



Why your business should go back
to school: How you can inspire the
next STEM generation

Foreword

I am delighted to introduce this guidance for businesses and other organisations looking to provide support and inspiration for science, technology, engineering and maths (STEM) in schools.

It has been produced as part of Project ENTHUSE, a unique partnership between business, learned societies, charities and Government, which provides funding and support for transformational professional development for teachers and technicians across the UK.

The guidance is based on consultation with teachers, further developed through debate between teachers, businesses and learned societies.

We believe that teachers are crucial in developing and inspiring young people to become the scientists and engineers of the future. But there is a much wider role that we can all play in helping teachers to make STEM-related subjects more engaging by opening young people's eyes to their relevance to themselves and their own lives.

I hope that this guidance makes it easier for us to give teachers that support, helping every young person feel that a STEM career could be for them.



*Ian Duffy, Community Development Manager,
BP plc*

This research and report was produced by EdComs, the UK's largest communications, marketing and research agency specialising in education.

Our aim

Our aim is to open the eyes of more young people to the opportunities offered by studying STEM subjects, and encourage them to continue with science and maths post-16. Research shows that we can do this by helping more businesses to bring real-world context and inspiration into the classroom in a way that has genuine impact. We know that contextualising learning and widening the horizons of students by including examples of how STEM knowledge and skills are used in society and the workplace have a positive effect on engagement and attainment.¹

We have worked with teachers to understand what they want from business and we have talked to businesses about what would help them to take up the challenge. The result is this summary of the key issues that need to be addressed and an argument to encourage businesses of all sizes - and learned societies via their members - to get involved, support schools and provide really effective STEM-related resources.

Many businesses and learned societies are already engaging in this arena and, through this guidance, we hope to encourage even more. That includes smaller businesses whose contribution is vital to showcase the breadth of employers that need STEM skills, and the exciting technologies they use or produce. Getting involved is easier than you think - this document aims to help by providing a simple guide to the key issues, the considerations to take into account and places to start.

You might also find it helpful to read *Making Education Your Business*, a toolkit just published by the Royal Society and CBI, which goes into more detail on how to build high quality, mutually beneficial relationships with schools and colleges.²

The problem

Throughout the UK, there is widespread and on-going concern that not enough young people are choosing to study STEM-related subjects after the age of 16. On the one hand, this is creating a skills gap that is limiting business growth and having a negative impact on the economy.³ On the other, we need to ensure the general population has a good level of scientific understanding, enabling people to participate more actively in the economy and society as a whole.

To add to the problem, the profile of those who do go on to study particular STEM subjects and pursue certain STEM careers is too narrow. Women, working class and some minority ethnic groups remain under-represented in some disciplines and/or occupations, particularly in the physical sciences and engineering. This not only means a pool of potential talent is being lost, but that those industries are missing out on the many benefits of a more diverse workforce.

“A student is least likely to express science aspirations if they are female, White, have low/very low levels of cultural capital, are in the bottom set and do not have any family members who use science in their jobs.”⁹

To improve this situation it is believed that young people need to be engaged with and inspired by STEM from primary age, to help them to build their skills and potentially envisage themselves moving into both scientific and more broadly STEM-related careers.¹⁰



In 2015, 21% of those taking Physics A level and 60% of those taking Biology were female. The figures for GCSE were 50% and 49% respectively.⁴

49%

of state-funded co-ed schools had no girls go on to take A-level physics in 2011.⁵

The percentage of girls choosing Physics hasn't changed over

30 years⁶

In higher education, 16% studying engineering and technology, 18% studying computer sciences, 34% studying architecture, building and planning, 39% studying mathematical sciences and 40% studying physical sciences are female.⁷



Women make up 63% of health professionals but only

14%

of all people working in STEM occupations.⁸

Our approach

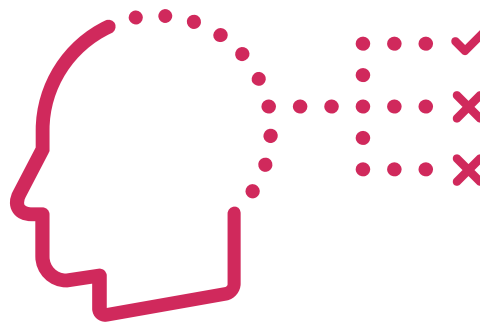
Our approach has been



We conducted a

survey with teachers

in the summer term 2015, to understand what they are looking for from business and how best to support STEM-related teaching and learning.



