Research Report DFE-RR147

The STEM cohesion programme: final report

NFER

Department for Education

Contents

Definitions

STEM
STEM is the acronym for science, technology, engineering and maths. The government's STEM programme aims to increase young people's STEM skills in order to provide employers with the skills needed for a 21st century workforce and ensure the UK's place as a leader of science-based research and development. Many organisations are involved in working to inspire and engage young people in STEM. As a result, the STEM Cohesion Programme was created as a means of coordinating the wide range of expertise and resources available.

Enrichment and Enhancement activities (E&E)
An enrichment and enhancement (E&E) STEM activity is an activity that offers schools the opportunity to deliver exciting and inspiring activities to their pupils. Examples of such activities might include practical workshops or design challenges which are intended to make a difference to learning and improve teachers' understanding of the benefits of STEM education. It is hoped that E&E activities will make a positive contribution to the wider aim of encouraging more young people to take up STEM education post-16 or to consider a STEM-related career path.

STEM Directories
The STEM Directories provide schools, colleges, employers and others interested in supporting STEM with an online listing of Enrichment and Enhancement (E&E) schemes and activities. Each activity entry includes curriculum links, to help teachers and lecturers towards sustaining the impact of an E&E experience.

Action Plans (APs)
The STEM Cohesion Programme is divided into 11 action programmes (APs), corresponding to key areas of activity across STEM education (For example, continuing professional development (CPD), careers, enhancement and enrichment activities). A 'lead organisation' has been appointed to each action programme to act as a focal point, bringing together existing schemes and resources as well as establishing new projects where needed.

STEM Stakeholders
STEM-related industry, and STEM-related subject associations, institutes and societies.

Executive summary

The STEM Cohesion Programme

- The UK engineering and science industries are recognised as a vital element of the overall UK economy, with a turnover of approximately £257 billion (Annual Business Inquiry (ABI), Office for National Statistics (ONS) 2007; cited in Confederation of British Industry (CBI), 2010). However, skills shortages in these areas will threaten the UK's capacity for growth.
- As a result, in recent years, there has been a substantial increase in interest and investment in science, technology, engineering and maths (STEM) education from government, charities, subject associations, learned societies and industry. Many different organisations are now working to engage young people with STEM and the scope of initiatives is broad, including hundreds of opportunities for enrichment and enhancement by schools and colleges, professional development experiences for teachers and the development of curriculum resources. In 2006 the STEM Programme Report (published by the Department for Education and Science (DfES, now DfE) and Department for Trade and Industry (DTI) called for better coordination of the organisations involved in STEM education. The STEM Cohesion Programme was thus created as a means of bringing together the many stakeholders who support the teaching and promotion of STEM subjects.
- The STEM Cohesion Programme is divided into 11 action programmes (APs), corresponding to key areas of activity across STEM education (for example, continuing professional development (CPD), careers, enhancement and enrichment activities). A 'lead organisation' has been appointed to each action programme to act as a focal point, bringing together existing schemes and resources as well as establishing new projects where needed. Where appropriate, lead organisations have also created directories of initiatives, which can be used by schools and colleges to identify possible CPD opportunities and/or enhancement and enrichment activity.
- During its lifetime, the STEM cohesion programme has acted as a key driver in the development of communications and relationships between organisations with a STEM agenda. Its creation provided impetus for stakeholders to work collaboratively, united by a shared ambition to improve the availability and coordination of STEM related information and provision. Evaluation evidence has demonstrated the impact of this work, with teachers reporting improvements in relation to:
  - the coordination of information to, and between, schools;
  - their awareness of STEM-related opportunities and activities, and how to access them; and
  - their engagement with STEM-related provision.
- At the same time, STEM stakeholders, including STEM-related businesses, subject societies and institutions, have seen positive developments with regards to:
  - their understanding of the national STEM agenda;
  - the development of links with other STEM organisations;

- reduced duplication of provision; and
- the development of STEM programmes and policies.

About the evaluation

- The National Foundation for Educational Research (NFER) was commissioned by the Department for Children, Schools and Families (DCSF, now DfE) to evaluate the impact of the STEM Cohesion Programme on schools, colleges and stakeholders[1]. This is the third and final report produced by the evaluation. It provides an update on the initial baseline and Year 2 reports produced in August 2009 and July 2010 respectively, and synthesises key evaluation findings and trends over the past three years of the evaluation.
- The main data collection activities conducted during the evaluation have been:

  1) a telephone survey to maths, science and technology teachers/lecturers;

  2) a key stage 3 student survey;

  3) feedback collected from representatives of the lead organisations;

  4) a stakeholder survey to the wider STEM community; and

  5) school/college case studies.
- For the teacher/lecturer survey two versions were created. One focused on obtaining views about STEM information related to continuing professional development and enhancement and enrichment activities. A second survey dealt with careers related information.

Teachers' awareness of STEM information sources

- Teachers attach a broad range of meanings to the term 'STEM'. In addition to its basic meaning as an acronym, teachers associated 'STEM' with collaboration and cross-curricular working by teachers, additional resources being made available and various projects, challenges and events.
- Teachers exhibit a good awareness of opportunities and activities in relation to STEM enrichment, CPD and careers. Sixty-nine per cent of teachers in the Year 3 survey reported being aware of STEM enrichment activities for students, while 61 per cent were aware of STEM CPD opportunities.
- Awareness amongst teachers of STEM careers-related enrichment and CPD activities has increased over the past three years. More than half of the teachers responding to the Year 3 careers survey were aware of careers-related CPD activities (58 per cent) and enrichment opportunities (70 per cent) related to STEM careers; a significant increase from Year 2 of the survey.
- Knowledge of where to go for information on STEM activities and opportunities was also moderately good. Around six out of ten teachers reported knowing where to go for information regarding STEM enrichment and STEM CPD activities.
- Teachers' knowledge of how to access information on STEM careers has increased over the past three years. From Year 2 to Year 3 of the careers

[1] In addition, there are a number of other evaluations taking place of the individual action programmes

survey, teachers were significantly more likely to know where to go for information on STEM careers, information on careers-related enrichment and careers-related CPD. Teachers were also significantly more likely to know where to access classroom/curriculum resources relating to STEM careers.

- The sources of information on STEM enrichment and CPD that teachers were most commonly aware of included: the National Science Learning Centre (53 per cent of teachers), the SSAT (50 per cent) and STEM Ambassadors (48 per cent). For information on STEM careers, teachers were most commonly aware of: DCSF (now DfE) communication campaigns (53 per cent of teachers), the 'see where they can take you' website (43 per cent), and STEMNET and STEMPOINTs (42 per cent).

Sources of information used by teachers

- Only a minority of the teachers and lecturers had not used any of a substantial number of sources that were listed in the survey to gain information on STEM enrichment activities or STEM CPD (17 per cent and 25 per cent, respectively). This represents a notable drop compared to figures for Year 1 of the survey.
- The majority of teachers responding to both of the surveys report using between one and five sources of information on STEM enrichment and CPD or STEM careers.
- Teachers and lecturers most frequently identified that they had used the following sources for information:

  On STEM CPD activities:

  - Local Authority consultants and advisors (25 per cent)
  - National Science Learning Centre (25 per cent)
  - The Specialist Schools and Academies Trust (SSAT) (21 per cent).

  On STEM enrichment activities:

  - Local Authority consultants and advisors (24 per cent)
  - The Royal Society of Chemistry (RSC) (24 per cent)
  - The Association for Science Education (ASE) (23 per cent).

  On STEM careers activities:

  - The 'jobs4U' website (31 per cent)
  - DCSF (now DfE) communications campaigns (30 per cent)
  - The 'see where they can take you' website (27 per cent).

Effectiveness of information sources

- Of those teachers and lecturers who are using information on STEM, most find it current, clearly arranged and sufficiently detailed. It appears that coordination of information is an area where some teachers feel improvements could still be made. However, in Year 3, notably more teachers agreed that careers information was well-coordinated than was the case in Year 2 of the survey.
- Most teachers agreed that information about STEM careers, options for studying STEM and routes and pathways into STEM careers was sufficiently detailed, and this proportion had increased considerably since Year 2 of the evaluation. Still, slightly less than half of teachers (46 per cent) agreed that there was sufficient

availability of resources to support integration of careers resources into lessons, although this did represent an increase on the corresponding figure from Year 2 (27 per cent)

- Science teachers tended to agree more frequently than their mathematics and technology/engineering colleagues that information on STEM CPD and enrichment was effective.

Teachers' engagement with STEM provision

- Teachers' engagement with STEM enrichment and CPD activities is increasing. Almost half of teachers responding to the Year 3 survey (44 per cent) reported that they 'often' engaged with STEM enrichment activities and three in ten (32 per cent) often engaged with STEM CPD activities. This was a statistically significant increase on the corresponding figures in Year 2 of the survey.
- Fewer teachers report engaging with careers-related STEM activities. Approximately three in ten teachers (28 per cent) 'often' engaged with STEM careers-related enrichment activities, while fewer teachers (15 per cent) often engaged with STEM careers-related CPD. This may indicate that there is often not a substantial STEM careers focus within enrichment activities for students and CPD for teachers.
- Most teachers identify engaging with STEM enrichment and careers activities. Eighty-one per cent of teachers and lecturers identified STEM enrichment activities that they had engaged with during 2009/10 academic year, while 78 per cent of teachers identified STEM careers-related activities that they had been involved with. Both these measures represented a substantial increase over the Year 2 figures.
- Substantial proportions of teachers indicated that they had not participated in any STEM CPD (49 per cent) during 2009/10, which was actually slightly higher than the 43 per cent of teachers reporting no STEM CPD activities in Year 2.
- Teachers' satisfaction with the range of STEM activities available to them is increasing. Satisfaction with the range of STEM enrichment opportunities and STEM CPD opportunities available increased significantly between Year 2 and Year 3 of the survey. Satisfaction with the range of STEM careers provision also increased over this same period.

How could information be improved?

- A considerable proportion of teachers responding to the surveys were unable to identify any suggested improvements in the provision of information on STEM enrichment, CPD or careers (42 per cent, 51 per cent and 34 per cent of the total number of respondents referring to enrichment information, CPD information and careers information, respectively). Those teachers suggesting improvements identified a number of ways that STEM information could be improved which related to: the presentation of information; the amount of information available; the nature of information presented; and funding, finance and time for accessing information.
- Most teachers responding to the surveys indicated that there were no gaps or duplication in STEM provision or that they were not aware of such issues. Other teachers highlighted gaps in relation to specific areas of STEM, particular key

stages and ability levels, the accessibility of provision and employer and industry-linked provision, in particular.

Teachers' and lecturers' attitudes towards and experiences of STEM

- In Year 3, the majority of teachers and lecturers responding to the enrichment/CPD survey (73 per cent) felt confident incorporating a wide range of practical work into their teaching of STEM subjects. Just under two-thirds of teachers and lecturers (63 per cent) were confident in their ability to involve students across all academic levels in STEM enrichment activities.
- Approximately one-fifth of teachers and lecturers reported not being confident in their ability to provide STEM careers information and STEM study guidance to students. However, in Year 2 there were significant improvements in participants' confidence in providing STEM careers information and study, compared to Year 1. This was the case across such areas as teachers' knowledge of STEM careers and routes, and ability to integrate this information into their teaching. While the positive trends for these measures continued for those responding to the Year 2 and Year 3 surveys, these were generally not found to statistically significant.
- Approximately one in three teachers and lecturers agreed that their schools or departments had adequate links with STEM-related industries. Looking at responses over time, there were no significant differences observed between those responding to the Year 2 and Year 3 surveys for these questions. This suggests that issues of inadequate links for schools with STEM industry and work experience in STEM careers are persisting, particularly in relation to maths and science.

Pupils' attitudes towards and experiences of STEM

- Over the period of the evaluation, several measures of pupil attitudes toward STEM showed improvement. These included enjoyment of science and engineering and intention to study STEM in the future. A number of measures, such as awareness of careers related to the STEM subjects, showed no significant changes, while in the area of aspiring to work in STEM area, pupil aspiration actually decreased throughout the evaluation period. Interesting changes observed throughout the evaluation period included the following:
  - In Year 2 of the survey, a greater proportion of pupils (78 per cent) reported that they enjoy science. This was a statistically significant increase on the proportion of pupils who reported enjoying science in Year 1 (68%). By Year 3, this proportion had reduced slightly to 73 per cent, although this decrease was not statistically significant.
  - Of those students studying engineering, a significantly greater proportion reported that they enjoy it in the second and third years of the evaluation, compared with the first year.
  - Between Years 1 and 2 of the survey, there were statistically significant increases in the numbers of pupils reporting that they would like/quite like to study science (45 per cent to 55 per cent) and mathematics (38 per cent to 46 per cent) in the future. By Year 3 of the survey, the proportions of pupils interested in studying science or mathematics had decreased (to 50 and 40

per cent respectively), although none of the changes in Year 3 was statistically significant.

  - Students' desire to study science beyond GCSE level is increasing. As in previous years, a greater proportion of pupils responding to the Year 3 survey indicated their intention to study science beyond GCSE-level

- Students' knowledge of STEM jobs increased initially throughout the evaluation period, before falling slightly during Year 3. A greater proportion of pupils responding to the Year 2 survey (58 per cent) felt they knew enough or a bit about STEM jobs than in Year 1. By Year 3, this proportion had reduced again to 53 per cent, although this decrease was not statistically significant.
- Although the interest and engagement of young people in STEM is increasing, by Year 3 of our evaluation, fewer pupils were aspiring to a STEM career. This would seem to indicate the need for continued focus on the communication of STEM careers information and guidance.

Impact of the action programme framework

- The STEM Cohesion programme programme has improved understanding of the national STEM agenda by bringing key players together and creating greater awareness of each other's remit and priorities. This was confirmed by various Lead organisations and 38 of 55 STEM stakeholders responding to the stakeholder survey[2].
- The key aim of the programme to increase linkages between lead organisations continues to be achieved. Most of the lead organisations and 35 out of 55 respondents to the stakeholder survey confirmed this linkage, reporting that the programme had strengthened existing links and facilitated the identification and development of further links with a wider range of organisations.
- The STEM Cohesion Programme has had a positive impact in terms of avoiding duplication, as well as providing a forum for identifying gaps in STEM delivery, according to Lead organisation interviewees and a majority of those responding to the stakeholder survey.
- The programme has had a positive impact on the development of the STEM programmes of Lead organisations and those responding to the stakeholder survey. For the latter (30 out of 55), increased awareness and clarity about what other organisations are doing has allowed them to find, and focus on, their own 'niche' or strengths in the STEM market, as well as rationalising activity.
- The STEM Cohesion Programme has had mixed impact on the development of the STEM policies of the various organisations responding to the research. Those stakeholder survey respondents who reported a positive impact (22 out of 55), referred to better and more frequent communication, increased information sharing and awareness raising as being influential. Others felt that the impact has been more indirect, or that it has validated existing STEM policies as opposed to directly contributing to their development.
- Lead organisations continue to work together as an inter-connected community with a shared communication strategy. Both lead organisations and 23 out of 55 stakeholder survey respondents reported that the programme has been influential in increasing the engagement of schools. Lead organisations found it

[2] Those responding to the stakeholder survey included representatives from industry, subject associations, institutes and societies.

difficult to identify increased attainment in STEM as an impact of the programme, citing this as a much longer-term outcome. Equally, stakeholder survey respondents found it difficult to isolate any difference the programme has made in increasing interest in STEM study and/or careers, given the number of associated factors that could be influential in this.

Challenges and developments

Challenges

- Lead organisations identified a number of challenges in Year 3 of the evaluation. These included: difficulties with engaging stakeholders (particularly schools); funding constraints and/or future uncertainties about funding (as a result of the change in government and a re-focusing of priorities); as well as a perceived lack of understanding of what STEM actually represents and a continuing lack of understanding and appreciation of the role of maths in STEM. These challenges were largely similar to those faced by these organisations in previous years of the evaluation.
- The status and capacity of careers provision in schools, continued to give cause for concern. A lack of cohesion between STEM and careers activities in schools was noted, as well as senior leadership teams not prioritising STEM careers information and guidance.
- The 'rarely cover'[3] policy was identified by interviewees during the third year of the evaluation as leading to a reduction in the numbers of teachers attending external CPD events.

Ways in which the programme could be developed

- Suggestions for developing the STEM Cohesion Programme in the future included: increasing the engagement of stakeholders through the promotion of greater understanding of STEM, showcasing good practice; improving coordination across the key players involved, especially with schools having a broader range of sources from which to draw for CPD and E&E activities; and ensuring scope for ongoing review of the action programme framework. The need for joint forward planning in relation to emerging government policy and priorities was also highlighted by Lead organisation interviewees.
- Ensuring the sustainability of the programme was reported to rely on shared responsibility and commitment, together with a recognition that STEM cohesion should be funded as part of the working role of the principal leads involved, not just 'tacked on' to an existing job. Lead organisation interviewees also noted the need for the government departments that invest in STEM to be 'joined up' themselves, the need to draw in more stakeholders, the importance of embedding STEM more broadly and the ability to demonstrate evidence of effectiveness. Finally, for some lead organisations, sustainability of the programme could be affected by funding uncertainties, which had the potential to adversely affect the rate of progress.
- As the programme contract comes to an end in March 2011, many of the stakeholders and lead organisations hope that participating organisations will wish to maintain and develop the relationships fostered during the programme, in

[3] This policy aims to move towards a situation whereby teachers are only rarely asked to cover for absent colleagues.

order to reap the benefits of multi-agency working – namely, the possibility of achieving an even greater impact on teachers and schools, through more effective joint planning of STEM related information and provision. To encourage ongoing collaboration after the demise of the formal programme, some lead organisation representatives identify that it would be important to create opportunities for STEM stakeholders to continue to meet, for example, either at national conferences or as members of regional groups.

