustained through long-term, committed partnerships

CASE STUDY

Deloitte's Technology, Media and Telecoms Challenge

With a focus on increasing awareness of and access to careers in STEM-related fields, Deloitte has developed a programme for 16 – 18 year old students to give them an insight into technology, media and telecommunications (TMT) trends, to explore potential career pathways in these sectors and to develop their interpersonal skills.

The 'Deloitte Access' programme, in partnership with Teach First, aims to improve social mobility and opportunities for young people from low-income communities. Students from some of the country's most disadvantaged localities develop and pitch business ideas related to TMT. Previous challenges have included developing an idea for a YouTube channel with a sustainable revenue source, a design for a new smartphone, and a business-to-business use for drones.

Over a three month period, with regular coaching from Deloitte's TMT partners and practitioners, students develop their ideas and presentations before presenting them to a panel of sector experts via video conference, to compete for a place in the final. The teams of students then have one more month to finesse their idea (with the help of their coaches) before coming to London to present to a panel of industry leaders and a large audience.

Throughout the challenge, students have the opportunity to develop a better understanding of these sectors and to meet a range of people working in the industry – generating ambition and inspiration for them to pursue these pathways.

Deloitte is acutely aware of the STEM skills gaps in the economy and shortage of UK STEM graduates – and this programme is one of the ways it is working with schools to help address this issue.

For more information, visit www2.deloitte.com/uk/en/pages/about-deloitte-uk/articles/deloitte-access.html

Key features

- ☑ Sustained through long-term, committed partnerships
- ☑ Considerate of local needs

CASE STUDY

Arup and City and Islington College

Arup are an independent firm of designers, planners, engineers, consultants and technical specialists offering a broad range of professional services. Arup supports engineering education at City and Islington College by offering students from the BTEC engineering course, who are specifically interested in civil engineering, the chance to work with Arup on a new infrastructure project designing a refurbished shopping centre development. Their aim is to inspire students to consider a future career in civil engineering. They particularly target students from disadvantaged and diverse backgrounds.

Arup engineers support the students on a weekly basis throughout the project, while they work in teams to design and build model prototypes of their proposed developments. Graduate Arup engineers have a mentoring role, which provides a professional development opportunity for employees, as well as giving the students valuable work experience in the civil engineering sector.

Arup engineers give specialist talks to the students, helping them to balance different design requirements and also hold a 2-day program at their offices, to teach them advanced drawing software called “REVIT” which is suited to complex building structures. University College London helps to host the project events and also runs a 2-day workshop where students learn building design under extreme weather conditions. Although the focus is on designing and drawing a refurbished shopping centre, however the students also construct a scale model of the shopping centre, floor by floor.

City and Islington College find this kind of business interaction invaluable, as both the teachers and students gain an insight into real-life civil engineering projects. This supplements curriculum teaching and allows the students to relate what they are learning in the classroom to real-life examples. It is hands on, and students learn new engineering and work-relevant project skills.

Once students have designed the prototype shopping centre development, they present their project to Arup engineers and students from other institutions. Teachers noted that this competition element brings the best out of the students as it develops their communication as well as project work skills.

Key features

- ☑ Curriculum relevant
- ☑ Considerate of local needs

Image:
Partnership Grants conference at the Royal Society.

4. Who to work with?

Consider working through an external delivery partner or supporting an existing scheme

- External brokerage organisations can provide support in building relationships with schools and colleges.
- There are a large number of experienced national organisations with which you can collaborate and whose aims and objectives may be well aligned to your own.
- Local providers can be particularly attuned to the needs of local pupils and economies.

Why work with a brokerage organisation?

External brokerage organisations are experienced in liaising with both businesses and schools and colleges and can make the process of building these relationships much easier. They can also help to match the needs and interests of both organisations when identifying suitable partnerships.

These brokers are experts in business-education relationships. As well as having established contact with schools and colleges, they can make the entire process much smoother through familiarity with the steps required for success.