We then used the findings of this research to inform a **deliberative event**

involving teachers, businesses and learned societies, held at the Science Museum in July 2015.

This event helped us

frame the guidelines

in this document and provided examples of good practice to highlight the key points.



Further examples of **good practice** were sourced from the National STEM Learning Centre.

What difference can business make?

Our work identified two key roles for business in supporting STEM-related teaching and learning.

1. Levelling the playing field - building 'science capital'

Researchers at King's College London have developed the concept of 'science capital' – exposure to scientific concepts and the world of STEM generally gained through family members' qualifications, occupations and/or interests. They found that a young person's level of science capital impacts on their likelihood to study science after the age of 16.¹¹

In a major survey of 10-14 year-olds, 60% of those with high science capital had science or STEM-related aspirations, compared to 32% with low science capital. Even if they didn't aspire to a STEM career, those with high science capital were likely to continue studying science. The researchers also found that science capital is unevenly spread across different social and economic groups, and those with high science capital are predominantly middle class.

As part of King's College London's conclusions, they pointed out that liking science is not enough – we need to help young people increase their exposure to the world of science and STEM.

BP's "Where's the Science in that? The Beach" uses peer learning and an everyday accessible location to engage students in the topic of evolution and inheritance.

www.bp.com/bpes/beach

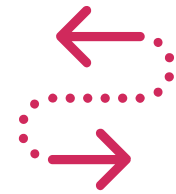
At the same time, they found that, while most students recognised that science could be useful for getting a good job, far fewer felt that such jobs were personally relevant or attainable. This was partly because they had a very narrow sense of what jobs science qualifications led to; partly because of a stereotypical view of those working in science (White, male, middle class); and partly because they thought only very 'brainy' people could do 'science jobs'.

Such perceptions were held even by those who were good at science and enjoyed it, and were more likely to be held by female, working-class and some minority ethnic – particularly Black – students.

Business has a crucial role to play here. Helping to improve the science capital of young people will help to create a level playing field and increase the likelihood of young people from all backgrounds becoming engaged with STEM. Achieving this will not only get more young people thinking that STEM is 'for them', but will produce more STEM-literate citizens who will in turn pass on higher levels of science capital to future generations.

We have identified three areas where business can help improve levels of science capital.

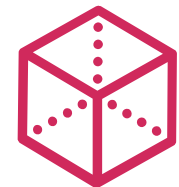
- By working directly with young people who lack science capital and their teachers, business can introduce them to the possibilities opened up by STEM and encourage them to keep their options open. This could be by discussing the breadth of jobs available in a range of sectors,¹² by showing how transferrable STEM-related skills are and how they are used in business, or simply by sharing a personal enthusiasm for STEM-related subjects.



- By providing real industry role models - at all levels - to give young people insights not only into the variety of people employed in STEM-related jobs, but also the different routes they have followed to get there. For some young people, it might be about ensuring a realistic understanding of what's needed to achieve their aspirations, while for others it might be more about getting a clearer sense of how useful a stepping stone a science qualification can be. This can be achieved in a range of ways, both face to face and online.



- By providing activities with a STEM focus that reach out to families and facilitate dialogue between young people and their influencers. School is one route through which to enable this, but science capital is crucially built through parents, who exert the most influence on young people's choices, particularly when making key career decisions.¹³ Business can help parents understand the opportunities that STEM qualifications can bring. It can also help families enjoy learning more about STEM-related concepts and encourage them to investigate and discuss STEM issues – such as climate change, space exploration, evolution or conservation – as a family.