1 The STEM Cohesion Programme

Research conducted since 2000 has suggested that the popularity of science, technology, engineering and mathematics subjects are in decline (Roberts Review, 2002; Stagg et al., 2003). Some of the issues associated with this development have been attributed to young people's negative perceptions and experiences of STEM subjects[4], the lack of information and advice on STEM careers[5] and the lack of subject-specific CPD for teachers[6]. This trend was of particular concern given the importance of the science-based economy in the UK (HM DTI/DfES, 2004). In 2005, the Higher Education Funding Council for England (HEFCE) identified STEM subjects as 'strategically important and vulnerable subjects' in terms of the mismatch between the supply and demand in these areas (HEFCE, 2005).

STEM education provides 'the foundation for innovation and technological advance' (CBI, 2010). Indeed, the UK engineering and science industries are recognised as a vital element of the overall UK economy, with a turnover of approximately £257 billion (ABI, ONS, 2007; cited in CBI, 2010). However, skills shortages in these areas will threaten the UK's capacity for growth. A growing need for technicians in the STEM areas was recognised as a priority for immediate action in the national skills audit produced by UKCES (2010) and the Sector Skills Council for science, engineering and manufacturing technologies (Semta, 2010) has estimated 'a net requirement for 19,200 technicians (qualified to Level 3 or above) within the science, engineering and manufacturing industries' by 2016. Thus, a solid foundation in STEM areas is essential for young people to be able to function in the 21st century.

In recent years, there has been a substantial increase in interest and investment in STEM education from government, charities, subject associations, learned societies and industry. Many different organisations are now working to engage young people with STEM and the scope of initiatives is broad, including hundreds of opportunities for enrichment and enhancement by schools and colleges, professional development experiences for teachers and the development of curriculum resources.

[4] For example, Jenkins and Nelson, 2005; Murray and Reiss, 2005; Bennett and Hogarth, 2006; Cleaves, 2005; Francis et al., 2004.
[5] For example, Cleaves, 2005; Dalgety and Coll, 2004; London Development Agency, 2006,
[6] For example, Khourey-Bowers, C; & Simonis, D, G., 2004.

In 2006 the STEM Programme Report, published by the DfES and DTI, called for better coordination of the organisations involved in STEM education. The STEM Cohesion Programme was thus created as a means of bringing together the many stakeholders who support the teaching of STEM subjects. By organising existing activities it is hoped that:

- schools and colleges will have a better understanding of what is available to them and be more able to access appropriate provision
- stakeholders and funders should have a clearer picture of what is already being done and where gaps in provision remain.

The STEM Cohesion Programme is divided into 11 action programmes (APs), corresponding to key areas of activity across STEM education. A lead organisation has been appointed to each action programme to act as a focal point, bringing together existing schemes and resources as well as establishing new projects where needed. Where appropriate, lead organisations have also created and maintained directories of initiatives, which can be used by schools and colleges to identify possible CPD opportunities and/or enhancement and enrichment activity.

The initial focus of the programme was on creating and supporting partnerships between STEM stakeholders. In its second year of operation, following feedback from the first evaluation report, there was more emphasis on direct work with schools and colleges, in order to communicate the importance of engaging with the STEM agenda, as well as raising awareness of the opportunities available. Then, in September 2009 the National STEM Centre was launched which contains the UK's largest collection of STEM resources for teachers and lecturers, as well as offering a physical space for collaboration between STEM partners via a designated STEM associates area. In July 2010 the Centre officially opened its doors to the public and launched its new eLibrary of online teaching materials to build on the already extensive physical library. The National STEM Centre, through its physical space and website, is now widely recognised as meeting the need for more centralised signposting to STEM support for schools and colleges.

Although unified in their overarching ambitions, it is important to appreciate the variation that exists across the action programmes. Firstly, they have not

all begun from the same starting point. For example, the contract for undertaking work associated with AP10 (practical work in science) was only awarded in Spring 2009. Most other action programmes started in Autumn 2008 and the National Centre for Excellence in the Teaching of Mathematics (lead organisation for AP2) was in fact established two years before the arrival of the STEM Cohesion Programme with the aim of improving coordination of mathematics CPD. Hence, many of AP2 activities were well advanced by the time the STEM Cohesion Programme was conceived. There is also variation in the extent to which APs are coordinating existing provision and/or driving the development of new activities. Within the careers strand (AP8) for instance, there has been a need to fill gaps in provision and create resources where none existed previously. This same AP is also targeting key stage 3 pupils and consequently, the impact of its work will take time to materialise as we wait to see whether these pupils opt for STEM study at A level and degree level. Indeed, longer-term impacts will not necessarily be captured by this particular evaluation which operates over a two and a half year period, between September 2008 and March 2011. With the wealth of STEM-promoting initiatives currently underway in the UK, it would beneficial to review data on the numbers of young people choosing STEM study over the next 5–10 years. Such an exercise would help demonstrate the long-term effects of the various programmes currently in place.

For the purposes of this evaluation, we are concerned with 8 of the 11 action programmes (those involving a STEM partner as a lead organisation, rather than those led by central government). These eight action programmes are listed in Table 1.1, along with their main purpose, the lead organisations and examples of activities undertaken in Year 3 of the programme.

Table 1.1: The action programmes of the STEM Cohesion Programme

Action programme	Lead organisation	Examples of activities undertaken in 2009-2010
AP2 Improving teaching through CPD for mathematics teachers	National Centre for Excellence in the Teaching of Mathematics (NCETM)	• Creation of a National CPD Committee for maths to identify national priority areas. • Establishment of a national standard for maths. • The NCETM website has a database of maths CPD, so that teachers can access information from one central place. • Development of regional area committees so that in every English region, representatives from every sector meet on a termly basis to discuss and agree local and regional priorities, and provide information and reaction to government policy.
AP3 Improving teaching and learning through CPD for science teachers	National Science Learning Centre (NSLC)	• Both the National and regional CPD committees have met to consider the potential political and educational changes that will affect science CPD in the future. It is proposed that the National Committee will focus on informing policy, providing information to regional committees and being influential in curriculum development, while the regional committees are to focus on mapping and coordination of CPD, provision of advice and guidance, and monitoring quality of CPD. • There has been some increased use of the TDA database for mapping CPD. • Regional committees have mapped CPD school clusters and these will be reviewed on an ongoing basis. The Science Learning Centre, London have developed a successful Cluster Forum which facilitates clusters working collectively to share good practice.
AP4 Improving teaching and learning by engaging teachers with engineering and technology	Royal Academy of Engineering (RAEng)	• The RAEng co-funds (with DfE match-funding its contribution) a series of CPD courses at the NNSLC for design and technology teachers. Three courses have been developed and the fourth and final one is being developed. • The RAEng is the lead organisation for engineering and technology in eight regions of the LSIS 16+ STEM Programme for the 2010-11 academic year. • A comprehensive programme of CPD for teachers of the Level 3 Diploma in Engineering is fully underway. • An RAEng staff member has been seconded full-time at STEMNET to develop CPD for teachers who want to incorporate engineering dimensions within a STEM club setting.

		• The RAEng is funding the Maths Support Network to undertake work on contextualising the mathematics content of the 14-19 Diploma in Engineering.
AP5 Enhancing and enriching the science curriculum	SCORE (Science Community Representing Education)	• The SCORE partnership response to the Ofsted consultation on their guidance documents for subject-specific inspections recommended looking for evidence of schools incorporating E&E activity into the science curriculum. The letter informing scheme providers of the requirement for publicly available evaluation, together with the evaluation booklet, have gone out to all providers currently listed in the STEM Directories. • Five evaluation case studies to support the new requirement for publicly available evaluations have been prepared for entry in the STEM Directories. • SCORE has supported the RAEng workshops on effectively evaluating STEM enrichment and enhancement (E&E) activities. The workshops were aimed at STEM E&E providers and offered advice on conducting suitable evaluations for large- and small-scale STEM initiatives. • A summary document of the SCORE curriculum workshops aimed at E&E STEM providers is available online. • Gap analysis evaluation of the enhancement and enrichment provision is currently being undertaken.
AP6 Enhancing and enriching the teaching of engineering and technology across the curriculum	Royal Academy of Engineering	• A pre- and post- E&E event evaluation questionnaire has been developed (with ERS and Engineering UK) and trialled for the Tomorrow's Engineers initiative. It is now to be customised for each partner scheme in Tomorrow's Engineers. • An RAEng staff member has been seconded full-time at STEMNET to develop booster training for STEM Ambassadors who are engineers. • Three workshops on evaluation for E&E providers, funded by RAEng (with bursaries from the National STEM Centre) have been delivered in Newcastle, Birmingham and Bristol.
AP7 Enhancing and enriching the teaching of mathematics	Advisory Committee for Mathematics Education (ACME)	• The enhancement and enrichment Strategic Management Group (chaired by STEMNET) brings together colleagues operating across AP 5–7 to provide coherent direction for E&E activity across the STEM fields. • ACME continues to be an active member of this Strategic Management Group, through which it contributes the Committee's direction for AP5–7. • ACME's attendance at a meeting of mathematics E&E providers has provided linkage with the

		STEM E&E Strategic Management Group and will ensure that ACME is kept in touch with issues 'on the ground'. • ACME attendees at the above meeting provided an update on the STEM Directories and the forthcoming requirement of evaluation to ensure continued listing. The decision has been taken to look at usage statistics for the STEM Directories in order to help promote the idea of continued listing.
AP8 Improving the quality of advice and guidance for students (and their teachers and parents) about STEM careers, to inform subject choice	The National STEM Careers Coordinator at the Centre for Science Education at Sheffield Hallam University	• Full programme of outreach, including a number of high-profile representations to stakeholders, for example the House of Commons and the British Science Festival. • A link with Maths CPD providers via NCETM has been made available. • Additional science and maths curriculum materials have been published, with technology curriculum materials under development. • Economic Wellbeing pack being piloted. • STEM careers role model training being rolled out through STEMNET regions. • 'Excellent' uptake of Upd8 resources and TTV programmes by teachers.
AP10 Improving the quality of practical work in science	SCORE	• SCORE continues to coordinate the development of benchmarking of practical work resources, including case studies of schools with differing provision. The work will show examples of the types of behaviours and outcomes that would indicate good quality practical work. • Getting Practical held its first Annual Conference to celebrate its success in its first year. Seven hundred people are reported to have been trained through the Getting Practical programme which is on schedule to reach its overall target of 2000 by the end of the academic year in 2011. • The programme is currently being independently evaluated to review its impact on the delivery of practical work. • The Getting Practical website, www.gettingpractical.org.uk continues to be used as a hub to promote other practical science resources, including key books promoting the latest developments in practical science, new software resources to support practical chemistry and information from the Outdoor Science Working Group's seminar series. • The Getting Practical Wiki, which offers a range of material for improving practical work in science, currently has 450 registered users, all of whom have taken part in the professional development programme.

2 About the evaluation

2.1 Aims of the evaluation

The NFER was commissioned by the, then, DCSF (now DfE) to evaluate the STEM Cohesion Programme. The overall aims of the research were to gather:

- evidence of the programme's impact on teachers/lecturers and pupils/students
- clear and accessible information on 'what works', how, why and in what circumstances.

Within these broad aims, the evaluation investigated specific issues and questions pertinent to each of the three strands within the programme, which included:

Strand 1: Enhancement and Enrichment Co-ordination

Strand 2: Action Programmes

Strand 3: Careers Awareness and Subject Choice Programme.

In doing so, the following areas were explored:

Schools and colleges

- Awareness of, and access to, STEM-related information (covering careers, CPD and enhancement and enrichment opportunities)
- Views on the effectiveness of that information
- Engagement with STEM provision
- General attitudes towards, and experiences of, STEM. For example, confidence in teaching and knowledge of STEM careers.

Students

- Enjoyment of STEM subjects
- Views on STEM careers information
- Impact on attitudes towards STEM subjects and STEM careers.

Stakeholders

- Linkages between stakeholders
- Impact on their work generally, such as the influence on their STEM policies, programmes and funding decisions.

This is the third and final report produced by the evaluation. It provides an update on the initial base line and Year 2 reports produced in August 2009 and July 2010 respectively, and synthesises key evaluation findings and trends over the past three years of the evaluation. Where results are statistically significant they are clearly labelled in the text as such. Where other terms, for example 'notable' or 'marked', are used, these relate to findings that are considered interesting or indicative, but not statistically significant.

Whilst the NFER evaluation is evaluating the STEM Cohesion Programme as a whole, it should be noted that a number of individual action programmes are also being independently assessed.

2.2 Data collection

In the final year of the evaluation, there have been five main data collection activities:

- A telephone survey to maths/science and technology teachers/lecturers
- A key stage 3 student survey
- Verbal updates from representatives of the lead organisations
- A stakeholder survey to the wider STEM community
- School case studies.

Teacher/lecturer survey

For the teacher/lecturer survey two versions were created:

- One focussed on obtaining views about STEM information related to continuing professional development and enhancement and enrichment activities (CPD/E and E survey).
- A second survey dealing with careers-related information (careers survey).

Both surveys were directed towards teachers/lecturers with a responsibility for science, technology or maths in primary, secondary and FE colleges, although teachers were asked to complete only one survey, rather than both types. In Year 3, an additional question was included to elicit interviewees' perceptions of what STEM means to them. The surveys were predominantly made up of closed questions with a small number of questions inviting an open response.

A sample of 750 institutions, comprised of 70% secondary schools, 20% primary schools, and 10% FE colleges was devised. In devising the sample of schools/colleges, we sought to ensure representation from institutions:

- across the nine government office regions in urban and rural areas
- in areas of deprivation and relative wealth, using free school meals as an indicator of deprivation
- with differing levels of STEM attainment and participation.

In a small number of places there were differences in the characteristics of teachers' schools and the relevant population; on the whole the samples covered a broad spread of school characteristics. The analysis included frequencies of responses and also statistical tests of difference including t-tests, ANOVAs and chi-squares. These techniques are quite robust to fluctuations in the data.

In Year 1 of the evaluation, the survey response rate for the teacher/lecturer survey was disappointing; 3,825 surveys were administered and 531 were subsequently returned. This low response was considered perhaps indicative of schools/colleges' general lack of awareness of STEM initiatives and information sources. Although the paper survey included a detailed explanation of its purpose, teachers do not always have the time to digest this information and hence may have concluded that the survey was not appropriate for them to complete. To combat this problem, in Year 2, we decided to change our approach and elicit the views of teachers and lecturers through a telephone interview. This provided an opportunity for us explain the purpose of the research and say why it is important for them to register their views, whether or not they feel they are 'aware of STEM'.

This new methodology generated a total of 687 completed interviews in Year 2; 489 on enrichment activities and CPD and 198 on careers. It should be noted that 140 teachers took part in both Year 1 and 2 of the survey, whilst the remaining 547 served as a booster sample and completed just the Year 2 survey. In the second

year of our survey a much larger number of schools were represented in the sample, including 417 secondary schools, 81 primary and 102 FE colleges. This compares with a composition of 174 secondary, 5 primary and 26 FE colleges in the first year of the survey.

The new methodology used in Year 2 was repeated in Year 3. However, to ensure sample consistency between Years 2 and 3 and to assist data analysis, we did not seek to include a booster sample of teachers. Instead, in Year 3, we surveyed only those teachers who had taken part in Year 1 and/or Year 2. A total of 445 teachers took part. 346 undertook the enrichment and CPD survey, while 99 undertook the careers survey. Of the 346 responses to the enrichment and CPD survey, 59 per cent were from secondary teachers, 26 per cent were from FE teachers/lecturers and 15 per cent were from primary teachers. Of the responses to the careers survey, 98 survey returns were from secondary teachers, while a single respondent identified as a FE teacher/lecturer. For a detailed sample breakdown across all three years, see Appendix 1.

Interpreting the survey findings

Whilst the change in methodology from paper to telephone survey enabled us to increase the number of completed surveys, it has also created some issues in terms of interpreting the responses. Teachers are more likely to miss out or not respond to questions in a paper survey, compared to a telephone interview. In an interview context, they have an opportunity to clarify a question with the interviewer, or the interviewer can encourage teachers to provide an answer rather than make no comment at all. Consequently, the 'no response' percentage for many questions dropped in the second year of the survey. A large difference between no response percentages in Year 1 and Years 2 and 3 could give the potentially false impression of substantial movement in how teachers have responded to a question, for example, suggesting they feel a lot more positive in Year 2. The final report, as in the Year 2 report, therefore uses valid percentages, with no responses removed, as opposed to actual percentages. Since the samples of teachers responding to a particular question may differ due to the change in methodologies, comparisons between valid percentages in Year 1 and Years 2 and 3 should be treated with a degree of caution.

Although we achieved a higher number of responses in Year 2 (687 surveys), only 140 of these included teachers who had completed surveys in both years 1 and 2. In terms of making a longitudinal comparison, it was decided to compare the change in teacher responses of this group of 140, rather than test independent samples from

Year 1 and Year 2. Only questions that maintained the same structure were included in the comparison. This approach was maintained in Year 3 of the evaluation.

Key stage 3 student survey

In Year 1 of the evaluation 13 schools were recruited from those taking part in the teacher survey, for the purpose of administering a careers survey to a class of year 10 students. In Year 2 of the evaluation, 10 of the original 13 schools agreed to take part again, while in Year 3, nine of the original 13 participated again.

The survey included questions on:

- perceptions of STEM (such as enjoyment of STEM, desire to study, knowledge of STEM careers)
- views on careers information
- future career intentions.

In total, in Year 3 of the evaluation, 238 surveys were returned from the nine secondary schools. For more information on the sample see Appendix 2. In Year 2, 261 surveys were returned from 10 secondary schools; in Year 1, 342 surveys were returned from 13 secondary schools.