The main benefits of working with a brokerage partner are:

- Help and guidance with the initial set-up of the partnership and getting started.
- Administrative support, including contacting and communicating with schools.
- Support in conducting impact evaluation (see Chapter 5).
- Training for business employees, for example advice on appropriate language, communication and age-group-specific needs.
- Learning from someone who knows what works and not having to start from scratch.
- Reducing risk. Brokers act to ensure that companies are working with schools in the required manner, for example child protection.
- Assistance with producing resources for schools and colleges, as they have expertise on language and delivery that businesses may lack.
- Existing infrastructure and extensive school and college contacts to boost take-up of the scheme.

Considerations

Brokerage partners tend to follow a particular structure and method, so it is important to assess whether a broker's programme would be aligned to the aims and motivations of your own organisation. Smaller organisations may find these kinds of agencies the best way to work with schools and colleges in their local area over the long-term. Some larger organisations undertake a combination of working through an external delivery partner and setting up and running their own scheme. Whether working directly with schools, or through an external brokerage organisation, face-to-face contact between business personnel and teachers is important.

You don't have to start from scratch

Teachers and businesses are often unaware of existing schemes, and this can lead to a range of overlapping initiatives. Supporting an existing scheme, or collaborating with other businesses which have similar objectives, will help to reduce duplication and target resources more efficiently in key areas. Having a smaller number of competing initiatives would make it simpler for teachers and schools to navigate the space and select a suitable partner.

Who are the national delivery partners and brokering organisations?

See **Box 6** for some examples of the existing large national external delivery partners and organisations. This list is not exhaustive, so check online for local initiatives. Some national schemes do have local branches, but do bear in mind smaller, area-specific brokerage organisations may be more appropriate. This can be particularly relevant for small and medium sized businesses that rely on a strong, local labour market.

CASE STUDY

The Furness Education and Skills Partnership

The Furness Education and Skills Partnership (FESP) was established in 2011, with support from the Royal Academy of Engineering through its Barrow Engineering Project. FESP works in Barrow-in-Furness to promote collaboration between businesses and schools to benefit young people. Barrow-in-Furness is a region with a long-standing engineering heritage, and many engineering firms are still based there today. However, post-16 uptake of STEM subjects remains poor, and many firms struggle to attract young people from the local area: 35% of 18 – 30 year olds left Barrow-in-Furness to look for employment elsewhere, double the rate for the rest of the country.

Local employers are keen to promote their businesses to young people and FESP connects teachers with these businesses to bring the world of work into the classroom. Businesses range from BAE Systems Submarine Solutions, with around 5000 local employees, to very small firms, including sole traders. FESP looks for commitment and drive from both businesses and teachers to ensure the partnership is sustainable over the long term.

The nature of business engagement with schools through FESP is varied, but always involves collaboration between businesses and teachers. Schools engage with a wide range of businesses, giving young people a good sense of the local career opportunities available. This approach considers the local needs of Barrow-in-Furness, with all engagement tailored towards meeting the FESP's objectives:

- A balanced and collaborative education and business partnership, between local schools and local businesses.
- To promote awareness of potential careers pathways and raising young people's aspirations.

©BAE Systems.

- To provide real world examples to support curriculum teaching, across primary and secondary schools, and sixth form and further education colleges.
- To develop workplace-transferable skills in young people.

FESP is also committed to engaging teachers and parents, recognising the influence these individuals have on young people's aspirations and choices. The programme includes arranging teacher visits to local industry, and careers fairs for pupils and parents. These help ensure young people make informed and sensible career-relevant decisions.

Key features

☑ Collaboratively planned
☑ Curriculum relevant
☑ Sustained through long-term, committed partnerships
☑ Considerate of local needs