The Get Gas Safe education programme reaches out to families through schools to promote awareness of gas safety. Students are encouraged to talk to their families about what they have learnt at school, thus contributing towards building a more informed society.

www.getgassafe.org.uk/

79%




of teachers think it is **important** for schools to explain to students that it is useful to know about science in daily life.

2. Helping to improve teacher confidence


Research suggests that the main reasons students give for choosing a subject is that they like doing it and they believe they will do well at it.¹⁴ Of the various things that young people say encouraged or discouraged them when learning science, the quality of the teacher is the most commonly mentioned.¹⁵ In a recent survey, almost two-thirds of students said they had consulted teachers regarding career decisions, and young people are nearly 20% more likely to ask subject teachers for advice than careers advisers.¹⁶

By supporting teachers, some of whom – particularly at primary level - may not be science specialists, business can help them have the confidence to teach STEM-related topics in creative and inspiring ways, and to promote STEM as a career path to their students.



The STEM Ambassadors programme enables anyone of any age working in a STEM-related job to engage with schools to encourage and promote STEM industries. Ambassadors not only work with young people to increase engagement with STEM subjects, but also help teachers by explaining current applications of STEM in industry.

www.stemnet.org.uk/ambassadors



Through their set of 'stimulus materials', National Grid aim to help teachers run practical and engaging STEM-based classes. The leaflets explain energy-related topics in simple language helping teachers to understand and digest more complex scientific issues.

www.nationalgrideducation.com/resources



Our research identified three key areas where business could help teachers:

- Supporting teachers in areas that stretch them as well as their students beyond their own **specialisms**. Not surprisingly, teachers we talked to said they would shy away from topics and concepts that made them feel uncomfortable, and, with modern technology moving so quickly, there is plenty that business can do to help.
- At primary school level only 3% of teachers hold a specialist degree and Initial Teacher Training (ITT) qualification in science.¹⁷
- It is estimated that around 500 secondary schools and colleges in England don't have a specialist physics teacher.¹⁸
- Supporting **professional development** activities – such as those provided by Project ENTHUSE - to help teachers develop and continuously update the skills and knowledge they need to become confident STEM advocates. Business can help teachers inspire students with 'real life' applications of science and maths that they have seen through employer placements or heard about from the business itself.
- Offering support both **on and off curriculum** in order to inspire young people. Inevitably, teachers spend most of their classroom time on topics that are directly on the curriculum and/or examined. However, our qualitative research found that they were willing to spend a surprising amount of time 'off curriculum' if the material was inspiring and relevant to the 'real world', and encouraged students to become more engaged in the subject.

Teachers said they were...

...most likely to use a business resource linked to the curriculum...



but they were most likely to think...

...that a business resource that is off-curriculum but brings a subject to life for students would have the most impact on students



Where should business focus?

No one is asking business to take the place of the teacher or the text book, but our research tells us that business has real value to add in bringing the 'real world' into the classroom.

This is important because it reinforces the relevance of the subject and allows young people to imagine themselves using science and maths skills in their future lives.

Within the theme of 'real world' there were four key strands where teachers felt that business could make a real difference:

- **Hands-on learning**

This is learning by doing and includes conducting hands-on experiments, seeing the consequences of actions and gaining first-hand experience of how science impacts our world. It appeals to the curiosity of young people and fosters a spirit of enquiry.

The Royal Society of Chemistry employs hands-on learning in its Mission: Starlight – a global experiment on UV protection resource, getting students to undertake practical investigations that give them experience in collecting data and developing scientific ideas.

www.rsc.li/uv-protection

- **Everyday science in the wider environment**

This looks at the world around us and shows young people how science impacts everyday life. It makes scientific concepts relevant to young people.

- **The positive impact of STEM on humanity**

This highlights how STEM can improve the world we live in – creating medicines to cure disease, drought-resistant crops to feed a community or transport solutions to link communities. It focuses on the outcomes and benefits of STEM for humanity, rather than just the concepts and mechanics, which can be appealing to those young people not immediately attracted by STEM-related subjects.