Lead organisation feedback

Representatives of the lead organisations were contacted in Spring 2011 and asked to provide an update on their activities since we last spoke to them (Summer 2009 and Spring 2010). They were also given an opportunity to comment on areas such as key challenges, developments and links between STEM stakeholders. The findings from these discussions are presented in Chapters 10 and 11 of the report.

Stakeholder survey

In order to ascertain the impact of the programme on the wider STEM community, as with Year 1, a brief proforma was circulated to 167 stakeholders in December 2010. Responses were received from 55 organisations, a substantial increase on the 24 obtained in Year 1, including representatives from industry, subject associations, institutes and societies. The proforma included questions on:

- respondents' awareness of the STEM Cohesion programme generally

- possible impacts of the programme (a list of specified areas was given and respondents were asked to indicate either 'a positive impact', 'no impact', or 'not applicable' and, if possible, to provide examples).

Data from the survey was entered into Excel spreadsheets which allowed responses to be categorised and quantified in terms of the proforma themes set out above. The findings from analysis of the stakeholder survey are presented in Chapters 10 and 11 of the report.

School case studies

To increase our understanding of the data collected via teacher surveys, as in Year 2, the evaluation has included school case-study visits. Teachers responding to either of the surveys were invited to signal their interest in taking part as a case study during the telephone interviews. In addition, researchers conducting teacher interviews highlighted teachers/schools as potential case-study examples. Case-study schools identified were those reporting a significant impact from their involvement in the programme with the aim of the visits being to understand how these impacts had been achieved. We also sought to include schools with different levels of STEM engagement at the beginning of their involvement and to ensure that the sample included schools with different levels of attainment in different socio-economic contexts.

Nine case studies were completed in Year 3, involving seven secondary schools, including two girls' schools, and two further education colleges. In-depth qualitative data was collected through interviews with 27 teachers, six pupil focus groups, and consultation with 12 parents via a brief survey.

Case-study discussions focussed on:

- schools' use of STEM information
- experiences of STEM E&E, CPD, careers support and resources
- schools' general engagement with STEM
- the information generally available on STEM-related activities
- suggestions for improvements to the provision of information.

The qualitative data collected during the school case studies was analysed thematically. The number of schools agreeing to act as a case study was quite low; nine in Year 3 and eight in Year 2. Thus, whilst the findings from the case studies can

not be considered representative of the school population as a whole, they do however provide valuable insights on STEM education and careers information and, as such, have been used within the report to illustrate and expand on some of the main survey findings.

3 Are teachers and lecturers aware of STEM information sources?

Key findings summary

- Teachers attach a broad range of meanings to the term 'STEM'. In addition to its basic meaning as an acronym, teachers associated 'STEM' with collaboration and cross-curricular working by teachers, additional resources being made available and various projects, challenges and events.
- Teachers exhibit a good awareness of opportunities and activities in relation to STEM enrichment, CPD and careers. Sixty-nine per cent of teachers in the Year 3 survey reported being aware of STEM enrichment activities for students, while 61 per cent were aware of STEM CPD opportunities.
- Awareness amongst teachers of STEM careers-related enrichment and CPD activities has increased over the past three years. More than half of the teachers responding to the Year 3 careers survey were aware of careers-related CPD activities (58 per cent) and enrichment opportunities (70 per cent) related to STEM careers; a significant increase from Year 2 of the survey.
- Knowledge of where to go for information on STEM activities and opportunities was also moderately good. Around six out of ten teachers reported knowing where to go for information regarding STEM enrichment and STEM CPD activities.
- Teachers' knowledge of how to access information on STEM careers has increased over the past three years. From Year 2 to Year 3 of the careers survey, teachers were significantly more likely to know where to go for information on STEM careers, information on careers-related enrichment and careers-related CPD. Teachers were also significantly more likely to know where to access classroom/curriculum resources relating to STEM careers.
- Almost all teachers participating in the survey were aware of at least one potential source of information on STEM enrichment, CPD and careers.
- The sources of information on STEM enrichment and CPD that teachers were most commonly aware of included: the National Science Learning Centre (53 per cent of teachers), the SSAT (50 per cent) and STEM Ambassadors (48 per cent). For information on STEM careers, teachers were most commonly aware of: DCSF (now DfE) communication campaigns (53 per cent of teachers), the 'see where they can take you' website (43 per cent), and STEMNET and STEMPOINTs (42 per cent).

The following six chapters of the report (chapters 3–8) focus on the data obtained through the Year 3 telephone surveys that were conducted with teachers and lecturers in primary and secondary schools, as well as FE

colleges. The broad intention of the surveys was to explore teachers' views on STEM information sources, covering areas such as awareness, use, effectiveness and so on. The responses to these surveys will be presented alongside the responses to the Year 1 self-completion paper surveys and the Year 2 telephone surveys.

This chapter examines teachers' and lecturers' understanding of the term 'STEM' and their awareness of the different sources of information regarding STEM careers, enrichment activities and CPD opportunities. The surveys explored these areas by asking whether teachers and lecturers were aware of the various STEM activities available to them, and whether they knew where to go for information about these activities. Teachers and lecturers were also presented with an extensive list of potential sources of information, and asked whether they were aware each of the sources.

3.1 Understanding of 'STEM' and awareness of STEM activities generally

In Year 3 of the survey, an additional question was asked of teachers and lecturers, asking them to convey what the term 'STEM' means to them. This question was asked in order to explore the extent to which teachers and lecturers hold differing perceptions of what the term 'STEM' means to them. Indeed, only a small minority of teachers (5 per cent responding to the enrichment and CPD survey, and 8 per cent of those responding to the careers questionnaire) responded that 'STEM' was simply an acronym representing science, technology, engineering and mathematics.

Teachers attached a number of other meanings to the terms STEM. These included, in order of frequency:

- the idea of a cross-curricular approach to the STEM subjects and collaborative working with colleagues
- additional resources, and the organisation of those resources for the STEM subjects
- various challenges, project and events associated with the STEM subjects, and the enhanced learning opportunities that are associated with these,
- promotion of careers/employability related to the STEM subjects, and
- the understanding of STEM as a particular government body, or initiative.

These responses reveal that, while the dialogue surrounding the STEM agenda is quite active and well developed at a policy level, at school level, there remain different understandings of the term 'STEM'. While most teachers and lecturers do understand the term's origin as an acronym for the STEM subjects, many attach a meaning to the term that might relate more directly to their particular experience of the STEM agenda, be that careers, collaborative working, STEM 'events' or particular government bodies.

Before focussing on teachers' and lecturers' awareness of specific information sources, the questionnaire set out to capture their awareness of STEM activities generally. They were asked, for example, about their awareness of STEM enrichment activities for students and STEM CPD opportunities. Should teachers and lecturers report awareness of these activities, it would suggest that they are receiving information about these from some source or another.

In Year 3, more than two-thirds of teachers and lecturers (69 per cent) agreed that they were aware of STEM enrichment activities for students (see Table 3.1). More than two-thirds of teachers and lecturers (70 per cent) were aware of enrichment activities for students which specifically covered STEM careers. Meanwhile, a majority of teachers and lecturers were aware of STEM CPD opportunities (61 per cent). Section 3.3 of the report reviews the sources of information on STEM enrichment activities and STEM CPD that teachers and lecturers were most commonly aware of.

More than half of the teachers and lecturers (58 per cent) agreed that they were aware of CPD opportunities that covered STEM careers. Although not statistically significant, this represents a marked improvement in level of awareness over previous years.

Table 3.1 Awareness of STEM provision

I am aware of...	Survey year	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	N (valid)
STEM enrichment activities for students					
	Year 3 (2010/11)	69	9	12	346
	Year 2 (2009/10)	66	21	13	489
	Year 1 (2008/09)	58	8	34	296
enrichment activities that cover STEM careers					
	Year 3 (2010/11)	70	21	9	99
	Year 2 (2009/10)	49	23	28	198
	Year 1 (2008/09)	45	13	42	229
STEM CPD opportunities for teachers/ lecturers					
	Year 3 (2010/11)	61	21	19	346
	Year 2 (2009/10)	57	21	22	489
	Year 1 (2008/09)	42	16	42	295
CPD opportunities for teachers that cover STEM careers					
	Year 3 (2010/11)	58	22	20	99
	Year 2 (2009/10)	43	22	35	198
	Year 1 (2008/09)	33	21	45	228

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1, Year 2 and Year 3

Comparison of those teachers and lecturers who participated in both the Year 1 and Year 2 surveys revealed that significantly[7] more teachers were aware of STEM enrichment activities and STEM CPD opportunities generally, in the second year of the evaluation. While this trend continued for teachers undertaking both the Year 2 and Year 3 questionnaires, these increases were not found to be statistically significant.

While there were increases in the proportions of teachers aware of enrichment activities and CPD covering STEM careers between Year 1 and Year 2, these

[7] Significance tests were carried out at the 95 per cent level.

were not found to be statistically significant. However, the increases in awareness of careers-specific STEM CPD and enrichment observed between Year 2 and Year 3 of the survey are statistically significant.

Looking at the responses from different educational institutions to the enrichment and CPD survey[8] during the third year of the evaluation, a considerably larger proportion of secondary teachers (80 per cent) were aware of STEM enrichment opportunities for students. This compares to 56 per cent of primary teachers and 53 per cent of FE lecturers who reported being aware of STEM enrichment opportunities for students.

3.2 Knowing where to go for information

Teachers and lecturers responding to the surveys were then asked whether they knew where to go for information regarding a range of STEM activities. Responses are shown in Table 3.2.

Table 3.2 Knowledge of where to go for STEM provision

I know where to go for...	Survey year	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	N (valid)
information regarding STEM enrichment activities for students					
	Year 3 (2010/11)	64	19	17	346
	Year 2 (2009/10)	61	21	18	489
	Year 1 (2008/09)	45	18	37	295
information regarding STEM CPD opportunities for lecturers/teachers					
	Year 3 (2010/11)	61	21	19	346
	Year 2 (2009/10)	57	21	22	489
	Year 1 (2008/09)	37	17	46	294
information on STEM careers-related enrichment activities					
	Year 3 (2010/11)	60	25	15	99
	Year 2 (2009/10)	40	25	34	198
	Year 1 (2008/09)	32	23	45	227

[8] The STEM enrichment and CPD survey was completed by teachers/lecturers from primary schools, secondary schools and FE colleges. The STEM careers survey was only completed by secondary school teachers.

information on STEM careers-related CPD opportunities					
	Year 3 (2010/11)	47	33	20	99
	Year 2 (2009/10)	34	26	39	198
	Year 1 (2008/09)	27	26	47	227
for information about STEM careers					
	Year 3 (2010/11)	77	13	10	99
	Year 2 (2009/10)	51	23	26	198
	Year 1 (2008/09)	44	22	34	228
I know where to access STEM careers classroom/curriculum resources					
	Year 3 (2010/11)	56	19	25	99
	Year 2 (2009/10)	40	22	38	198
	Year 1 (2008/09)	31	23	46	229

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1, Year 2 and Year 3.

In Year 3, almost two-thirds of teachers agreed that they knew where to go for information about STEM enrichment activities for students (64 per cent), while a slightly smaller proportion (60 per cent) knew where to go for information on STEM careers-related enrichment activities. Sixty-one per cent of those responding to the enrichment and CPD questionnaire agreed that they knew where to go for information on STEM CPD opportunities for teachers and lecturers, while only 47 per cent of those responding to the careers questionnaire agreed that they knew where to go for information on STEM careers-related CPD opportunities. More than half of teachers (56 per cent) knew where to go for classroom or curriculum resources that related to STEM careers.

Comparing responses from different institutions, secondary school teachers reported somewhat lower knowledge (56 per cent) of where to go for information on STEM CPD opportunities than their primary (64 per cent) and FE (65 per cent) counterparts.

Comparison of teachers and lecturers who participated in both the Year 1 and Year 2 surveys revealed that at the time of the second survey, significantly more teachers knew where to go for information regarding STEM enrichment

activities for students and STEM CPD opportunities for teachers/lecturers. While smaller increases were observed between Year 2 and Year 3 of the survey, these were not found to be statistically significant.

Increases in teachers' knowledge of where to go for information on STEM careers-related enrichment and CPD were observed throughout the research period. These figures were not found to be statistically significant between Years 1 and 2 of the survey, but from Year 2 to Year 3 of the survey, teachers were significantly more likely to know where to go for information on STEM careers, information on careers-related enrichment and careers-related CPD. In Year 3 of the survey, teachers were also significantly more likely to know where to access classroom/curriculum resources relating to STEM careers.

During the qualitative case-study interviews, many teachers commented that they were quite comfortable in locating any information they required, but that this was not always necessary. In Year 2 of the evaluation, one design and technology teacher commented: 'I'm quite aware of where I need to look, if I did need to look. But I haven't needed to as we've already been involved in the existing activities'. A biology teacher in Year 3 suggested that teachers were perhaps more comfortable accessing information because there was now a greater awareness of what STEM is, and of the fact that there is a wealth of relevant information and resources 'out there'.

3.3 Knowledge of specific information sources

Lastly, the questionnaires asked teachers and lecturers about whether they were aware of a range of specific information sources about STEM enrichment activities, STEM CPD activities and STEM careers activities. The list provided included potential sources such as the STEM Directories, STEMNET, Science and Engineering Ambassadors and the various professional associations[9]. Table 3.3 shows the percentages of teachers who were aware of a particular numbers of sources.

[9] Due to the timing of the survey, the recently introduced National STEM Centre website and its e-Library was not included as one of the potential sources.

Table 3.3 Awareness of specific sources of STEM information[10]

	Enrichment and CPD Questionnaire (%)			STEM Careers Questionnaire (%)		
	Year 3 (2010/11) list of 28 sources, N=346	Year 2 (2009/10) list of 25 sources, N=489	Year 1 (2008/09) list of 21 sources, N=299	Year 3 (2010/11) list of 18 sources, N=346	Year 2 (2009/10) list of 18 sources, N=198	Year 1 (2008/09) list of 13 sources, N=232
Aware of no sources	1	1	10	5	6	11
1-5 sources	34	22	41	56	47	67
6-10 sources	33	36	24	33	41	18
11-15 sources	25	26	14	6	6	4
16+ sources	7	15	11	0	1	N/A

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1, Year 2 and Year 3.

In Year 3 of the survey, almost two thirds of teachers and lecturers (64 per cent) were aware of six or more potential sources of information on STEM enrichment and STEM CPD, with just one per cent not aware of any of these potential sources. Less than half of teachers and lecturers (39 per cent) were aware of six or more potential sources of STEM careers information. Five per cent of teachers and lecturers were not aware of any sources of STEM careers information.[11]

In Year 3, the sources of information on STEM enrichment activities and STEM CPD that teachers and lecturers were most commonly aware of were:

[10] Please note, this question was asked differently across the two years. In Year 1, respondents were presented with a list of sources to tick, along with space to add any others they were aware of. In Years 2 and 3, respondents were asked to list any sources they were aware of, without prompts, and then the interviewer asked about their awareness of a specific list of sources they had not already mentioned.

[11] Please note that when comparing responses across the years it is important to consider that different numbers of sources were listed in the two surveys. For this reason, it is not appropriate to make a direct comparison between the two surveys.

- The National Science Learning Centre (53 per cent)
- The Specialist Schools and Academies Trust (SSAT) (50 per cent)
- STEM Ambassadors (48 per cent)
- The Institute of Physics (47 per cent)
- Regional Science Learning Centres (47 per cent)
- The Royal Society of Chemistry (46 per cent)
- Local Authority consultants and advisors (45 per cent).

The sources of information on STEM careers that teachers and lecturers were most commonly aware of were:

- DCSF (now DfE) communications campaign such as radio adverts) (53 per cent)
- 'see where they can take you' (www.scienceandmaths.net)(43 per cent)
- STEMNET and STEMPOINTs (42 per cent)
- The Jobs4U website (37 per cent)
- STEM subject choice and careers' programmes shown on Teachers TV (33 per cent)
- The online STEM Directories (29 per cent)
- The STEM Directory - Engineering and Technology (paper version) (29 per cent)
- The National Science Learning Centre (29 per cent).

4 What sources of information are being used?

Key findings summary

- Only a minority of the teachers and lecturers had not used any of the listed sources[12] to gain information on STEM enrichment activities or STEM CPD (17 per cent and 25 per cent, respectively). This represents a notable drop compared to figures for Year 1 of the survey, and is indicative of increased awareness of the resources available.
- The majority of teachers responding to both of the surveys report using between one and five sources of information on STEM enrichment and CPD or STEM careers.
- Teachers and lecturers most frequently identified that they had used the following sources for information:

  On STEM CPD activities:

  - Local Authority consultants and advisors (25 per cent)
  - National Science Learning Centre (25 per cent)
  - The Specialist Schools and Academies Trust (21 per cent).

  On STEM enrichment activities:

  - Local Authority consultants and advisors (24 per cent)
  - The Royal Society of Chemistry (24 per cent)
  - The Association for Science Education (23 per cent).

  On STEM careers activities:

  - The 'jobs4U' website (31 per cent)
  - DCSF (now DfE) communications campaigns (30 per cent)
  - The 'see where they can take you' website (27 per cent).

Having considered the extent to which teachers and lecturers are aware of STEM-related information, this section aims to explore whether the sources of STEM information are actually being used. Teachers and lecturers were asked whether they had used a specific list of sources (this list consisted of those sources that respondents had previously identified that they were aware of, as discussed in the previous chapter). Additionally, teachers were asked to identify whether they had found any sources of information particularly helpful.

[12] During each year of the teacher surveys, teachers were asked whether they were aware of, or had used, a range of specific STEM information sources. These lists were different during each year of the survey, reflecting new sources of information becoming available over the three years of the evaluation. For a full list of the particular information sources listed as part of each survey, please see the relevant research instruments in Appendix 3.