BOX 6 Examples of existing business-school and college brokerage partners

Programme	Education level targeted	Focus	Programme details
STEM Insight – Formerly the Teacher Industrial Partner's Scheme	All levels	Teacher professional development	Teachers of STEM subjects complete a placement with a local STEM-related employer, followed by a CPD package delivered by National STEM Learning Centre and Network.[25]
The National STEM Learning Centre and Project ENTHUSE	All levels	Teacher professional development	Business support for teacher professional development, particularly by supporting the ENTHUSE awards and financing STEM CPD for teachers at the National STEM Learning Centre.[23]
STEPs at Work – Royal Academy of Engineering and University of Wolverhampton	All levels	Teacher professional development	Business support for teacher professional development through teacher visit days to a local STEM-related industry. STEP's at Work has regional coordinators across the country.[39]
Teach First	Secondary schools	Mentoring	Teach First's 'Futures' mentoring programme is designed to help disadvantaged pupils access higher education through bespoke local area partnerships with businesses.[40]
Careers and Enterprise Company – Enterprise Advisers	Secondary schools	Careers	If you would like to volunteer permanently with local schools, the new Enterprise Adviser Network aims to establish lasting connections between volunteers from business and school senior leadership, working together with other businesses in the area to develop an effective employer engagement programme.[41]
Founders 4 Schools	Secondary schools	Careers	Targeted towards business leaders, from businesses of all sizes, particularly start-ups. The scheme involves speaking to pupils about your job, followed by a question and answer session.[42]
Inspiring the Future	All levels	Careers	Volunteers sign up to commit one hour per year to speak about their job through delivering a careers talk in schools. This relies upon several different businesses engaging with individual schools to provide a range of career examples.[43]
Speakers for Schools	State secondary schools and colleges	Careers	High profile speakers for state secondary schools. Particularly targeted at middle-to-higher management. The business-person delivers a talk about their insights and experiences.[44]
STEM Ambassadors	All levels	Careers and curriculum enhancement	STEM Ambassadors are business-based volunteers who support the teaching of STEM subjects in schools. This support includes careers talks or fairs, practical workshops, supporting classroom teaching, after-school STEM clubs, mock interviews and sessions on employability skills.[45]
Ahead Partnership – make the grade	Secondary schools. Currently runs local schemes in Birmingham, London, Yorkshire and the Humber.	Curriculum enhancement	Partnerships between educators and employers to design engaging and inspirational work-related practical activities for pupils. Targeted specifically towards local needs. Ahead Partnership brings together schools and businesses and co-ordinates collaboration and the joint production of resources.[46]
Business in the Community – Business Class	Primary and secondary schools	Curriculum enhancement	Business in the Community focuses on mutually beneficial, long-term, sustainable, partnerships between businesses and schools, delivered through its regional business class clusters. Businesses wishing to work with schools are supported throughout by a dedicated business class education manager.[47]
Teach Too – Education and Teaching Foundation	Colleges	Curriculum enhancement	Business personnel spend time teaching their occupation within colleges or contribute to curriculum development. Teach Too also encourages vocational teachers to update their industry experience through work placements.[48]
Young Enterprise	Primary through to university	Curriculum enhancement	Young enterprise run workshops on workplace skills that complement the National Curriculum. Businesses can get involved in a number of ways, from providing a donation, assisting with workshops or mentoring students[49]
Tomorrow's Engineers	Secondary schools	Various	This is a co-ordinated schools outreach and careers information programme led by the engineering community. It aims to allow everyone between 11 and 14 to have at least one engineering experience with an employer. Any engineering company can join and there are regional programme managers across the UK. Tomorrow's Engineers also provides a 'toolkit' of resources and activities to support the scheme, including evaluation.[50]

Please note, these are sorted purely by programme focus and this table does not constitute or imply endorsement.

Image:
La Sainte Union and the Centre for Ecology and Hydrology, Partnership Grants project *Save our trees – what is ailing our horse chestnut trees?*

5. Evaluate and improve

Collect relevant data and use this to systematically improve the programme

- All schemes should be evaluated – results can be motivating for both partners and can help ensure the sustainability and effectiveness of the scheme.
- Evaluation can be conducted very simply and a number of organisations have produced guidelines to help you.
- Evaluate your scheme against the original aims and use this information for continual feedback and improvement.

Through evaluation, you will gain insights that will allow you to assess whether your initial objectives have been achieved. If the right information is collected regularly, this can then be used systematically to improve the scheme.