- **STEM in the workplace**

This shows young people how STEM-related concepts are really used by people in their jobs, and why they are important.

Coca Cola runs five Education Centres in the UK, allowing students an insight into state-of-the-art manufacturing sites and creating exciting links between the world of work and classroom learning.

www.therealexperience.co.uk

Across these themes, businesses need to think carefully about what they have to offer, where they can have the most impact and how much capacity they have. Support for pupils and teachers can come in many different forms and

on different scales, can be geared to the needs of different types and ages of pupil, and can engage, inspire and educate in very different ways.

Here are just some of the activities and resources that teachers tell us are of most use to them:

Careers-related support

- Individuals visiting to talk about their job and the career pathway.
- Videos and other materials that show the range of jobs people do that need STEM-related skills, and the range of people that do them.
- Workplace visits for groups of pupils of any age.
- Work experience placements for older pupils.
- Mentoring, particularly for disadvantaged students.
- Contributions to business-led CPD courses, mentoring and support in lesson planning for STEM-related subjects, improving teacher confidence and leadership.
- Teacher placement schemes in business or business-led workshops or open days for teachers.
- Encouraging employees to become school governors, particularly if they can help the school think about the way it offers STEM-related provision and careers advice.

86%
AGREE



that businesses should play a role in helping teachers understand what skills students need to pursue a STEM career.

As part of their CSR Community strand 'Life in the Fast Lane', Unipart Group have worked closely with a local school to help deliver the Year 6 creative curriculum topic 'In the Fast Lane', the outcome of which is to design, manufacture, test and evaluate a powered vehicle and present findings back to Unipart senior managers. An employee has also become chair of the school board of governors.

www.unipart.co.uk/UserFiles/File/2013%20UNIPART%20CR%20REPORT.pdf

Curriculum-related support

- 'Real-world' examples that link to the curriculum and show its relevance. These might be in the form of downloadable or 'hard copy' information leaflets, posters, videos, presentations or lesson plans.
- Project-based competitions.
- Demonstrations, for example of scientific processes.
- In-person support for STEM-related lessons and after-school clubs.
- Other events, such as science fairs, workshops or open days that give young people an opportunity to engage with STEM.

Brompton Bicycles use the real world context of a company setting to engage students in topics such as control systems, graphics, resistant materials and textiles technology.

www.stem.org.uk/elibrary/collection/4121/brompton-bicycle

The Big Bang Fair is an annual event for 7-19 year-olds showcasing the exciting and rewarding opportunities available to them in STEM. The four-day event – consisting of theatre shows, interactive workshops and exhibits – also plays host to a number of STEM-related competitions.

www.thebigbangfair.co.uk

- Realistic projects that encourage independent learning and team work and bring the curriculum to life. This might take the form of a simple project brief, or include supporting resources.

Teachers said they would like the following STEM volunteer activities provided by business in their schools:

72%

class talks



70%

talks about personal experiences



70%

help with after school clubs

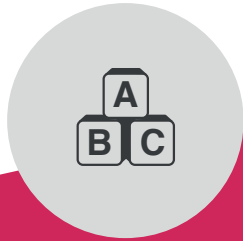


61%

conducting practicals



Matching resources to lifestage



EARLY YEARS

Desired outcome

Improving science capital in the home



PRIMARY

Desired outcome

Improving science capital in school but also reaching out into the home



SECONDARY

Desired outcome

Improving science capital at school and by providing world of work context



LATE SECONDARY

Desired outcome

Improving science capital at school and via contact with the workplace

Resource Ideas

- Physical resources (toys etc.)
- Resources to link to family e.g. for parents to use at home

- Teacher resources
- Teacher and staff training
- Practical ideas – show and tell
- Code clubs
- Resources for parents to use at home
- Family open days (at workplace)

- In school – practical, curriculum relevant help
- Project based work
- Problem solving workshops
- Careers advice
- Careers talks/ events
- Parents evening/ talks

- Employee case studies
- Apprenticeships
- Links to FE/HE
- Mentoring/e-mentoring
- Careers advice
- Careers talks/ events
- Work experience
- Summer placements
- Parents evening/ talks

How do you build a strong relationship with schools?