It is important to reiterate here (as noted in Chapter 2), that the change in methodology from a paper survey in Year 1 to a telephone survey in Years 2 and 3 reduced the 'no response' percentage for many questions, but created some issues in terms of interpreting the responses. This final report, as in Year 2, therefore uses valid percentages (with no responses removed) as opposed to actual responses. Since the samples of teachers responding to a particular question may differ due to the change in methodology, comparisons between valid percentages in Year 1 and Years 2 and 3 should be treated with a degree of caution. At the same time, in terms of making a longitudinal comparison, it was decided to compare changes in teacher responses only of those who had completed surveys in both Years 1 and 2. Thus, only questions that maintained the same structure were included in the comparison. This approach was maintained in Year 3 of the evaluation.

4.1 Number of sources used

Table 4.1 shows the number of sources teachers and lecturers reported using to find information across the different STEM areas of enrichment and CPD.

Table 4.1 Use of information sources on STEM enrichment and CPD[13]

	Information on enrichment activities (%)			Information on CPD (%)		
	Year 1 (2008/09) list of 21 sources, N=299	Year 2 (2009/10) list of 25 sources, N=489	Year 3 (2010/11) list of 28 sources, N=346	Year 1 (2008/09) list of 21 sources, N=299	Year 2 (2009/10) list of 25 sources, N=489	Year 3 (2010/11) list of 28 sources, N=346
Did not use any sources	46	21	17	47	22	25
Used 1 or 2 sources	24	24	37	29	26	43
Used 3-5 sources	20	28	30	15	27	24
Used 6-8 sources	7	15	10	9	14	6
Used 9+ sources	2	13	6	<1	12	1

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.

[13] Please note, this question was asked differently across the different years. In Year 1, respondents were presented with a list of sources and asked to tick any they had used, along with space to add any others. In Year 2 and 3, respondents were asked to list any sources they were aware of, without prompts, and then the interviewer asked about their awareness of a specific list of sources they had not mentioned. For those sources which they were aware of, respondents were asked if they had used each source.

Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1, Year 2 and Year 3.

Only a minority of the teachers and lecturers had not used any of the listed sources to gain information on STEM enrichment activities or STEM CPD (17 per cent and 25 per cent, respectively). This represents a notable drop compared to figures for Year 1 of the survey for enrichment and CPD activities, where the figures were 46 per cent and 47 per cent, respectively.

In Year 3 of the survey, the majority of those gaining information through the sources listed had used between one and five sources. The lists of potential sources of information on STEM careers, CPD and enrichment used in the surveys were slightly different across the Year 1, Year 2 and Year 3 surveys. As such, a direct comparison of figures between the surveys is inappropriate. However, the Year 3 responses do tend to paint a more positive picture of teachers' use of STEM information than the responses from Year 1, with three quarters or more of teachers from both surveys reporting use of at least one form of information on STEM enrichment and CPD or STEM careers.

Teachers and lecturers most frequently identified that they had used the following sources for information on STEM CPD activities:

- Local Authority consultants and advisors (25 per cent)
- National Science Learning Centre (25 per cent)
- The Specialist Schools and Academies Trust (21 per cent)
- The Association for Science Education (ASE) (16 per cent)
- The National Strategies (Science and Maths) (15 per cent)
- The National Centre for Excellence in the Teaching of Mathematics (13 per cent).

As can be seen, teachers reported obtaining information on STEM CPD from a range of different sources. Local Authority advisors and consultants were the most commonly used source of information, with approximately one quarter (25 per cent) of teachers and lecturers using them as a source for information on STEM CPD:

> The maths team at county are quite proactive, so there's a termly newsletter with any new publications, links. The county do termly subject leader days as well, so we meet with a cluster of schools, so I go to those as well – with regard to maths it's quite good.
>
> Subject coordinator, mathematics, Year 2 primary school

The National Science Learning Centre was the next most popular source for information on STEM CPD, being used by around a quarter (25 per cent) of teachers and lecturers.

In relation to STEM enrichment, the following sources of information were most often used by teachers and lecturers**:**

- Local Authority consultants and advisors (24 per cent)
- The Royal Society of Chemistry (24 per cent)
- The Association for Science Education (23 per cent)
- NRich Maths (23 per cent)
- The Specialist Schools and Academies Trust (21 per cent)
- The National Centre for Excellence in the Teaching of Mathematics (21 per cent).

Again, Local Authority consultants and advisors were the most commonly utilised source for information on STEM enrichment. Other commonly used sources of information for STEM enrichment, including the SSAT, the NCETM and the ASE were similar to those sources often used for STEM CPD information. This indicates that teachers and lecturers may be receiving information on STEM enrichment and CPD from the same sources.

Table 4.2 shows the number of sources teachers and lecturers reported using to find information on STEM careers.

Table 4.2 Use of information sources on STEM careers[14]

	Information on STEM careers (%)		
	Year 1 (2010/11) list of 13 sources, N=232	Year 2 (2009/10) list of 18 sources, N=198	Year 3 (2008/09) list of 18 sources, N=99
Did not use any sources	11	23	21
Used 1 or 2 sources	67	32	28
Used 3-5 sources	42	27	18

[14] Please note, this question was asked differently across the three years. In Year 1, respondents were presented with a list of sources and asked to tick any they had used, along with space to add any others. In Year 2, respondents were asked to list any sources they were aware of, without prompts, and then the interviewer asked about their awareness of a specific list of sources they had not mentioned. For those sources which they were aware of, respondents were asked if they had used each source.

Used 6-8 sources	9	15	4
Used 9+ sources	1	3	0

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1, Year 2 and Year 3.

With respect to STEM careers, teachers and lecturers most often stated that they had used the following sources for information:

- Jobs4U website (31 per cent)
- DCSE (now DfE) communications campaign, for example radio adverts (30 per cent.)
- 'See where they can take you' (www.scienceandmaths.net) (27 per cent)
- STEMNET and STEMPOINTs (26 per cent)
- STEM subject choice and careers programmes shown on Teachers TV (18 per cent)
- Enginuity website (www.enginuity.org.uk) (15 per cent).

Interestingly, most of these commonly used sources of information on STEM careers are web-based sources.

In addition to the sources mentioned above, qualitative case-study interviews revealed the existence of informal networks which furnished teachers with STEM-related information. At one secondary school, in Year 2 of the evaluation, which was involved in a wide range of STEM activities, teachers explained how information on these activities was drawn from colleagues, local community contacts and serendipitous meetings. Indeed, for a number of the schools that were consulted, teachers perceived very little need to engage in searching for STEM information as, by virtue of their existing involvement in activities, they received further information on relevant activities. Teachers reported this occurring both through the formal information channels of those organisations with whom they were already involved (for example, emails from East Midlands Science Learning Centre and contact with local universities), as well as through informal relationships with these providers of STEM activities and other users. In Year 3 of the evaluation, teachers in case-study schools stressed the role of a STEM coordinator in assessing, filtering and communicating relevant STEM-related information.

> I tend to use the [information] sources that relate specifically to projects we are [already] involved with.

STEM Coordinator, Year 2 secondary school

If I visit anywhere, I'll speak to people and get cards and numbers – networking.

Head of Design and Technology, Year 3 secondary school

I have built up a comprehensive network of contacts over the years, including the local university forensic science department. If I want something I usually give them a ring and usually they can help.

Science teacher, Year 3 secondary school

Part of the careers thing that I did was I contacted all the universities that offer maths at a degree level … got on all their email lists. So hopefully, the local universities will start sending us stuff directly.

Maths teacher, Year 3 secondary school

4.2 Helpfulness of information sources

Teachers and lecturers were asked whether they had found any sources of information regarding STEM enrichment activities and STEM CPD particularly helpful. Almost half (49 per cent) of teachers did not nominate any specific source of information. Eight per cent of teachers identified STEMNET as especially helpful. Furthermore, four and three per cent of teachers, respectively, identified Regional Science Learning Centres and the National Science Learning Centre as particularly helpful. The remaining teachers nominated a wide range of individual sources as being particularly helpful. Examples, nominated by fewer than three per cent of teachers, included the SSAT, RAEng, RSC and the STEM Directories. The STEM careers questionnaire posed the same question. Again, STEMNET was identified as being particularly helpful (9 per cent of teachers). The National Science Learning Centre was also identified as particularly helpful by four per cent of teachers.

The next chapter of the report looks in more depth at the issue of effectiveness.

5 How effective are the information sources?

Key findings summary

- Of those teachers and lecturers who are using information on STEM, most find it current, clearly arranged and sufficiently detailed. It appears that coordination of information is an area where some teachers feel improvements could still be made. However, in Year 3, notably more teachers agreed that careers information was well-coordinated than was the case in Year 2 of the survey.
- Most teachers agreed that information about STEM careers, options for studying STEM and routes and pathways into STEM careers was sufficiently detailed. Still, slightly less than half of teachers (46 per cent) agreed that there was sufficient availability of resources to support integration of careers resources into lessons, although this did represent an increase on the corresponding figure from Year 2 (27 per cent)
- Science teachers tended to agree more frequently than their mathematics and technology/engineering colleagues that information on STEM CPD and enrichment was effective.

This section explores the extent to which teachers and lecturers felt that the information on STEM provision provided to them was effective. More specifically, the section considers whether teachers and lecturers feel the information on STEM provision is current, clearly presented, locally focussed, well coordinated, detailed and user-friendly.

Due to a high rate of non-response to these questions in the Year 1 survey, the Year 2 and Year 3 survey included a ‘don’t know’ response option. As the response scales therefore differ between the surveys, figures from the Year 1 surveys are not presented alongside the figures from Years 2 and 3.

It is important to reiterate here (as noted in Chapter 2), that the change in methodology from a paper survey in Year 1 to a telephone survey in Years 2 and 3, although reducing the ‘no response’ percentage for many questions in the later surveys, created some issues in terms of interpreting the responses. This final report, as in Year 2, therefore uses valid percentages (with no responses removed) as opposed to actual responses. Since the samples of teachers responding to a particular question may differ due to the change in methodology, comparisons between valid percentages in Year 1 and Years 2 and 3 should be treated with a degree of caution. At the same time, in terms of making a longitudinal comparison, it was decided to compare changes in teacher responses only of those who had completed surveys in both Years 1 and 2. Thus, only questions that maintained the

same structure were included in the comparison. This approach was maintained in Year 3 of the evaluation.

5.1 The extent to which STEM information is current and up-to-date

Teachers and lecturers were asked if they felt that STEM information was current and up-to-date. The most frequent response in Years 2 and 3 across the areas of enrichment, CPD and careers was 'agree'. Only between four and seven per cent of teachers and lecturers disagreed that information across each of STEM enrichment, CPD and careers was current and up to date.

Table 5.1 The extent to which STEM information is current and up-to-date

Information is current and up-to-date	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Don't know (%)	N (valid)
STEM enrichment provision					
Year 3 (2010/11)	61	17	7	15	346
Year 2 (2009/10)	66	15	3	16	486
STEM CPD provision					
Year 3 (2010/11)	61	13	6	19	346
Year 2 (2009/10)	58	13	4	25	486
STEM careers					
Year 3 (2010/11)	66	23	4	7	74
Year 2 (2009/10)	69	15	4	11	144

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 2 and Year 3

5.2 Clear arrangement and presentation

In Year 3, more than half of teachers and lecturers agreed that information on STEM was presented and categorised clearly. The proportion of teachers agreeing that information on STEM careers is clearly presented and categorised saw a notable jump from Year 2 to Year 3, from 53 per cent to 69 per cent.

Table 5.2 Clarity of presentation and categorisation of STEM information

Information is clearly presented and categorised	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Don't know (%)	N (valid)
STEM enrichment provision					
Year 3 (2010/11)	52	25	8	16	346
Year 2 (2009/10)	60	16	8	15	486
STEM CPD provision					
Year 3 (2010/11)	56	17	7	19	346
Year 2 (2009/10)	55	15	4	25	486
STEM careers					
Year 3 (2010/11)	69	20	4	7	74
Year 2 (2009/10)	53	27	8	12	144

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 2 and Year 3.

5.3 Coordination of information

While many more teachers and lecturers agreed than disagreed that STEM information was well coordinated, this tendency was not as pronounced as it was in most other questions from this section. For some teachers using it, concerns still remain regarding the coordination of information on STEM, particularly in the areas of STEM enrichment (14 per cent). Notably, the proportion of teachers agreeing that information on STEM careers is well coordinated rose between Year 2 and Year 3, from just over a third of teachers (35 per cent) to almost half of the teachers (47 per cent).

Table 5.3 Coordination of STEM information

Information is well coordinated	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Don't know (%)	N (valid)
STEM enrichment provision					
Year 3 (2010/11)	43	25	14	18	346
Year 2 (2009/10)	45	25	13	16	486
STEM CPD provision					
Year 3 (2010/11)	46	23	9	22	346
Year 2 (2009/10)	43	22	8	27	486
STEM careers					
Year 3 (2010/11)	47	31	10	12	74
Year 2 (2009/10)	35	32	20	13	144

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 2 and Year 3

In Year 2 of the evaluation, teachers in the case-study schools identified the role of STEM Coordinator as being an innovative school-level approach to the coordination of STEM information. Within one secondary school in the East of England, a member of the Senior Management Team from the science department had taken on the position of STEM Coordinator. As well as overseeing the school's large array of STEM activities, the STEM Coordinator provided a focal point for STEM information coming into the school. Using the knowledge gained through oversight of the school's STEM programmes, the Coordinator was then able to forward the information on to the most appropriate teacher. A mathematics teacher explained the benefits of this arrangement:

> If something arrives and you like the look of it and have some breathing space, then something can be done about it. However, if you're just snowed under, then you can't take it on. The STEM Coordinator is in charge of that, so he's trying to make sure that that doesn't happen.

By Year 3 of the evaluation, the value and importance of this role in terms of coordinating STEM information was highlighted by many of the teachers in the case-study schools.

5.4 Adequacy of detail

In Year 3, just over half of teachers and lecturers agreed with the statement that information on STEM enrichment and CPD included sufficient detail regarding activities.

Table 5.4 Perceived adequacy of detail in STEM information (as reported by STEM teachers and lecturers)

Information includes sufficient detail regarding activities	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Don't know (%)	N (valid)
STEM enrichment provision					
Year 3 (2010/11)	54	19	5	17	346
Year 2 (2009/10)	54	21	8	17	486
STEM CPD provision					
Year 3 (2010/11)	54	17	6	21	346
Year 2 (2009/10)	48	20	6	26	486

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire Year 2 and Year 3

Those responding to the questionnaire on STEM careers information were asked a series of questions regarding the sufficiency of detail across various aspects of STEM careers information. Responses are shown in Table 5.5. A majority of teachers agreed with the statements that information included sufficient detail regarding STEM careers (60 per cent), options for studying STEM (66 per cent) and route and pathways into STEM careers (57 per cent). However, slightly fewer than half (46 per cent) of teachers agreed that there was sufficient detail and resources to support them in integrating information about careers. Across each measure of the adequacy of information on STEM careers, considerably more teachers agreed with these statements when responding to the Year 3 survey than was the case for earlier years of the evaluation.

Table 5.5 Perceived adequacy of detail in regard to STEM careers information (as reported by STEM teachers and lecturers)

Information includes sufficient detail:	Agree (%)	Neither agree nor disagree (%)	Disgree (%)	Don't know (%)	N (valid)
Regarding STEM careers					
Year 3 (2010/11)	60	28	3	10	74
Year 2 (2009/10)	44	28	10	17	144
Regarding options for studying STEM					
Year 3 (2010/11)	66	22	4	8	74
Year 2 (2009/10)	41	26	15	19	144
Regarding routes and pathways into STEM careers					
Year 3 (2010/11)	57	24	10	10	74

Year 2 (2009/10)	44	28	10	18	144
Resources to support me in integrating information about careers					
Year 3 (2010/11)	46	32	14	8	74
Year 2 (2009/10)	27	32	26	15	144

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 2 and Year 3.

5.5 Potential to tailor information

Again, considerably more teachers and lecturers agreed, than disagreed, that the information on STEM allowed them to judge and select what might be appropriate and useful for their circumstances. This was more strongly the case across STEM enrichment and CPD areas (55 and 58 per cent, respectively) than STEM careers, where relatively fewer teachers and lecturers (47 per cent) agreed that they were able to tailor the information to their circumstances. This did, however, represent an improvement on the Year 2 responses, where just 40 per cent of teachers and lecturers agreed with the statement that the 'information allows me to judge and select what might be appropriate/useful for me and my staff.'

Table 5.6 Potential to tailor STEM information

Information allows me to judge and select what might be appropriate/useful for me and my staff	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Don't know (%)	N (valid)
STEM enrichment provision					
Year 3 (2010/11)	55	21	6	17	346
Year 2 (2009/10)	57	19	8	16	486
STEM CPD provision					
Year 3 (2010/11)	58	17	6	20	346
Year 2 (2009/10)	52	16	6	25	486
STEM careers					
Year 3 (2010/11)	47	39	3	11	74
Year 2 (2009/10)	40	31	16	13	144

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 2and Year 3

5.6 Details on local activities

Less than half of teachers and lecturers responding to the Year 3 survey agreed that STEM enrichment information (41 per cent) and CPD information (46 per cent) included details about activities in their local area. Neutral responses (including

'neither agree nor disagree' and 'don't know') made up a considerable proportion of responses: 41 per cent and 43 per cent of responses, respectively, to the questions on STEM enrichment information and STEM CPD information.