Simple methods for evaluating education engagement have been developed by a number of organisations and these can be easily adapted to suit your scheme.

Keep it simple

Evaluation doesn't need to be complicated – it can often be done very easily and very cheaply. Simple methods for evaluating education engagement have been developed by a number of organisations and these can be easily adapted to suit your scheme (See **Box 7**).

Collect information for reporting

Figures and results can be helpful for ensuring senior management's continued support, and helps support decisions about the continuation or expansion of a programme. Evidence of positive impact is highly motivating for both the business employees and the teachers involved, further supporting the sustainability of the scheme. Evaluation data can also help identify if and where a scheme is not meeting objectives and highlight areas for improvement.

The *Generic Social Outcomes framework*[51], developed by the Arts Council, is a useful resource when considering what type of information to collect and how to record it. It is also helpful to ask yourself which aspects of the scheme you would be willing to change as a result of the evaluation. The process of feedback and improvement will only be effective if you are collecting the information you need.

Assess against your objectives

Measure your impact against the key aims of the scheme as identified at the outset. Evaluation of a partnership programme should consider both the aims of your organisation and those of the partnering teachers and schools or colleges. Remember that not all aims are quantitatively measurable. Qualitative verbal or written feedback can also be useful.

How to evaluate a scheme

What to test:

- Adopting a principle of only testing things you can change will help simplify your evaluation.
- Evaluate both benefits to the business, including 'softer' benefits such as staff development, and benefits to the teachers and pupils.
- Make evaluation proportional to the scale of the programme. A one off event may not require long term evaluation, but long term monitoring of larger schemes can be valuable. Data is vital if the scheme is to be scaled up in the future.

How to test it:

- Follow an existing framework or protocol (described in **Box 7**), or learn from businesses with established schemes. Discuss with them how they manage evaluation and feedback.
- Ensure any questionnaires are well designed and concise, and that they do not ask any unnecessary or leading questions.
- Include qualitative and quantitative analysis, such as observation, questionnaires, data analysis (for example of examination results) or interviews. Oral or written feedback can be just as valuable for improving the scheme.
- Build evaluation formally into the scheme as a continuous data collection process, eg by asking for feedback after each school or college visit. A yearly cycle of evaluation and improvement can match up well to the school cycle, but your evaluation cycle will also depend on the length of your programme and on how frequently you work with students.

Next steps

- If your company is large enough, nominate a single person to be responsible for evaluating the success of the scheme and build this into their formal responsibilities.
- Actively seek out areas for improvement.
- Keep abreast of changes in STEM education and curriculum content which might affect the relevance of your scheme.

A yearly cycle of evaluation and improvement can match up well to the school cycle, but your evaluation cycle will also depend on the length of your programme and on how frequently you work with students.

BOX 7 Frameworks to support the evaluation of STEM education interventions

- **Research Councils UK, Evaluation: Practical Guidelines**.[52] This guide is for researchers looking to evaluate their public engagement. It contains useful guidance on data collection and prior planning which is applicable to businesses.
- **STEM Learning Centre, Does it work? Better evaluation: better STEM**.[53] This contains a flow chart on how to integrate evaluation into your programme.
- **STEM Learning Centre, Summary of Public Sector Guidance for Evaluation with respect to STEM Initiatives**.[54] This guide to evaluation includes some helpful examples.
- Some brokerages (including Business Class,[45] Ahead Partnership,[44] and Tomorrow's Engineers[55]) provide an evaluation component as part of the programme.

Image:
Fulford School and the University of York, Partnership Grants project *Biotechnology – from gene to product.*

Acknowledgements

Many thanks to the following individuals who participated in our roundtable sessions.