Through talking with teachers, businesses and learned societies, we have identified a number of areas that we believe will help organisations forge strong and meaningful relationships with

schools, teachers and young people and inform the development of effective STEM-related resources. This is our checklist for success.

Know your audience

Business and schools have different rhythms and timetables, whether in terms of access to email/phone or school holidays. Make sure that you take the school context into consideration.

Share-ability

Schools are communities and teachers love to share with their peers. Make it easy to share resources and learnings, for example via online links, and making them simple to download in a usable format.

Long-term engagement, not one-offs

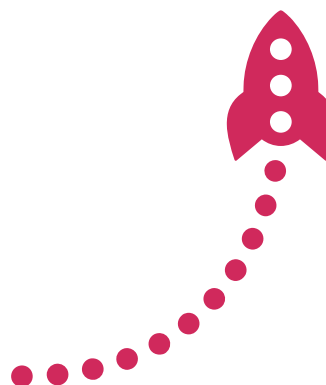
We understand that engaging with a school can seem a large commitment for a business. Both short- and long-term interactions can have benefits, but schools do prefer sustained, long-term engagement – at least once a year with at least one year group – so that relationships can be developed and activities can be built into school timetables, creating an on-going change in school culture. A recent Business in the Community report finds a number of business benefits accruing to longer-term relationships.¹⁹

Communication is key

Keep the communication channels open and remain flexible. Make sure you listen to the needs of the school and take time to understand them. Remember that your expectations might be different from theirs, so be transparent and encourage them to be too.

Watch your language

Make it easy to understand and avoid jargon, and don't be afraid to ask teachers to explain their language to you.



*Making Education Your Business*²⁰ offers further guidance on how to go about deciding which education engagement option best fits the needs of your organisation and of science and maths teachers.

Why your business should go back to school



“A student is least likely to express science aspirations if they are female, White, have low/very low levels of cultural capital, are in the bottom set and do not have any family members who use science in their jobs.”

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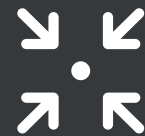


of teachers think it is **important** for schools to explain to students that it is useful to know about science in daily life.

What can business do?

- Work directly with young people who lack science capital and their teachers.
- Provide real industry role models - at all levels - to give young people insights into STEM-related jobs.
- Provide activities with a STEM focus that reach out to families.
- Support teachers through stretching them beyond their specialism; support CPD; offer support both on and off curriculum.

Where should business focus?



- Hands-on learning
- Everyday science in the wider environment
- The positive impact of STEM on humanity

How to build strong relationships with schools?

- Know your audience
- Share-ability
- Long-term engagement, not one-offs

86% AGREE



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Contributors



EdComs

EdComs has over 21 years' experience of helping businesses and organisations make an educational, business and social impact – establishing a virtuous circle that makes our work the most effective in the education market. Our expertise in understanding what teachers need and how students learn has enabled EdComs to have a strong, successful history in delivering impactful STEM programmes.

It has been a pleasure to work with the Project ENTHUSE partners in producing this guidance for business. We hope that this guidance helps enthuse all businesses to support teachers in inspiring STEM in future generations.

Research and Consultancy Director



Project ENTHUSE partners

The partners in Project ENTHUSE are: the Wellcome Trust, Department for Education, BAE Systems, Biochemical Society, BP, Institution of Engineering and Technology, Institution of

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Sarah Giles, The Royal Society
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Sources

¹ See, for example:

Orthner, D.K. et al (2012) Improving Middle School Student Engagement Through Career-Relevant instruction in the Core Curriculum. *The Journal of Educational Research*. 106 (1) pp 27-38.

www.tandfonline.com/doi/abs/10.1080/00220671.2012.658454

King's College London (2013) *Aspires: Young people's science and career aspirations age 10-14*.