Table 5.7 STEM information: details on local activities

Information includes details about activities in my local area	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Don't know (%)	N (valid)
STEM enrichment provision					
Year 3 (2010/11)	41	23	18	18	346
Year 2 (2009/10)	44	22	17	17	486
STEM CPD provision					
Year 3 (2010/11)	46	22	11	21	346
Year 2 (2009/10)	43	18	11	28	486

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, Year2 and Year 3

Across the various measures of the effectiveness of STEM information, a number of variations were observed based on teachers' subject specialism areas and school stage. For example, those teachers and lecturers who reported having a science specialism tended to agree more often than their mathematics-specialism and engineering/technology-specialism[15] colleagues that information on STEM enrichment and CPD was effective, across such areas as the extent to which STEM information is current and up-to-date, the level of detail of STEM information and the clarity of STEM information. For information on STEM careers, there was no clear pattern of particular subject-specialist teachers rating the various aspects of information on STEM careers more highly than other teachers.

Some differences were observed in responses to this section of questions amongst teachers from primary schools, secondary schools and FE colleges. Primary school teachers tended to agree less frequently than their secondary and FE colleagues that information on STEM enrichment was effective. This was true across such aspects of enrichment information as the extent to which enrichment information is current and up-to-date, its clarity of presentation and its level of detail. It may be that greater attention to tailoring information on STEM enrichment towards this particular sector could be beneficial.

[15] Teachers and lecturers who taught a combination of more than one subject (of science, maths and technology) represented approximately nine per cent of the sample for the STEM enrichment and CPD survey and three per cent of the STEM careers survey.

6 To what extent are teachers and lecturers engaging with STEM provision?

Key findings summary

- Teachers' engagement with STEM enrichment and CPD activities is increasing. Almost half of teachers responding to the Year 3 survey (44 per cent) reported that they 'often' engaged with STEM enrichment activities and three in ten (32 per cent) often engaged with STEM CPD activities. This was a statistically significant increase on the corresponding figures in Year 2 of the survey.
- Fewer teachers report engaging with careers-related STEM activities. Approximately three in ten teachers (28 per cent) 'often' engaged with STEM careers-related enrichment activities, while fewer teachers (15 per cent) often engaged with STEM careers-related CPD. This may indicate that there is often not a substantial STEM careers focus within enrichment activities for students and CPD for teachers.
- Most teachers identify engaging with STEM enrichment and careers activities. Eighty-one per cent of teachers and lecturers identified STEM enrichment activities that they had engaged with during 2009/10 academic year, while 78 per cent of teachers identified STEM careers-related activities that they had been involved with. Both these measures represented a substantial increase over the Year 2 figures.
- Substantial proportions of teachers indicated that they had not participated in any STEM CPD (49 per cent) during 2009/10, which was actually slightly higher than the 43 per cent of teachers reporting no STEM CPD activities in Year 2.
- Teachers' satisfaction with the range of STEM activities available to them is increasing. Satisfaction with the range of STEM enrichment opportunities and STEM CPD opportunities available increased significantly between Year 2 and Year 3 of the survey. Satisfaction with the range of STEM careers provision also increased over this same period.

This chapter reports on teachers' and lecturers' level of engagement with STEM activities. The surveys asked teachers to comment on their levels of engagement with various STEM activities as well as to provide details of any STEM activities they had been involved with during the preceding academic year.

It is important to reiterate here (as noted in Chapter 2), that the change in methodology from a paper survey in Year 1 to a telephone survey in Years 2 and 3 reduced the 'no response' percentage for many questions, but created some issues in terms of interpreting the responses. This final report, as in Year 2, therefore uses valid percentages (with no responses removed) as opposed to actual responses. Since the samples of teachers responding to a particular question may differ due to the change in methodology, comparisons between valid percentages in Year 1 and

Years 2 and 3 should be treated with a degree of caution. At the same time, in terms of making a longitudinal comparison, it was decided to compare changes in teacher responses only of those who had completed surveys in both Years 1 and 2. Thus, only questions that maintained the same structure were included in the comparison. This approach was maintained in Year 3 of the evaluation.

6.1 Levels of engagement with STEM

Teachers responding to the surveys were asked whether they 'often' engage with STEM activities. Responses to each of the STEM areas are shown in Table 6.1

Table 6.1 Levels of engagement with STEM

I often engage with...	Survey year	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	N (valid)
STEM enrichment activities for my students	Year 3 (2010/11)	44	26	30	346
	Year 2 (2009/10)	40	24	36	486
	Year 1 (2008/09)	28	30	42	263
STEM CPD activities to develop my teaching	Year 3 (2010/11)	32	28	39	346
	Year 2 (2009/10)	32	26	42	486
	Year 1 (2008/09)	23	32	46	260
STEM careers-related enrichment activity	Year 3 (2010/11)	28	34	37	99
	Year 2 (2009/10)	24	19	58	198
	Year 1 (2008/09)	18	25	57	213
STEM careers-related CPD for teachers	Year 3 (2010/11)	15	18	67	99
	Year 2 (2009/10)	13	16	71	198
	Year 1 (2008/09)	10	29	62	213

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1 Year 2 and Year 3.

STEM enrichment activities for students was the area of provision that teachers most frequently identified that they 'often' engaged with. Indeed, in Year 3, 44 per cent of

teachers and lecturers reported being 'often' engaged with STEM enrichment activities for their students. The proportion of teachers and lecturers responding that they 'often' engaged with STEM CPD activities was slightly lower, though still representing a third of respondents, at 32 per cent.

The proportion of teachers and lecturers who reported 'often' being engaged with STEM careers-related enrichment activities was slightly lower. Only 28 per cent of teachers and lecturers agreed that they were often engaged with careers-related enrichment activities, while just 15 per cent of respondents were often engaged with STEM careers-related CPD. This may indicate that there is often not a substantial STEM careers focus within CPD for teachers.

In Year 3 more teachers agreed that they 'often' engaged with STEM activities than in Year 1, across enrichment, CPD and careers activities. In most cases, it appeared that the incidence of teachers 'often' engaging with STEM provision had been increasing steadily throughout the period of the research.

There appeared to be little difference in the level of engagement with STEM activities amongst teachers with different STEM subject specialisms. Indeed, those teachers with specialisms in science, mathematics and engineering/technology[16] responding to the enrichment and CPD survey all indicated in similar proportions that they 'often' engaged with STEM enrichment (46, 47 and 44 per cent respectively). A slightly lower proportion of teachers with engineering/technology specialisms reported that they engaged with STEM CPD activities (24 per cent) than science and mathematics specialist teachers (36 and 34 per cent respectively).

A lower proportion of science specialist teachers reported often engaging in careers-related enrichment activities (20 per cent such respondents), than their mathematics and technology/engineering specialist counterparts (36 per cent of respondents and 35 per cent respondents, respectively[17])

In the qualitative case-study work, teachers were asked whether their school's level of engagement with STEM activities had changed over recent years. The vast majority of case-study teachers found this difficult to answer, most often because

[16] This comparison examines the responses of those teachers who teach only one of science, maths or engineering/technology, and excludes the smaller number of teachers of more than one STEM subject. The technology and engineering responses have been grouped together because of their relatively smaller responses.

[17] Please note that these percentages are calculated off a relatively low base: 46 science specialists, 25 mathematics specialists and 23 technology/engineering specialists, respectively.

they had only joined the school quite recently. Of the minority that did answer, the level of engagement in STEM activities was generally said to be increasing, as the following comments show.

> We've definitely done a lot more in the last few years – the headteacher really values STEM as an initiative. We are not a specialist science school but I would say we are a STEM school.
>
> Director of STEM learning

> Our level of engagement [with STEM activities] is increasing year on year, especially since we've had specialist science status.
>
> Science teacher (biology)

6.2 Areas of engagement with STEM

Teachers and lecturers were asked to list any STEM activities that they had engaged with during the preceding academic year.

STEM enrichment

In Year 3 of the survey, only 19 per cent of teachers and lecturers indicated that they had done 'no activities' in relation to STEM enrichment during the academic year 2008/09. The corresponding figure for the Year 2 survey was 29 per cent, indicating that an increasing proportion of teachers and lecturers are participating in at least some form of STEM enrichment activities. Generally, teachers did not specify the subject focus of the enrichment activities. Where specified, activities tended to focus on 'STEM' generally/all STEM subjects and on science. This was followed by smaller numbers of mathematics activities, and smaller numbers still of activities focused on engineering and technology.

A large and varied range of enrichment activities were reported by teachers responding to the surveys. These involved a very large range of external partners and programmes. Enrichment activities with students tended to involve: enriching teaching within the classroom environment; projects and practical activities, including suspended timetable activities; visits to industrial sites or workplaces; visits to universities and colleges; fair or week\day in a particular project; competitions and awards; clubs; listening to expert speakers; and visits to museums and exhibitions.

STEM CPD

In Year 3 of the survey, almost half of teachers and lecturers (49 per cent) had not undertaken any STEM CPD activities during 2009/10. The corresponding figure for Year 2 was slightly lower, at 43 per cent. Where CPD activities had been undertaken, they often appeared to be non-subject specific.

Similarly to STEM enrichment activities, a wide range of CPD activities were reported by teachers. CPD activities mentioned by teachers included: in-school STEM CPD such as INSET days; CPD provision through LAs, particularly network meetings, conferences and events at external locations, including the professional societies; courses delivered externally, including through Science Learning Centres; CPD on pedagogic issues; working with exam boards/ looking at new syllabus; working with advisors and visiting speakers; and personal research and reading journals and articles.

STEM careers

In Year 3 of the careers survey, only 22 per cent of teachers indicated that they had been involved in no careers-related STEM activities during the previous year. This represents a fall from Year 2, where the corresponding figure was 48 per cent. The remaining half of respondents who had engaged with STEM careers activities during Year 2 of the evaluation had been involved with a wide variety of STEM careers-related activities.

Many of the teachers had been involved in careers-related activities at their school/college. These included, for example, special careers day activities, or evening meetings; visitors to the school, including STEM Ambassadors; and lessons focussing specifically on careers. A smaller number of teachers emphasised that they continually endeavour to relate topics that are being covered in the classroom to the world of work.

A smaller number of teachers identified off-site career activities undertaken in the preceding year. These included, for example, visits with students to STEM employers or university departments.

6.3 Satisfaction with the range of STEM provision

Teachers were asked whether they felt there was an appropriate range of provision available across the STEM areas. Table 6.3 shows the distribution of responses.

Table 6.3 Satisfaction with the range of STEM provision

I feel there is an appropriate range of...	Survey year	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	N (valid)
STEM enrichment opportunities available	Year 3 (2010/11)	58	29	13	346
	Year 2 (2009/10)	51	35	14	486
	Year 1 (2008/09)	33	47	19	262
STEM CPD opportunities available	Year 3 (2010/11)	53	32	15	346
	Year 2 (2009/10)	46	39	16	485
	Year 1 (2008/09)	32	50	18	260
STEM careers provision available	Year 3 (2010/11)	54	31	15	99
	Year 2 (2009/10)	35	34	30	198
	Year 1 (2008/09)	18	44	39	211

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1, Year 2 and Year 3.

In Year 3, more than half of respondents to the enrichment and CPD questionnaire (58 per cent) felt that there is an appropriate range of STEM enrichment opportunities for students available. Similarly, more than half of respondents (53 per cent) appear satisfied with the range of STEM CPD opportunities available. Teachers' satisfaction with both these aspects of STEM provision has increased steadily throughout the research period, with the changed satisfaction levels of those teachers responding to both the Year 2 and Year 3 surveys being statistically significant .

Teachers' responses to the range of STEM careers provision indicated low levels of satisfaction in Year 2 and in Year 1. However, agreement that there is an appropriate range of STEM careers provision has grown considerably throughout the research period, such that a majority of teachers (54 per cent) agreed with the statement 'I feel there is an appropriate range of STEM careers provision available' in Year 3 of the survey. The growth in agreement from Year 1 to Year 2, and from Year 2 to Year 3 are both statistically significant.

Although teachers tended not to disagree that there is an appropriate range of STEM provision available, considerable proportions (around three in ten) neither agreed nor disagreed with the statements 'I feel there is an appropriate range of STEM enrichment/CPD opportunities/career provision available'. This more hesitant and less decided view exhibited by some of the respondents may be indicative of a limited awareness of the STEM provision available amongst some teachers.

There was considerable variation of opinion amongst subject teachers about the range of STEM enrichment activities available. Sixty-five per cent of science specialist teachers agreed that there was an appropriate range of STEM enrichment opportunities available, while the figure was considerably lower for technology/engineering and mathematics specialist teachers (59 per cent and 51 per cent, respectively).

In the qualitative case-study work, teachers were invited to comment on whether or not they had noticed any changes over the last two years in the information available around STEM in relation to, for example, CPD, E&E and careers. Only a minority of case-study teachers chose to comment and their responses were fairly evenly split between those who felt that there was now an appropriate level of information, and those who felt the level had not really changed at all.

> The information sources are good and there is a lot out there. It's just about teachers having the time to find what's releveant that makes things difficult. STEM has mushroomed in the last five years so there is a lot going on.
>
> Director of STEM learning

> I have only been in this post for two years but over that time I wouldn't necessarily say there's been any more of it at the beginning or at the end of those two years.
>
> Maths teacher

7 How could information be improved?

Key findings summary

- A considerable proportion of teachers responding to the surveys were unable to identify any suggested improvements in the provision of information on STEM enrichment, CPD or careers (42 per cent, 51 per cent and 34 per cent of the total number of respondents referring to enrichment information, CPD information and careers information, respectively).
- Those teachers suggesting improvements identified a number of ways that STEM information could be improved which related to: the presentation of information; the amount of information available; the nature of information presented; and funding, finance and time to access information.
- Many teachers responding to the surveys indicated that there were no gaps or duplication in STEM provision or that they were not aware of such issues. Other teachers highlighted gaps in relation to specific areas of STEM, particular key stages and ability levels, the accessibility of provision and employer and industry-linked provision, in particular.

This section will consider ways in which teachers felt STEM information may be improved. The surveys asked teachers to list any changes or improvements they could suggest for information on STEM enrichment, STEM CPD and STEM careers. Survey respondents were also asked whether they could identify any gaps in STEM provision, or whether there were areas where provision was unnecessarily duplicated.

7.1 Suggested changes or improvements

While many teachers and lecturers made various suggestions for how information on STEM enrichment, CPD and careers could be changed and improved, a considerable proportion of teachers across each of the surveys felt that the information did not need any changes or improvements (42 per cent, 51 per cent and 34 per cent of the total number of respondents referring to enrichment information, CPD information and careers information, respectively, in Year 3 of the survey). The responses of those teachers identifying potential improvements during the survey, and those of teachers participating in the case studies, can be grouped into four broad areas:

- presentation of information;
- amount of information;
- nature of information and provision; and
- funding and time.

Presentation of information

A number of teachers responding to the enrichment/CPD survey felt that STEM information could be improved through better coordination, making it easier for teachers to locate the relevant information. Ways to achieve this may include: more centralised and searchable sources of information, for example through a centralised website with links to different resources and organisations, designated personnel and named teachers within schools who receive and distribute STEM information who may not necessarily be Heads of Departments and STEM advisors/a STEM advisory service. Others felt information could be more timely, providing greater warning and lead in time to allow teachers to plan ahead to access provision. During a qualitative case-study interview in Year 2 of the evaluation, one teacher commented:

> ...with the emails from STEMNET, most things come through, but there is not always time to do anything about it. Sometimes it seems that they might hear about something, but it's quite late. For example a trip for students that might be happening in just one week- it's obviously too late to organise.

Some case-study teachers felt email alerts and updates as well as fliers providing information on STEM provision would be most effective:

> I wouldn't say so much that staff go on the internet looking for courses, it comes through the post and 'ooh yeah, we fancy that one'….you go on a course and then they tell you about another course and you go on that one as well.
>
> Year 2 primary teacher

Teachers responding to the surveys also felt that Information could be improved with simplification and synthesis and with indications as to previous-users feedback on the provision advertised. Information could also be better channelled through existing subject and support networks in local authorities and amongst partnering schools.

During case-study visits in both Years 2 and 3 of the evaluation, a number of teachers made reference to the high volume of emails they receive providing information on STEM provision. Some felt that this information may be more effective if it came less frequently but contained more information. One Year 2 science teacher commented: 'It's easier if you get more information, less regularly. For example a termly newsletter with a lot of information, as opposed to something once per week'. This teacher commented that the National Science Learning Centre's annual booklet allowed an overview of the courses provided, and an opportunity to strategically link courses to individual teachers' development plans: 'We get [the National Science

Learning Centre's] yearly booklet of courses. We used this in conjunction with our own development plan and performance management objectives to decide what type of courses it would be useful for us to go on'.

While many teachers are now accessing information through online channels, some teachers in Year 2 of the evaluation commented that further use of web-based information sources would be welcomed. Conversely, similar numbers of teachers in Year 2 identified that they would welcome information through more personal channels. This was reaffirmed by teachers in Year 3 who referred to talks, workshops and informal contact as being valuable. Clearly, different teachers have different preferences when seeking STEM information.

Amount of information

A number of teachers responding to the surveys indicated the need for more information on STEM generally in order to further raise awareness. This was a particularly strong theme in their responses to our question on improvements. Information needed to be more effectively and proactively publicised to make it more visible and in order to inform those staff with currently little awareness of STEM opportunities. Some respondents also suggested the need for more information on each of the respective areas of STEM, or for particular groups such as primary pupils, or those in rural areas.

Nature of information and provision

Some teachers responding to the survey advised of the need to receive more information about localised STEM provision and opportunities. Respondents also wanted information which provided ideas and materials for enrichment, projects and practical activities to help them enrich STEM learning for a range of student abilities. A small proportion of teachers would also be interested in information and good practice on what other schools are doing in terms of STEM enrichment, CPD and careers. The need for more information on how to work with and access STEM industry and employers was also highlighted by a small number of teachers.