Business personnel
Rob Lamb, IBM UK
Katie Hassell, Airbus Defence and Space
Sarah Jones, Association of the
British Pharmaceutical Industry
Mike Warriner, Google UK
Katy Gandon, L'Oréal UK
Katriona Methven, L'Oréal UK
Paul Broadhead, Rolls-Royce
Craig Walker, Shell
Chris Mairs, UKforCE
Lucia Cuttle, IBM UK
Mark Wakefield, IBM UK
Lydia Beaton, James Dyson Foundation
Robyn Skelton, James Dyson Foundation
Julie Mercer, Deloitte
Justine Weston, Mars Food UK Ltd
Alison Atkins, PepsiCo
Yvonne Baker, STEM Learning Ltd
Vaughan Lewis, STEM Learning Ltd
Lynne Matthews, EDF Energy

Teachers
Heather Aspinwall, Wirral Metropolitan College
Ian Bettison, King Edward VI Camp Hill School for Girls
Aaron Bowater, 157 Group
Matthew Bromley, Derby College
Angela Carpenter, Knockhall, a Lilac Sky Academy
Nick Clarke, City and Islington College
Deborah Colvin, Frederick Bremer School
Jeremy Crocker, Amersham School
David Duncker-Brown, Lady Manners School, Bakewell
Sue Ennis, Wirral Metropolitan College
Matt Foyle, Lady Manners School, Bakewell
Clare Gartland, University Campus Suffolk
Claire Gavaghan, Waltham Forest College
Gerry Gray, Testbourne Community School
Amy Herbert, Gower College
Dawn John, Chiltern Hills Academy
Jane Kelly, Lancasterian Primary School
Jacob Lean, Bitterne Park School
Alison Maynard, Lancasterian Primary School
Mark Mckelvie, Pudsey Grangefield School
Rodger Mitchell, Ripple Primary School
Trissa Pearson, Central Nottingham College
Luke Pendlebury, St Faith's School
Sarah Sephton, William Morris Sixth Form
David Swinscoe, City and Islington College
Sharon Thompson, Sir George Monoux College
Andrew Watts, Prior Pursglove College
Ben Wong, Bury Grammar School for Boys

We also wish to thank the following individuals for their useful contributions.
Sherry Coutu, Founders 4 Schools
Alison Atkins, Federation of Small Businesses
Ian Cording, Federation of Small Businesses
Pete Grady, Department for Business,
Innovation and Skills
Susannah Wiltshire, Department for
Business, Innovation and Skills
Nick Chambers, Education and Employers
Jane Turner, Primary Science Quality Mark
Melanie Washington, STEMNET
Claire Donovan, Royal Academy of Engineering
Kath Unwin, Mark Rutherford School
Brian Wood, Furness Education and Skills Partnership
Lynda Mann, Royal Academy of Engineering
Dr Rhys Morgan, Royal Academy of Engineering
Liz Watts, EdComs
Hannah Kilshaw, EdComs
Dr Pari Collis, former Royal Society
Education Committee member
Ramin Narimani, City and Islington College

The Royal Society gratefully acknowledges the financial support received for our work from the Department for Business, Innovation and Skills, the Gatsby Charitable Foundation and from IBM United Kingdom Trust in support of this document.

References

1 *Your Life Tough Choices*, 2016. Kearney, AT. http://yourlife.org.uk/tough-choices-the-real-reasons-a-level-students-are-steering-clear-of-science-and-maths/

2 CBI/Pearson Education and Skills Survey. 2015. *Inspiring Growth*. http://news.cbi.org.uk/reports/education-and-skills-survey-2015/education-and-skills-survey-2015/

3 McKinsey and Company. 2007 *How the world's best-performing school systems come out on top.* Barber, M and Mourshed, M. http://mckinseyonsociety.com/how-the-worlds-best-performing-schools-come-out-on-top/

4 Wellcome Trust Monitor. 2013. An independent nationwide survey of 460 young people. Six in ten young people stated that it was having a good science teacher which inspired them to study science at university. http://www.wellcome.ac.uk/News/Media-office/Press-releases/2013/WTP052643.htm

5 Royal Society 2014 *Vision for science and mathematics education*. https://royalsociety.org/topics-policy/projects/vision/

6 Corporate Citizenship, on behalf of City of London, 2010. *Volunteering – The Business Case. The benefits of corporate volunteering in education*. http://corporate-citizenship.com/our-insights/volunteering/

7 Ed.Coms on behalf of Project ENTHUSE. 2016 *'Why your business should go back to school: How you can inspire the next STEM generation'.* www.stem.org.uk/next-generation

8 Doran, G. T. 1981. *There's a S.M.A.R.T. Way to Write Management's Goals and Objectives*, Management Review, Vol. 70, Issue 11, pp. 35 – 36.