www.kcl.ac.uk/sspp/departments/education/research/aspires/ASPIRES-final-report-December-2013.pdf

² The Royal Society and CBI (2015) *Making Education Your Business: A practical guide to supporting STEM in schools and colleges*.

royalsociety.org/topics-policy/education-skills/

³ See, for example:

Royal Academy of Engineering (2012) *Jobs and growth: the importance of engineering skills to the UK economy*.

www.raeng.org.uk/publications/reports/jobs-and-growth

TISME (2013) *What influences participation in science and mathematics? A briefing paper from the Targeted Initiative on Science and Mathematics Education*.

www.kcl.ac.uk/sspp/departments/education/research/aspires/TISME-briefing-paper-March-2013.pdf

CBI (2015) *Inspiring Growth: CBI/Pearson Education and Skills Survey 2015*.

news.cbi.org.uk/business-issues/education-and-skills/gateway-to-growth-cbi-pearson-education-and-skills-survey-2015/

⁴ Joint Council for Qualifications Examination Results

www.jcq.org.uk/examination-results

⁵ Institute of Physics (2012) *It's Different for Girls: The influence of schools*.

www.iop.org/education/teacher/support/girls_physics/file_58196.pdf

⁶ WISE (2014) *"Not for people like me?" Under-represented groups in science, technology and engineering*.

www.wisecampaign.org.uk/uploads/wise/files/not_for_people_like_me.pdf

⁷ Race for Opportunity (2015) Sector Factsheet: *Ethnic Minorities in Science, Technology, Engineering and Mathematics (STEM)*. BITC.

raceforopportunity.bitc.org.uk/sites/default/files/rfo_sector_factsheet_set_vfinal_new_2.pdf

⁸ WISE (2015) *Women in the STEM workforce*.

www.wisecampaign.org.uk/resources/2015/09/women-in-the-stem-workforce

⁹ King's College London *op.cit.* p11

¹⁰ King's College London *op.cit.* p27

¹¹ King's College London *The Enterprising Science Project: Science Capital*.

www.kcl.ac.uk/sspp/departments/education/research/cppr/Research/currentpro/Enterprising-Science/Science-Capital.aspx

¹² RAEng (2012) *Jobs and growth: the importance of engineering skills to the UK economy*.

www.raeng.org.uk/publications/reports/jobs-and-growth

¹³ Allabout School Leavers (2015) *The School & College Leavers Careers Market 2015: Annual Research Report*.

www.allaboutschooleavers.co.uk/employer-advice/latest-research

¹⁴ Tripney, J. et al (2010) *Subject Choice in STEM: Factors influencing young people (aged 14-19) in education – a systematic review of the UK literature*. Wellcome Trust.

www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_publishing_group/documents/web_document/wtx063082.pdf

¹⁵ Wellcome Trust (2013) *Wellcome Trust Monitor Wave 2: Tracking public views on science, biomedical research and science education*.

www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_grants/documents/web_document/wtp053113.pdf

¹⁶ Allabout School Leavers *op.cit.*

¹⁷ The Royal Society (2010) *Science and Mathematics Education, 5-14: A 'state of the nation' report*

royalsociety.org/topics-policy/projects/state-of-nation/5-14

¹⁸ SCORE (2011) *Subject Specialist Teaching in the Sciences: Definitions, Targets and Data*.

www.score-education.org/media/7987/spec-teach.pdf

¹⁹ Warwick Institute for Employment Research (2015) *Destiny should not be determined by Demography: Building alignment between the classroom and the boardroom*. Business in the Community.

www.bitc.org.uk/our-resources/report/destiny-should-not-be-determined-demography

²⁰ The Royal Society and CBI *op.cit.*



Project ENTHUSE is a partnership between government, charities and employers; created to ensure that world leading science, technology, engineering and mathematics (STEM) teaching is delivered in all UK schools and colleges, through enabling science teachers and support staff to participate in the high quality, subject specific continuing professional development provided by the National STEM Learning Centre.