Funding and time

Teachers responding to the surveys sometimes cited the need for more funding in order to access STEM provision and for more time to research and utilise information. Teachers would like information on what funding can be drawn upon to support access to STEM provision as well as information on free or subsidised STEM

provision. Isolated comments also indicated that the value for money of STEM provision could be improved and that more information could be provided on the cost of advertised STEM activities.

When exploring potential improvements to STEM information with teachers participating in the qualitative case-study interviews in Years 2 and 3 of the evaluation, the common theme of 'time' emerged. Most teachers felt that the STEM information available to them was adequate, but that they often lacked the time to properly consider all the information that they received.

> There is a lot of information out there. Now that I'm acting Head of Science, I'm getting bombarded with emails from various organisations. To be honest, sometimes I don't even read them. You've only got so much time. It's not difficult to find, if you want something. There are plenty of opportunities out there.
>
> Year 2 Head of Science

> If I notice something, and I've got a few minutes, then I'll read it, and it might start the germ of an idea. But there will be equally valid things that come through but I'm just too busy to take them on board at that time.
>
> Year 2 maths teacher

> The reason why I don't respond to a lot of it is, it doesn't immediately look relevant to what I've got on that week or I just simply don't have the time.
>
> Year 3 maths teacher

> There are never enough hours in the day to process everything, so things have to be prioritised and the priority obviously has to be teaching the kids in front of us at the time.
>
> Year 3 maths teacher

A lack of time means that the presentation of information is even more important – it needs to be timely, clear, concise and carefully directed towards the appropriate staff.

7.2 Gaps or duplication in provision

Most survey respondents (between 70 and 80 per cent responding to the STEM enrichment/CPD and careers surveys) indicated that there were no gaps or duplication in STEM provision or they were not aware of gaps and duplication. For some teachers, this response may be linked to relatively low levels of awareness of the STEM provision available, and indeed some teachers made this explicit in their response.

Those teachers that did identify issues with STEM provision tended to focus on the gaps in provision, and less on issues of duplication. Gaps were identified in relation to each of the separate STEM areas to similar degrees. Some teachers indicated that there were gaps in STEM provision for particular Key Stages, such as Key Stage 5, and different levels of pupil ability. There were also felt to be gaps in the accessibility of STEM provision including: affordable provision; local provision; and equality of access to provision. Others noted gaps in STEM provision related to the lack of employer and industry provision as well as gaps in STEM careers provision which could show the relevance of STEM careers for a range of pupil ability levels. Finally, some gaps were also noted around the lack of support for those teachers wishing to undertake ‘in-house’ provision of STEM enrichment.

8 Teachers' and lecturers' attitudes towards and experiences of STEM

Key findings summary

- In Year 3, the majority of teachers and lecturers (73 per cent) felt confident incorporating a wide range of practical work into their teaching of STEM subjects. Just under two-thirds of teachers and lecturers (63 per cent) were confident in their ability to involve students across all academic levels in STEM enrichment activities.
- Despite a lack of confidence amongst a small minority of teachers, a comparison of responses over time shows that teachers' confidence in providing information on STEM study and careers is improving. In Year 2 there were significant improvements in participants' confidence in providing STEM careers information and study, compared to Year 1 across such areas as teachers' knowledge of STEM careers and routes, and ability to integrate this information into their teaching. While the positive trends for these measures continued for those responding to the Year 2 and Year 3 surveys, these were generally not found to statistically significant.
- Approximately one in three teachers and lecturers agreed that their schools or departments had adequate links with STEM-related industries. Looking at responses over time, there were no significant differences observed between those responding to the Year 2 and Year 3 surveys for these questions. This suggests that issues of inadequate links for schools with STEM industry and work experience in STEM careers are persisting, particularly in relation to maths and science.

The final part of the surveys examined teachers' and lecturers' general attitudes towards, and experiences of, STEM. The three broad areas explored were:

- confidence in teaching STEM, particularly with regard to incorporating practical activities and real-world applications of STEM
- confidence in incorporating STEM careers information into the teaching of STEM subjects, and knowledge of pathways leading to further STEM study and careers
- assessment of the adequacy of schools' links with STEM-related industries and HEIs.

As well as presenting data in relation to the areas listed above, this section also provides a comparison of teachers and lecturers who completed surveys in both Year 1 and Year 2, and Year 2 and Year 3. This allows us to assess any changes in teachers' attitudes and experiences over this period.

It is important to reiterate here (as noted in Chapter 2), that the change in methodology from a paper survey in Year 1 to a telephone survey in Years 2 and 3 reduced the 'no response' percentage for many questions, but created some issues in terms of interpreting the responses. This final report, as in Year 2, therefore uses valid percentages (with no responses removed) as opposed to actual responses. Since the samples of teachers responding to a particular question may differ due to the change in methodology, comparisons between valid percentages in Year 1 and Years 2 and 3 should be treated with a degree of caution. At the same time, in terms of making a longitudinal comparison, it was decided to compare changes in teacher responses only of those who had completed surveys in both Years 1 and 2. Thus, only questions that maintained the same structure were included in the comparison. This approach was maintained in Year 3 of the evaluation.

8.1 Classroom practice

In Year 3, 64 per cent of teachers responding to the enrichment and CPD questionnaire, and 49 per cent of those responding to the careers questionnaire felt confident in building real world applications of STEM into their lessons. Almost three-quarters of teachers and lecturers (74 per cent) felt confident incorporating a wide range of practical work into the teaching of STEM subjects.

Just under two-thirds of teachers and lecturers (63 per cent) were confident in their ability to involve students across all academic levels in STEM enrichment activities. With respect to STEM careers activities however, less than half of teachers (44 per cent) were confident in their ability to involve students of all academic levels, though this does represent an improvement on Years 1 and 2 of the survey.

Table 8.1 shows the breakdown of responses to questions on STEM classroom practice:

Table 8.1 Confidence in STEM classroom practice

	Survey year	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	N (valid)
I feel confident in my ability to build real work/world applications of STEM into my lessons					
Enrichment and CPD	Year 3 (2010/11)	64	25	12	346
	Year 2 (2009/10)	63	23	14	487
	Year 1 (2008/09)	46	26	28	272
STEM careers	Year 3 (2010/11)	49	31	20	99
	Year 2 (2009/10)	52	21	27	198
	Year 1 (2008/09)	41	26	33	220
I feel confident and able to incorporate a wide range of practical work into my teaching of STEM subjects					
Enrichment and CPD	Year 3 (2010/11)	73	19	9	346
	Year 2 (2009/10)	71	20	9	487
	Year 1 (2008/09)	56	22	22	270
I am able to involve students of all abilities in STEM enrichment/careers activities					
Enrichment and CPD	Year 3 (2010/11)	63	22	15	346
	Year 2 (2009/10)	62	22	16	487
	Year 1 (2008/09)	37	33	30	267
STEM careers	Year 3 (2010/11)	44	28	27	99
	Year 2 (2009/10)	32	24	44	198
	Year 1 (2008/09)	19	35	45	217

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1 Year 2, and Year 3.

Importantly, a comparison of teachers and lecturers who participated in Year 1 and Year 2 surveys revealed significant improvements in confidence in STEM classroom practice across the two time points, for each of the aspects of practice outlined in Table 8.1. While the positive trends generally continued for those responding to Years 2 and 3 of the survey, fewer of these movements were found to be statistically significant. None of the movements from the

CPD and enrichment surveys were found to be statistically significant, while for those teachers responding to the careers survey in both years two and three, a significant increase was observed in teachers' ability to involve students of all abilities in STEM careers activities.

Year 2 qualitative case study illustration: A positive impact on teaching practice

A primary teacher with responsibility for coordinating maths had recently attended a training event delivered by a private provider. The teacher had found out about the course from a flier sent directly to the school from the provider and decided to participate as it appeared to be relevant to helping to develop the teaching of mathematics in the school. The teacher found the course immensely useful and had subsequently implemented a new whole school policy on teaching mathematical calculation to improve the way and consistency with which this aspect of numeracy is taught. This had led to a positive impact on the teaching and learning of calculations and provided professional development for the teacher in their role as maths coordinator in the school.

Year 3 qualitative case study illustration: A positive impact on teaching practice

A secondary teacher explained the school's involvement with the Bloodhound project[18] after being personally approached by a parent who is a STEM/Bloodhound SSC Ambassador. The teacher was now running an after school club for a small group of KS3-4 pupils making a full-size replica of the cockpit of the Bloodhound supersonic car. Former pupils who were now working on Bloodhound at the local university had visited the school as part of the STEM Ambassadors scheme. The teacher planned to hold an event to showcase the replica at which the driver of Bloodhound would come and speak to pupils from the after school club. 'I have tried to bring Bloodhound into any and all lessons because it's iconic, it's British and it's promoting the STEM subjects and allows me to show the value of my own subject in the curriculum'.

[18] The Bloodhound project aims to inspire young people to pursue STEM careers. It is described on its website as 'the engineering adventure for the 21st century'. Almost 4,000 primary and secondary schools are reported to be using Bloodhound as a vehicle for teaching science, technology, engineering and maths and this figure is said to be increasing rapidly.

8.2 STEM careers and education pathways

Based on survey responses (see Table 8.2), it is apparent that approximately a fifth of teachers and lecturers in Year 3 are not confident in teaching areas linked to STEM careers information and STEM study guidance to students.

For example, while slightly more than half of teachers responding to the careers survey (54 per cent) agreed that they were able to integrate careers-related information into their teaching of STEM subjects, a substantial minority (23 per cent) of teachers disagreed. More than half of these teachers (53 per cent) felt confident in their knowledge of STEM courses in HE, while 17 per cent of teachers reported that they lacked confidence in their knowledge of STEM HE courses.

Respondents to both surveys were similarly confident about their knowledge of the routes and pathways into FE, HE and careers relating to STEM, with half or more of teachers agreeing with this statement 'I feel confident in my knowledge of routes and pathways into FE, HE and careers relating to STEM' (57 and 50 per cent in relation to each of the two types of questionnaires). However, a minority of approximately one fifth of teachers (17 and 20 per cent) did not share this confidence. Approximately half (51 per cent) of those teachers responding to the enrichment and CPD questionnaire were confident in their knowledge of the STEM careers available for people with STEM qualifications. Again, a substantial minority (20 per cent) of respondents did not share this confidence in their knowledge of STEM careers.

Table 8.2 Confidence in providing STEM careers information and study

	Survey Year	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	N (valid)
I am able to integrate careers-related information into my teaching of STEM subjects and delivery of the curriculum					
STEM careers	Year 3 (2010/11)	54	23	23	99
	Year 2 (2009/10)	44	31	25	198
	Year 1 (2008/09)	35	31	34	216
I feel confident in my knowledge of STEM courses in HE					
STEM careers	Year 3 (2010/11)	53	30	17	99
	Year 2 (2009/10)	38	17	44	198

	Year 1 (2008/09)	22	28	50	218
I feel confident in my knowledge of routes and pathways into FE, HE and careers relating to STEM					
Enrichment and CPD	Year 3 (2010/11)	57	25	17	346
	Year 2 (2009/10)	54	25	21	487
	Year 1 (2008/09)	35	35	30	268
STEM careers	Year 3 (2010/11)	50	30	20	99
	Year 2 (2009/10)	51	22	27	198
	Year 1 (2008/09)	26	30	44	216
I feel confident in my knowledge of the STEM careers available for people with STEM qualifications					
Enrichment and CPD	Year 3 (2010/11)	51	30	20	346
	Year 2 (2009/10)	47	27	26	487
	Year 1 (2008/09)	35	33	32	266

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1 Year 2 and Year 3.

Despite a lack of confidence amongst some teachers, a comparison of responses over time shows that overall, teachers' confidence is improving. Between Year 1 and Year 2, teachers felt significantly more able to integrate careers-related information into their STEM teaching and more confident in their knowledge of STEM courses in HE in the second survey than they had in the first. Teachers also felt significantly more confident about their knowledge of the routes and pathways into FE, HE and careers relating to STEM and more confident in their knowledge of the careers available for people with STEM qualifications. Fewer statistically significant changes were observed between Years 2 and 3 in comparison to Years 1 and 2; only the increase teachers' knowledge of STEM courses in HE was found to be significant. However, the positive trends of increasing confidence generally continued.

Generally, when comparing across the subject areas, teachers with a science specialism tended to be most confident in providing STEM careers information compared to technology/engineering and mathematics specialists. Technology/engineering specialists were more confident than their science

and mathematics specialist counterparts in their knowledge of the routes and pathways into FE, HE and careers relating to STEM.

8.3 School linkages with STEM-related industry and HEIs

In Year 3, only around one-third of teachers and lecturers agreed (32 per cent from both the STEM enrichment/CPD survey and the STEM careers survey) that their schools or departments had adequate links with STEM-related industries. Slightly more teachers and lecturers agreed than disagreed that their school or department had adequate links with HE institutions in areas concerning STEM (49 per cent from the STEM enrichment and CPD questionnaire and 43 per cent from the STEM careers questionnaire). Just 28 per cent of respondents to the STEM careers questionnaire felt that there were adequate opportunities for pupils to engage with STEM-related work-experience or placements, with a much larger proportion believing this not to be the case.

Year 2 qualitative case study illustration: links with industry

One teacher described the college's long history of engagement with STEM CPD and enrichment, including established links with the local University and local engineering-based industries and provision such as the science museum. The college also convened its own engineering network meetings on a regular basis inviting local industry and employers to discuss recent developments in industry and workforce requirements to ensure the college is up to date in its delivery of and training in the discipline. This meeting forms part of the staffs' annual CPD requirement for '*industrial updating*'. In terms of improvements, the teacher requested more information on local engineering-related companies offering work placements for students, as this was currently an area of difficultly. The teacher would also like more information on industries and companies that could offer 'industrial updating' type CPD for teachers. Currently this is provided from companies the college has existing links with, but there was a desire to broaden this out and have more links.

Table 8.3 shows the breakdown of responses to questions on schools' linkages with HEIs and STEM industry:

Table 8.3 School linkages with HEIs and STEM-related industry

	Survey year	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	N (valid)
I feel the school/department has adequate links with STEM related industries					
Enrichment and CPD	Year 3 (2010/11)	32	25	43	346
	Year 2 (2009/10)	26	25	49	486
	Year 1 (2008/09)	18	32	50	265
STEM careers	Year 3 (2010/11)	32	23	44	99
	Year 2 (2009/10)	29	22	49	198
	Year 1 (2008/09)	22	24	54	218
I feel the school/department has adequate links with HE institutions around STEM education					
Enrichment and CPD	Year 3 (2010/11)	49	30	22	346
	Year 2 (2009/10)	44	27	29	486
	Year 1 (2008/09)	25	33	42	267
STEM careers	Year 3 (2010/11)	43	29	22	99
	Year 2 (2009/10)	43	25	31	198
	Year 1 (2008/09)	22	29	49	217
I feel there are adequate opportunities for my pupils to experience work-related experience/placements of STEM careers					
STEM careers	Year 3 (2010/11)	28	22	50	99
	Year 2 (2009/10)	29	22	49	198
	Year 1 (2008/09)	22	24	54	216

Due to rounding, percentages may not sum to 100.
Percentages shown are valid percentages.
Source: NFER STEM Enrichment and CPD Questionnaire, STEM Careers Questionnaire Year 1, Year 2 and Year 3.

Encouragingly, significant improvements in schools/departments links with HE institutions were found when comparing the responses of teachers who had completed surveys in both Year 1 and Year 2 of the evaluation. However, no such difference was apparent in relation to links with STEM-related industry. Neither was there any difference across the two surveys in terms of teachers' ratings of the adequacy of opportunities for pupils to experience work-related placements of STEM careers. No significant changes were observed between those teachers responding to the Year 2 and Year 3 surveys. Issues of inadequate links for schools with STEM industry and work experience in STEM careers are therefore persisting, particularly in relation to maths and science.

Analysis of the responses to the enrichment/CPD survey by subject area revealed that technology/engineering specialist teachers had greatest links with STEM–related industry and HEIs in comparison to science and mathematics specialist teachers. Of the teachers responding to the STEM CPD and enrichment questionnaire, technology/engineering specialist teachers more commonly identified that they felt that their school/department had adequate links with STEM related industries (41 per cent for technology teachers, 24 per cent and 35 per cent respectively for mathematics and science teachers). Technology specialist teachers also agreed more frequently (56 per cent) than their mathematics and science colleagues that there were adequate links with HE institutions. For mathematics and science teachers the percentages were lower at 49 per cent and 44 per cent, respectively.

9 Pupils' attitudes towards and experiences of STEM

Key findings summary

- Over the period of the evaluation, several measures of pupil attitudes toward STEM showed improvement. These included enjoyment of science and engineering and intention to study STEM in the future. A number of measures, such as awareness of careers related to the STEM subjects, showed no significant changes, while in the area of aspiring to work in STEM area, pupil aspiration actually decreased throughout the evaluation period. Interesting changes observed throughout the evaluation period included the following:
  - In Year 2 of the survey, a greater proportion of pupils (78 per cent) reported that they enjoy science. This was a statistically significant increase on the Year 1 percentage of 68. By Year 3, this proportion had reduced slightly to 73 per cent, although this decrease was not statistically significant.
  - Of those students studying engineering, a significantly greater proportion reported that they enjoy it in the second and third years of the evaluation, compared with the first year.
  - Between Years 1 and 2 of the survey, there were statistically significant increases in the numbers of pupils reporting that they would like/quite like to study science (45 per cent to 55 per cent) and mathematics (38 per cent to 46 per cent) in the future. By Year 3 of the survey, the proportions of pupils interested in studying science or mathematics had decreased (to 50 and 40 per cent respectively), although none of the changes in Year 3 was statistically significant.
  - Students' desire to study science beyond GCSE level is increasing. As in previous years, a greater proportion of pupils responding to the Year 3 survey indicated their intention to study science beyond GCSE-level
- Students' knowledge of STEM jobs increased initially throughout the evaluation period, before falling slightly during Year 3. A greater proportion of pupils responding to the Year 2 survey (58 per cent) felt they knew enough or a bit about STEM jobs than in Year 1. By Year 3, this proportion had reduced again to 53 per cent, although this decrease was not statistically significant.
- Although the interest and engagement of young people in STEM is increasing, by Year 3 of our evaluation, fewer pupils were aspiring to a STEM career. This would seem to indicate the need for continued focus on the communication of STEM careers information and guidance.