9 Kail, A and Lumley, T. 2012 *Theory of Change: The beginning of making a difference.* http://www.thinknpc.org/publications/theory-of-change/

10 Kings College London, ASPIRES, 2014. *Young people's science and career aspirations, age 10 – 14.* https://www.kcl.ac.uk/sspp/departments/education/research/aspires/ASPIRES-final-report-December-2013.pdf

11 British Chambers of Commerce and the Government Equalities Office. *A model for school and business partnerships to promote young people's career prospects. Lessons from the School Business Partnerships Project.* 2016. http://www.britishchambers.org.uk/A%20MODEL%20FOR%20SCHOOL%20AND%20BUSINESS%20PARTNERSHIPS.pdf

12 Wellcome Trust and NFER, 2011. *Exploring young people's views on science education.* http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtvm052732.pdf

13 The National Curriculum:
England. https://www.gov.uk/government/collections/national-curriculum

Scotland. http://www.educationscotland.gov.uk/learningandteaching/curriculumareas/sciences/index.asp,

Northern Ireland. http://ccea.org.uk/curriculum

Wales. http://learning.gov.wales/resources/improvementareas/curriculum/programmes-of-study/?lang=en

14 Department for Education, Edubase2. http://www.education.gov.uk/edubase/home.xhtml

15 Association of Science Education. http://www.ase.org.uk/home/

16 Association of Teachers of Mathematics. http://www.atm.org.uk/

17 Mathematical Association. http://www.m-a.org.uk/

18 National STEM Learning Centre and Network. www.stem.org.uk

19 Royal Institution STEM Directories. http://www.stemdirectories.org.uk/

20 Education Business Partnership National. http://www.ebpnational.org.uk/

21 Education and Employers. 2013. *It's who you meet: why employer contacts at school make a difference to the employment prospects of young adults*. Mann, A. http://www.educationandemployers.org/wp-content/uploads/2014/06/its_who_you_meet_final_26_06_12.pdf

22 CBI. 2015. *Tomorrow's World: Inspiring primary scientists.* http://www.cbi.org.uk/tomorrows-world/assets/download.pdf

23 Project ENTHUSE. www.stem.org.uk/project-enthuse

24 National Centre for Excellence in the Teaching of Mathematics, Maths Hubs. http://www.mathshubs.org.uk/

25 National STEM Learning Centre, STEM Insight. https://www.stem.org.uk/stem-insight

26 Careers and Enterprise Company. https://www.careersandenterprise.co.uk/

27 CBI. 2013. Leading the way: *improving school governance and leadership.* http://www.cbi.org.uk/media/2487439/leading_the_way.pdf

28 Wellcome Trust and the National Governors Association. 2015. *A Framework for Governance: A flexible guide to strategic planning.* http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtp058282.pdf

29 Wellcome Trust, Questions for Governors. http://www.questionsforgovernors.co.uk/

30 STEM clubs. http://www.stemclubs.net/step-by-step-guide/

31 Royal Society, Partnership Grants. https://royalsociety.org/grants-schemes-awards/grants/partnership-grants/

32 Education and Employers. 2012. *Work Experience: Impact and Delivery. Antony Mann. Education and Employers*. Mann, A. http://www.educationandemployers.org/wp-content/uploads/2014/06/work_experience_report__april_2012_.pdf

33 Alison Wolf, 2011. *Review of Vocational Education.* The Wolf Report. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/180504/DFE-00031-2011.pdf

34 CBI, 2015. *Best Foot Forward. Steps towards a better Britain in the new government's first 100 days*. http://news.cbi.org.uk/news/the-business-plan-for-first-100-days-of-new-government/best-foot-forward/