This chapter moves away from the views of teachers to provide a picture of pupils' attitudes towards and experiences of, STEM subjects and related careers information.

Data comes primarily from a paper survey completed by 238 pupils aged 14 and 15 years studying STEM subjects in nine secondary schools (see Appendix 2 for further sample information). The survey is a repeat of the surveys administered in 2008 (Year 1, baseline) and in 2009 (Year 2). A different set of Year 10 classes (from the same schools) completed the survey each year. This has allowed for identification of statistically significant changes in attitudes towards, and experiences of, STEM. Where such changes from the baseline and Year 2 results are found, they are highlighted in the text, and results from both previous surveys are included in the tables to aid the comparisons. Keeping with the format of the teacher survey data, pupil data is presented as valid percentages as opposed to actual percentages.

Qualitative data was collected through focus group discussions with pupils in case-study schools and, where relevant, this is used to illustrate and expand on some of the survey findings.

The chapter covers the following themes:

- pupils' enjoyment of STEM
- awareness of STEM careers
- knowledge of STEM careers
- perception of STEM careers
- interest in studying STEM
- interest in a STEM career
- sources of STEM careers information
- views on the effectiveness of STEM careers information.

9.1 Enjoyment of STEM

Survey pupils were asked whether they enjoyed studying the four individual STEM subjects (Tables 9.1 to 9.4). The majority of pupils who studied science and technology enjoyed, or quite enjoyed, the subjects. In relation to science, 73 per cent of pupils were positive, with 76 per cent of those studying technology also registering enjoyment of the subject. Looking across the three years of the survey, the increase from Year 1 to Year 2 in students reporting that they enjoy science (from 68 per cent to 78 per cent) was statistically significant at the 5% level, indicating that more pupils were enjoying science in Year 2 of the survey. By Year 3 of the survey, the proportion reporting their

enjoyment of science had reduced slightly from Year 2, but this decrease was not statistically significant.

When compared to science and technology, a lower proportion of pupils indicate that they enjoy mathematics (59 per cent). However, engineering was the subject that was enjoyed by the lowest proportion of pupils. Just over half of pupils (53 per cent) do not study engineering, but of those who do, as in Year 2 of the survey, over half in Year 3 indicated that they enjoy, or quite enjoy, the subject (56 per cent of the 102 studying engineering).

Table 9.1 Enjoyment of science

	I enjoy science (%)	I quite enjoy science (%)	I don't really enjoy science (%)	I do not enjoy science (%)	N (valid)
Year 3 (2010/11)	29	43	23	4	236
Year 2 (2009/10)	28	51	16	6	259
Year 1 (2008/09)	21	47	24	8	341

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Table 9.2 Enjoyment of technology

	I enjoy technology (%)	I quite enjoy technology (%)	I don't really enjoy technology (%)	I do not enjoy technology (%)	I don't study technology (%)	N (valid)
Year 3 (2010/11)	25	26	13	3	29	229
Year 2 (2009/10)	17	36	12	7	28	252
Year 1 (2008/09)	22	30	14	9	26	335

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year 1 Year 2 and Year 3

Table 9.3 Enjoyment of engineering

	I enjoy engineering (%)	I quite enjoy engineering (%)	I don't really enjoy engineering (%)	I do not enjoy engineering (%)	I don't study engineering (%)	N (valid)
Year 3 (2010/11)	13	11	9	10	53	228
Year 2 (2009/10)	12	12	12	7	58	251
Year 1 (2008/09)	10	9	12	13	57	328

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three

Table 9.4 Enjoyment of mathematics

	I enjoy maths (%)	I quite enjoy maths (%)	I don't really enjoy maths (%)	I do not enjoy maths (%)	N (valid)
Year 3 (2010/11)	14	45	28	13	237
Year 2 (2009/10)	15	45	27	13	260
Year 1 (2008/09)	16	43	24	17	340

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three

9.2 Awareness of STEM careers

Pupils responding to the survey were asked about their awareness of different jobs and careers that involved the four individual STEM subjects (Tables 9.5 to 9.8), and the findings were broadly similar to those in both previous years. A majority of pupils were aware, or quite aware, of careers involving science (73 per cent), mathematics (72 per cent), or technology (65 per cent). In the qualitative case-study interviews, pupils identified the kinds of career areas they associated with these subjects and examples of these are presented below:

Science
- doctor/dentist
- vet
- psychiatrist
- animal researcher
- inventor
- astronaut
- environmentalist
- forensic scientist
- lab technician

Maths
- maths teacher
- architect
- accountant
- bank worker
- 'something in the city'
- 'working on the till in Tesco'

Technology
- designer
- marketing executive
- software technician

However, as in the previous two years, a lower proportion of both survey pupils (56 per cent), and case-study pupils indicated that they were aware, or

quite aware of careers involving engineering. This suggests that pupils would benefit from more explicit links being made to engineering careers.

Table 9.5: Awareness of jobs/careers involving science

	I am aware of jobs/ careers involving science (%)	I am quite aware of jobs/ careers involving science (%)	I am not really aware of jobs/ careers involving science (%)	I am not aware of jobs/ careers involving science (%)	N (valid)
Year 3 (2010/11)	27	45	24	3	235
Year 2 (2009/10)	25	47	24	5	260
Year 1 (2008/09)	26	40	26	9	340

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Table 9.6: Awareness of jobs/careers involving technology

	I am aware of jobs/ careers involving technology (%)	I am quite aware of jobs/ careers involving technology (%)	I am not really aware of jobs/ careers involving technology (%)	I am not aware of jobs/ careers involving technology (%)	N (valid)
Year 3 (2010/11)	21	42	27	7	233
Year 2 (2009/10)	22	41	30	7	259
Year 1 (2008/09)	20	43	29	8	338

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three

Table 9.7: Awareness of jobs/careers involving engineering

	I am aware of jobs/ careers involving engineering (%)	I am quite aware of jobs/ careers involving engineering (%)	I am not really aware of jobs/ careers involving engineering (%)	I am not aware of jobs/ careers involving engineering (%)	N (valid)
Year 3 (2010/11)	19	35	32	13	235
Year 2 (2009/10)	22	33	28	17	256
Year 1 (2008/09)	21	36	25	19	334

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Table 9.8: Awareness of jobs/careers involving mathematics

	I am aware of jobs/ careers involving maths (%)	I am quite aware of jobs/ careers involving maths (%)	I am not really aware of jobs/ careers involving maths (%)	I am not aware of jobs/ careers involving maths (%)	N (valid)
Year 3 (2010/11)	32	39	19	9	237
Year 2 (2009/10)	31	39	26	5	260
Year 1 (2008/09)	29	39	25	7	340

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

9.3 Knowledge of STEM careers

Following the questions about awareness of careers involving individual STEM subjects, survey pupils were asked whether they felt they knew enough about STEM-related jobs (Table 9.9).

Just over half of pupils responding to the survey felt they knew enough or a bit about STEM jobs (53 per cent), with less than half reporting that they did not know enough, or did not know much (47 per cent). Looking across the three years of the survey, the increase from Year 1 to Year 2 in the proportion of pupils reporting that they knew enough or a bit about STEM jobs was statistically significant at the 5% level, indicating that more pupils knew about STEM jobs in Year 2 of the survey. By Year 3 of the survey, this proportion reporting enough knowledge of STEM jobs had reduced again, although this decrease was not statistically significant.

Table 9.9: Knowledge of STEM jobs

	I feel I know enough about STEM jobs (%)	I feel I know a bit about STEM jobs (%)	I feel I don't know much about STEM jobs (%)	I feel I don't know enough about STEM jobs (%)	N (valid)
Year 3 (2010/11)	17	35	39	7	235
Year 2 (2009/10)	17	41	34	8	259
Year 1 (2008/09)	11	41	37	11	341

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three

9.4 Perception of STEM careers

The questionnaires then explored pupils' perceptions of what scientists, technologists, engineers and mathematicians do (Table 9.10), and the results showed no significant change from the two previous years.

Table 9.10: Perceptions of STEM careers

	I think scientists, technologists, engineers and mathematicians do interesting/ useful jobs (%)	I think scientists, technologists, engineers and mathematicians do quite interesting/ useful jobs (%)	I think scientists, technologists, engineers and mathematicians do not do really interesting/ useful jobs (%)	I think scientists, technologists, engineers and mathematicians do not do interesting/ useful jobs (%)	N (valid)
Year 3 (2010/11)	17	35	39	7	235
Year 2 (2009/10)	17	41	34	8	259
Year 1 (2008/09)	11	41	37	11	341

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Pupils' perceptions of STEM careers were positive, with a majority of pupils (69 per cent), a slightly lower figure than in Year 2 of the survey, feeling that scientists, technologists, engineers and mathematicians do jobs that are useful and interesting, or quite useful and interesting. Such attitudes were also expressed during qualitative pupil focus groups:

> [People in STEM jobs] are quite creative people who put their own stamp on things.

> A [STEM] job is a hands-on job, it's more innovative – you can come up with new ideas. You can do a prototype and see if it works. Inventing something new would be good.

Only a small minority (three per cent of pupils responding to the survey) felt that the jobs of scientists, technologists, engineers and mathematicians are not interesting or useful.

9.5 Interest in studying STEM

Pupils were surveyed about their interest in studying STEM subjects in the future (see Tables 9.11 to 9.14 below), and the highest level to which they intended to take each subject (see Table 9.15 below).

Pupils were most interested in studying science, technology and mathematics in the future. Half the pupils (50 per cent) indicated that they would like, or quite like, to study science in the future, and slightly lower proportions responded similarly for technology (41 per cent) and mathematics (40 per cent). As in previous years, a substantially lower proportion of pupils (23 per cent) stated that they would like, or quite like, to study engineering in the future. This may be due to a lack of awareness around what engineering might actually involve.

Comparing Year 1 and 2 of the survey, there were statistically significant increases in the numbers of pupils reporting that they would like/quite like to study science in the future (45 per cent to 55 per cent) and to study mathematics (38 per cent to 46 per cent). However, in Year 3 of the survey, the proportions of pupils interested in studying science or mathematics had decreased, whilst the proportion interested in studying technology in the future had increased, although none of the changes were statistically significant.

As in previous years, in Year 3 of the survey, pupils' intentions for future study were closely related to what interested them. The STEM subjects that the greatest proportion of students intended to study post-GCSE were science (63 per cent) and mathematics (51 per cent).

A substantially smaller proportion of survey pupils intended to study technology post-GCSE (25 per cent), and only a minority intended to study engineering (14 per cent). The subject that the greatest proportion intended to study at degree level was science (27 per cent), although this was a slight decrease from Year 2 of the survey (31 per cent). Substantially smaller proportions intended to study mathematics (14 per cent), technology (nine per cent) and engineering (six per cent) at degree level.

Table 9.11: Studying science in the future

	I would like to study science in the future (%)	I would quite like to study science in the future (%)	I would not really like to study science in the future (%)	I would not like to study science in the future (%)	I don't know	N (valid)
Year 3 (2010/11)	27	22	25	21	3	234
Year 2 (2009/10)	29	26	23	18	3	256
Year 1 (2008/09)	25	20	22	30	4	341

Due to rounding to whole numbers, percentages may not sum to totals
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Table 9.12: Studying technology in the future

	I would like to study technology in the future (%)	I would quite like to study technology in the future (%)	I would not really like to study technology in the future (%)	I would not like to study technology in the future (%)	I don't know	N (valid)
Year 3 (2010/11)	15	26	27	25	5	234
Year 2 (2009/10)	12	23	30	30	5	257
Year 1 (2008/09)	11	26	29	27	7	340

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Table 9.13: Studying engineering in the future

	I would like to study engineering in the future (%)	I would quite like to study engineering in the future (%)	I would not really like to study engineering in the future (%)	I would not like to study engineering in the future (%)	I don't know	N (valid)
Year 3 (2010/11)	12	11	22	46	8	236
Year 2 (2009/10)	11	13	29	40	8	254
Year 1 (2008/09)	10	15	20	47	8	338

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Table 9.14: Studying mathematics in the future

	I would like to study maths in the future (%)	I would quite like to study maths in the future (%)	I would not really like to study maths in the future (%)	I would not like to study maths in the future (%)	I don't know	N (valid)
Year 3 (2010/11)	13	26	30	25	4	234
Year 2 (2009/10)	14	32	26	24	4	256
Year 1 (2008/09)	13	25	26	31	4	340

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Table 9.15: Future study intentions

Highest level intending to study:	Survey year	Up to GCSE (%)	Up to A-level (%)	Up to degree (%)	Not at all (%)	N (valid)
Science	Year 3 (2010/11)	37	36	27	-	237
	Year 2 (2009/10)	32	37	31	-	254
	Year 1 (2008/09)	48	26	26	-	342
Technology	Year 3 (2010/11)	34	16	9	39	236
	Year 2 (2009/10)	31	21	7	41	258
	Year 1 (2008/09)	36	23	8	33	338
Engineering	Year 3 (2010/11)	15	8	6	70	236
	Year 2 (2009/10)	11	6	8	75	255
	Year 1 (2008/09)	18	10	7	66	338
Mathematics	Year 3 (2010/11)	48	37	14	-	237
	Year 2 (2009/10)	40	47	13	-	254
	Year 1 (2008/09)	50	37	13	-	341

Due to rounding to whole numbers, percentages may not sum to 100%.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Focus group discussions shed light on the reasons young people may be interested in studying STEM. This included a perception that these subjects would be more likely to lead to employment, as well as of their relevance to a broad range of careers (not just those that are directly linked to STEM), through their contribution to a young person's portfolio of skills and qualifications. Some individuals were opting to study maths because they believed it was held in high regard and demonstrated their intellectual abilities:

> Science, maths and technology are subjects you have to concentrate on and work hard at, so that is good preparation for life outside school, sort of learning how to learn and to stick at something.

> Most jobs now need maths or science and to get GCSE in maths you need to know a lot of stuff.

> If you can do it, maths is a really good thing to do because people think really highly of it.

> I might do maths A level because maths is useful for everything.

9.6 Interest in a STEM career

In terms of future careers aspirations, just over half of pupils (52 per cent) completing the survey indicated that they would be interested in a job involving science, technology, engineering or mathematics, with just under two-fifths (38 per cent) not being interested, and one in ten (ten per cent) being undecided (Table 9.16). The change in responses from Year 2 to Year 3 of the survey (from 65 per cent saying they would like/quite like a STEM career to 52 per cent) was statistically significant, indicating that in Year 3, fewer pupils aspire to careers involving STEM subjects.

Pupils were also asked whether they had any ideas about what they would like to do for a career, and were able to list multiple possibilities. Categorisation of the careers that pupils were interested in showed that[19]:

- 23 per cent of pupils included an explicit STEM career in their list
- six per cent of pupils listed a career that was partly related to STEM (For example, pilot)
- 30 per cent of pupils opted for careers that were not related to STEM
- eight per cent of pupils indicated they were unsure but were considering a STEM-related career
- 32 per cent of pupils either indicated that they had no career ideas at this stage, or gave no response to the question.

The proportion of pupils in Year 3 of the survey who included a clear STEM career in their list of possible career options has decreased from the previous two years (38 per cent in Year 2 and 34 per cent in Year 1).

[19] In addition, three per cent of pupils gave comments related to careers that were too vague to be categorised.

Table 9.16: Interest in a STEM career

	I would like a job involving science, technology engineering or maths (%)	I would quite like a job involving science, technology engineering or maths (%)	I would not really like a job involving science, technology engineering or maths (%)	I would not like a job involving science, technology engineering or maths (%)	I don't know	N (valid)
Year 3 (2010/11)	27	24	23	13	10	232
Year 2 (2009/10)	33	31	18	10	7	255
Year 1 (2008/09)	28	28	19	16	9	340

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

9.7 Sources of STEM careers information

The questionnaire sought to establish how pupils obtained information on STEM careers. Pupils were firstly asked to state whether they had learnt about STEM careers from a list of potential sources (Table 9.17) and the results showed a similar picture to previous years.

As in previous years, the most common source of STEM careers information was parents and relatives which was experienced by 55 per cent of pupils, followed by teachers discussing such careers in lessons which was experienced by 52 per cent of pupils. Indeed, as in Year 2 of the survey, focus group participants in the qualitative case-studies voiced support for more direct reference of careers in STEM lessons:

> If they showed you more about what jobs or careers could come from certain subjects, like maths, there would be more interest in them.
>
> The teachers say maths will be useful if you want to be an accountant, but what if I don't want to be an accountant? I'm not really sure what else I could do with it.
>
> I want to be able to say to someone 'I enjoy this aspect of biology so how would I go about getting a job where I can use that aspect?'

Other common sources of information included events involving individuals in STEM jobs inside school (44 per cent), leaflets/booklets (40 per cent) and careers or PSHE lessons (37 per cent). Less than a fifth of pupils had talked to careers advisers about STEM careers (18 per cent), and only a minority (12 per cent) stated that they did not know anything about what a job involving science, technology, engineering or maths would be like.