35 Chambers of Commerce, 2015. Business and Education Survey: Make work experience a national priority. http://www.britishchambers.org.uk/policy-maker/policy-reports-and-publications/business-and-education-survey-make-work-experience-a-national-priority.html

36 Tomorrows Engineers, assorted work experience resources. http://www.tomorrowsengineers.org.uk/employertoolkit/workexperience/

37 Health and Safety Executive, Work Experience. http://www.hse.gov.uk/youngpeople/workexperience/index.htm

38 Royal Society, 2010. *State of the Nation: Science and mathematics education 5 – 14.* https://royalsociety.org/topics-policy/projects/state-of-nation/5-14/

39 Royal Academy of Engineering and University of Wolverhampton, STEPs at Work. http://www.wlv.ac.uk/about-us/our-schools-and-institutes/faculty-of-science-and-engineering/supported-learning-and-cpd/steps-at-work/

40 Teach First. http://www.teachfirst.org.uk/support-us/corporate-partnerships

41 Careers and Enterprise Company, Enterprise Advisers. http://www.careersandenterprise.co.uk/enterprise-advisers/

42 Founders 4 Schools. https://www.founders4schools.org.uk/about/

43 Inspiring the Future. http://www.inspiringthefuture.org/

44 Speakers for Schools. http://www.speakers4schools.org/

45 STEM Ambassadors. http://www.stemnet.org.uk/

46 Ahead Partnership, Make the Grade. http://www.aheadpartnership.org.uk/make-the-grade/about-the-programme/

47 Business in the Community, Business Class. http://www.bitc.org.uk/programmes/business-class

48 Education and Teaching Foundation, Teach Too. http://teachtoo.org/about

49 Young Enterprise. http://www.young-enterprise.org.uk/what-we-do/overview-new/

50 Tomorrows Engineers. http://www.engineeringuk.com/Tomorrows-Engineers/

51 Arts Council, Generic Social Outcomes. http://www.artscouncil.org.uk/what-we-do/supporting-museums/ilfa/measuring-outcomes/generic-social-outcomes/

52 Research Councils UK, 2011. *Evaluation: Practical Guidelines A guide for evaluating public engagement activities.* http://www.rcuk.ac.uk/RCUK-prod/assets/documents/publications/evaluationguide.pdf

53 National STEM Centre, 2009. *Does it work? Better evaluation: better STEM*. www.stem.org.uk/research

54 National STEM Centre, *Summary of Public Sector Guidance for Evaluation with respect to STEM Initiatives.* www.stem.org.uk/research

55 Tomorrows Engineers, Employer Toolkit. http://www.tomorrowsengineers.org.uk/employertoolkit/

The Royal Society

The Royal Society is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, as it has been since its foundation in 1660, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

The Society's strategic priorities emphasise its commitment to the highest quality science, to curiosity-driven research, and to the development and use of science for the benefit of society.

These priorities are:

- Promoting science and its benefits
- Recognising excellence in science
- Supporting outstanding science
- Providing scientific advice for policy
- Fostering international and global cooperation
- Education and public engagement

For further information

The Royal Society
Science Policy Centre
6 – 9 Carlton House Terrace
London SW1Y 5AG

T +44 20 7451 2500
E education@royalsociety.org
W royalsociety.org

Registered Charity No 207043

CBI

It is our mission to help create a thriving UK economy that's good for everyone.

We provide our members with the influence, insight and access they need to plan ahead with confidence and grow. We represent their views as we work with policymakers to deliver a healthy environment for businesses to succeed, create jobs and ultimately, drive economic growth and prosperity.

The CBI speaks on behalf of 190,000 businesses of all sizes and sectors. Together they employ nearly 7 million people, about one third of the private sector-employed workforce.

With 13 offices around the UK as well as representation in Brussels, Washington, Beijing and Delhi, the CBI communicates the British business voice around the world.

With over 50 years of experience, we are the UK's most effective and influential business organisation.

For further information please contact:

Grace Breen
T +44 20 7395 8047
E grace.breen@cbi.org.uk

or

Katy Pell
T +44 20 7395 8260
E katy.pell@cbi.org.uk

Issued: May 2016 DES4026