Table 9.17: Sources of STEM careers information

Response:	Survey year	%	N (valid)
My parents/other relatives have talked to me about careers in these areas	Year 3 (2010/11)	55	132
	Year 2 (2009/10)	56	139
	Year 1 (2008/09)	62	210
Teachers have talked about these careers in lessons	Year 3 (2010/11)	52	124
	Year 2 (2009/10)	51	128
	Year 1 (2008/09)	54	182
Careers involving science, technology, engineering or maths have been talked about in careers lessons or in PSHE lessons	Year 3 (2010/11)	37	87
	Year 2 (2009/10)	42	106
	Year 1 (2008/09)	41	138
I have experienced events inside school which involved people from jobs that use science, technology, engineering or maths (e.g. giving talks, demonstrations)	Year 3 (2010/11)	44	105
	Year 2 (2009/10)	42	104
	Year 1 (2008/09)	47	158
I have read leaflets/booklets about careers/jobs related to science, technology, engineering or maths	Year 3 (2010/11)	40	96
	Year 2 (2009/10)	40	99
	Year 1 (2008/09)	47	159
I have experienced events outside school which involved people from jobs that use science, technology, engineering or maths	Year 3 (2010/11)	38	91
	Year 2 (2009/10)	39	97
	Year 1 (2008/09)	42	141
Neighbours/family friends have talked to me about careers in these areas	Year 3 (2010/11)	32	77
	Year 2 (2009/10)	32	79
	Year 1 (2008/09)	41	137
I have found out about these careers from websites and the internet (e.g. Futuremorph, the maths career website)	Year 3 (2010/11)	29	69
	Year 2 (2009/10)	28	71
	Year 1 (2008/09)	31	103
I have talked to the careers adviser/personal adviser in school about these careers	Year 3 (2010/11)	18	43
	Year 2 (2009/10)	18	46
	Year 1	22	73

	(2008/09)		
I don't know anything about what a job involving science, technology, engineering or maths would be like	Year 3 (2010/11)	12	29
	Year 2 (2009/10)	23	58
	Year 1 (2008/09)	20	68
Year 1 N= 337; Year 2 N= 250; Year 3 N= 229			

Due to multiple response and rounding to whole numbers, percentages will not sum to 100 per cent, and responses will not sum to N.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Survey pupils were asked whether they had used any other sources of information to find out about STEM careers. The vast majority of pupils (85 per cent) did not give a response. Where responses were provided (by 38 pupils), they mentioned similar sources to those above. The most common source, cited by eight pupils, was television and/or radio, followed by the internet (five pupils) and then magazines, books and advertisements (three pupils each).

9.8 Views on the effectiveness of the STEM careers information

Survey pupils were invited to comment on the effectiveness of STEM careers information that they had received in terms of: how it helped them understand STEM careers (Table 9.18); whether they understood what they would need to do to get a STEM career (Table 9.19); and whether they knew what subjects they would need to study to pursue a STEM career (Table 9.20). The findings show that the picture has not changed significantly since the previous years.

Just over a half of the pupils surveyed (57 per cent) felt that the careers information they had received had given them a good, or quite good, understanding of STEM careers.

Table 9.18: Understanding of STEM careers

Response:	Survey year	%	N (valid)
The information **gave me a good understanding** of careers that involve science, technology, engineering or mathematics	Year 3 (2010/11)	11	23
	Year 2 (2009/10)	13	30
	Year 1 (2008/09)	10	29
The information **gave me quite a good understanding** of careers that involve science,	Year 3 (2010/11)	42	88
	Year 2 (2009/10)	44	105

technology, engineering or mathematics	Year 1 (2008/09)	45	136
The information **did not really give me a good understanding** of careers that involve science, technology, engineering or mathematics	Year 3 (2010/11)	36	76
	Year 2 (2009/10)	34	82
	Year 1 (2008/09)	33	99
The information **did not give me a good understanding** of careers that involve science, technology, engineering or mathematics	Year 3 (2010/11)	3	7
	Year 2 (2009/10)	9	22
	Year 1 (2008/09)	13	39
Year 1 N (valid)= 303; Year 2 N (valid)= 239; Year 3 N (valid)= 194			

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Just under three-fifths of pupils (57 per cent) felt that the careers information received had to some degree helped them understand what they would need to do to get a STEM job. The remaining 43 per cent of pupils stated that the information had not really, or had not at all, helped them.

Table 9.19: Understanding of how to get a STEM job

Response:	Survey year	%	N (valid)
The information **has helped me understand** what I would need to do to get a job or career involving science, technology, engineering or mathematics	Year 3 (2010/11)	16	33
	Year 2 (2009/10)	19	46
	Year 1 (2008/09)	16	47
The information has **helped me a bit to understand** what I would need to do to get a job or career involving science, technology, engineering or mathematics	Year 3 (2010/11)	36	75
	Year 2 (2009/10)	42	100
	Year 1 (2008/09)	42	128
The information has **not really helped me understand** what I would need to do to get a job or career involving science, technology, engineering or mathematics	Year 3 (2010/11)	33	70
	Year 2 (2009/10)	29	69
	Year 1 (2008/09)	27	83
The information has **not helped me understand** what I would need to do to get a job or career involving science, technology, engineering or mathematics	Year 3 (2010/11)	6	13
	Year 2 (2009/10)	9	22
	Year 1 (2008/09)	15	45
Year 1 N (valid)= 303; Year 2 N (valid) = 237; Year 3 N (valid)= 191			

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages.
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three

Slightly over two-thirds of survey pupils (67 per cent) felt that the careers information they had received had helped them to understand what they would need to study to enter a STEM career, a very slight increase from previous years. The remaining pupils (33 per cent) stated that the careers information had not really, or had not at all, helped them.

Table 9.20: Understanding of subjects needed to get into a STEM career

Response:	Survey year	%	N (valid)
The information **has helped me to understand** what subjects I would need to study to get into careers that involve science, technology, engineering or mathematics	Year 3 (2010/11)	19	39
	Year 2 (2009/10)	24	58
	Year 1 (2008/09)	20	60
The information has **helped me a bit to understand** what subjects I would need to study to get into careers that involve science, technology, engineering or mathematics	Year 3 (2010/11)	43	89
	Year 2 (2009/10)	40	96
	Year 1 (2008/09)	44	131
The information has **not really helped me to understand** what subjects I would need to study to get into careers that involve science, technology, engineering or mathematics	Year 3 (2010/11)	27	57
	Year 2 (2009/10)	27	64
	Year 1 (2008/09)	23	70
The information has **not helped me to understand** what subjects I would need to study to get into careers that involve science, technology, engineering or mathematics	Year 3 (2010/11)	3	6
	Year 2 (2009/10)	9	21
	Year 1 (2008/09)	13	40
Year 1 N (valid)= 301; Year 2 N (valid)= 239; Year 3 N (valid)= 191			

Due to rounding to whole numbers, percentages may not sum to totals.
Percentages shown are valid percentages
Source: NFER pupil survey covering views on STEM subjects and careers, Year one, Year two and Year three.

Finally, survey pupils were invited to give their thoughts on what they felt was the best way to learn about STEM careers. Ideas were offered by 262 pupils. The broad themes within their responses reflect the ways that they already find out about STEM careers (see Table 9.17), and the most commonly mentioned ways to learn are listed below:

- Using the internet/relevant websites to find information (23 per cent)
- Talking with individuals working in STEM-related roles (13 per cent)
- Talking to teachers (12 per cent).

Other issues in relation to the provision of careers information emerged during qualitative pupil and parent focus group discussions. Firstly, a number of pupil focus group participants indicated a lack of awareness of how to access sufficient careers advice, or commented that the information provided was sometimes too general and/or stereotypical, for example, that 'engineers work under cars':

> I really enjoy physics lessons and I'd like to find out more about how I could work in that field, but I don't know who I'd go and ask about that.
>
> We haven't really found out much yet about careers. There was an assembly about the options and they told us to take a wide range of subjects. The art teacher was helpful, but there is no one to tell you what you might need to do particular jobs.
>
> Some of the jobs they suggested were ridiculous. For chemistry and physics they said I should work in a brewery!

Young people also appeared to be interested, and therefore potentially motivated, by the prospect of entering high earning professions. Promotion of STEM careers therefore needs to ensure that salary levels are communicated in any advertising:

> Doctors get loads of money, but nurses don't get paid much.
>
> If you were a low-level scientist you wouldn't earn much money.
>
> The highest paying jobs for an academic person are the STEM jobs. If you are STEM that is the way to go.

Another issue worthy of consideration is the role parents have to play in advising their children on future careers. From the small numbers we consulted with, it would seem that parents had a relatively low awareness of STEM careers information, although most felt a STEM-related career would be worthwhile and said they would support their child if they decided to pursue such a career path. Parents therefore could be directly targeted in relation to STEM careers information, so that they are in a stronger position to guide their children:

> I am sorry to say we don't feel good enough to guide our children, but we are willing to learn more.
>
> I'm an Arts graduate so know absolutely nothing about science/STEM careers.

Guidance can play a major role in supporting parents to advise their children.

[Parents need] more information on the direct relationship between academic work and job/career opportunities.

10 Impact of the action programme framework

Key findings summary

- The STEM Cohesion programme has improved understanding of the national STEM agenda by bringing key players together and creating greater awareness of each other's remit and priorities. This was confirmed by various Lead organisations and 38 of 55 individuals responding to the stakeholder survey[20].
- The key aim of the programme to increase linkages between lead organisations continues to be achieved. Most of the lead organisations and 35 out of 55 respondents to the stakeholder survey confirmed this linkage, reporting that the programme had strengthened existing links and facilitated the identification and development of further links with a wider range of organisations.
- The STEM Cohesion Programme has had a positive impact in terms of avoiding duplication, as well as providing a forum for identifying gaps in STEM delivery, according to Lead organisation interviewees and a majority of those responding to the stakeholder survey.
- The programme has had a positive impact on the development of the STEM programmes of Lead organisations and those responding to the stakeholder survey. For the latter (30 out of 55), increased awareness and clarity about what other organisations are doing has allowed them to find, and focus on, their own 'niche' or strengths in the STEM market, as well as rationalising activity.
- The STEM Cohesion Programme has had mixed impact on the development of the STEM policies of the various organisations responding to the research. Those stakeholder survey respondents who reported a positive impact (22 out of 55), referred to better and more frequent communication, increased information sharing and awareness raising as being influential. Others felt that the impact has been more indirect, or that it has validated existing STEM policies as opposed to directly contributing to their development.
- Lead organisations continue to work together as an inter-connected community with a shared communication strategy. Both lead organisations and 23 out of 55 stakeholder survey respondents reported that the programme has been influential in increasing the engagement of schools. Lead organisations found it difficult to identify increased attainment in STEM as an impact of the programme, citing this as a much longer-term outcome. Equally, stakeholder survey respondents found it difficult to isolate any difference the programme has made in increasing interest in STEM study and/or careers, given the number of associated factors that could be influential in this.

[20] Those responding to the stakeholder survey included representatives from industry, subject associations, institutes and societies.

This chapter of the report looks at the impact of the STEM Cohesion Programme, with particular reference to how it has affected those working in STEM education. The findings are drawn from interviews conducted with representatives of the lead organisations responsible for the action programmes, together with the views of the wider STEM community via a short stakeholder survey completed by 55 representatives from organisations[21]. It focuses on a range of specified impacts upon which interviewees and stakeholder survey respondents were invited to comment, including:

- understanding of the national STEM agenda
- linkages across the STEM community
- avoiding duplication
- identification of gaps in STEM delivery
- development of STEM programmes
- development of STEM policies
- influence on funding decisions
- the difference the programme makes for teachers, pupils, schools and colleges.

10.1 Understanding of the national STEM agenda

Interviewees from lead organisations expressed general agreement that the STEM Cohesion Programme has improved understanding of the national STEM agenda. The framework is felt to have established a clear, overarching set of priorities and clarified responsibilities. Through its emphasis on collaboration, key players have been brought together, which has resulted in greater awareness and understanding of each other's remits and priorities. However, some representatives also voiced concern that the future for STEM remains uncertain, given changing government priorities and funding streams.

Encouragingly, overall awareness of the STEM Cohesion Programme and its APs was good amongst respondents to our stakeholder survey, with four-fifths (44 out of 55) stating they were either fully aware, or had some awareness of it. Nearly three-quarters of stakeholders (40 out of 55) indicated full, or some, awareness of the lead organisations responsible for each AP, while more than

[21] Those responding to the stakeholder survey included representatives from industry, subject associations, institutes and societies.

nine out of ten stakeholders (51 out of 55) reported being either fully aware, or having some awareness, of the National STEM Centre and its eLibrary. Again, as with the first stakeholder survey, the high level of positive responses may reflect a bias amongst those organisations that chose to return a response.

At the same time, more than two-thirds of stakeholder survey respondents (38 out of 55) reported a positive impact of the STEM Cohesion Programme on their understanding of the national STEM agenda. Amongst the specified outcomes offered for comment, this particular outcome received the highest number of positive ratings from respondents. Understanding was reported to have been enhanced through national events, such as conferences and presentations, as well as through meetings and discussions between the key players. The launch of the National STEM Centre, with its eLibrary, was also felt to have provided an opportunity for increased understanding and awareness. Understanding of the national STEM agenda was also reported to be essential for organisations to be able to work effectively within the marketplace.

> It is important for all partners to travel forward with a shared understanding of the role and objectives of each other and a good insight into how these are mutually supportive, so as to encourage and enable collaborative development.
>
> National Strategies representative

Of the fifth of stakeholders (11 out of 55) who reported no impact of the programme on their understanding of the national STEM agenda, this was most commonly reported to be because these particular organisations have been involved with the agenda for some time and, as such, they believe that they are already well versed in the relevant issues. One respondent identified some negative impact, where committees have not always been made up of experts, but instead have involved those with limited understanding of the STEM agenda.

10.2 Linkages across the STEM community

As noted in the introduction to this report, a key aim of the STEM Cohesion Programme is to bring stakeholders together in order to foster collaborative working. In Year 3 of the evaluation, feedback from lead organisations continues to confirm that this aim is being achieved. The programme is reported to provide a forum for collaboration, which means that the lead

organisations can offer more by working together, thus avoiding duplication, whilst at the same time, fostering good relationships which serve to strengthen the programmes on offer. Regional area committees now facilitate effective two-way communication between national and regional STEM groups, enabling regional groups to have input into the STEM Cohesion Programme, whilst at the same time, ensuring that national priorities remain responsive to regional needs.

In Year 2 of the evaluation, we reported that links between lead organisations are particularly evident where APs share a similar focus. This continues to be the case in Year 3, for example, working with the National Science Learning Centre (AP3), the National Centre for Excellence in the Teaching of Mathematics (NCETM) (AP2) has promoted STEM-funded projects through both the science and the maths portal. Close relationships continue to be reported between the APs connected to enhancement and enrichment activities (APs 5, 6 and 7) with the three lead organisations for these programmes (ACME, RAEng and SCORE) still working closely together on shorter duration projects.

Beyond the members of the immediate STEM cohesion group, lead organisations also reported greater linkage with other organisations within the wider STEM community, which is believed to have resulted in improvements to STEM provision as a whole.

Responses to the stakeholder survey confirm this increased linkage, both with lead organisations and with other STEM organisations. In particular, over the past two years, stakeholders reported having regular, or some, contact with the following lead organisations:

- NCETM: regular contact (11 out of 55); some contact (22 out of 55)
- National Science Learning Centre: regular contact (36 out of 55); some contact (16 out of 55)
- SCORE: regular contact (10 out of 55); some contact (27 out of 55)
- RAEng: regular contact (16 out of 55); some contact (23 out of 55)
- ACME: regular contact (seven out of 55); some contact (20 out of 55)
- The National STEM Careers Coordinator (at Sheffield Hallam University): regular contact (ten out of 55); some contact (21 out of 55).

Nearly two-thirds of stakeholder survey respondents (35 out of 55) reported a positive impact of the STEM Cohesion Programme on the development of links with other STEM organisations. The programme was believed to have brokered collaborative opportunities, strengthened existing links and facilitated the identification and development of further links with a wider range of organisations. Lead organisation meetings were reported to be a good forum for bringing organisations with similar aims together for networking and information sharing opportunities.

> It has provided a real opportunity to bring all stakeholders together into a coordinated programme of activity. It has assisted by enabling a common contact point for all key stakeholders undertaking activities related to our work; it is a valuable mechanism for enabling collaborative working and the sharing of ideas.
>
> Higher Education representative

Of the quarter of stakeholders (15 out of 55) reporting no impact of the programme on the development of links with other STEM organisations, this was most commonly because they already had longstanding, extensive links with other STEM organisations through a range of activities and funding schemes and, as such, the programme was not felt to have materially affected those relationships.

10.3 Avoiding duplication

For lead organisations, structures such as the National CPD Coordination Committee and the National STEM Centre, particularly its eLibrary, have been influential in facilitating greater sharing and signposting of available information and thus avoiding duplication. Partner organisations were said to be more aware of what each other is doing.

Over half the organisations responding to the stakeholder survey (29 out of 55) reported a positive impact of the STEM Cohesion Programme in terms of avoiding duplication, with just under a third (18 out of 55) reporting no impact. Those reporting a positive impact referred to improved lines of communication, clearer demarcation of responsibilities, and more effective coordination. Increased dialogue and interaction as a result of the programme was believed to have led to greater confidence that activities were ‘joined up’ as well as highlighting areas for closer collaboration.

> Enhanced relationships between different stakeholders within the STEM field and greater awareness of the different organisations' relative strengths has led to less duplication and more collaboration between partners.
>
> Higher Education representative

Those organisations reporting no impact of the programme in relation to avoiding duplication tended to argue that, although some progress has been made in terms of increased awareness of other organisations' work, better coordination is still a requirement. One respondent went further by saying that any progress made may well have taken place anyway, without the STEM Cohesion programme.

10.4 Identification of gaps in STEM delivery

Lead organisations identified the requirement of the STEM Cohesion Programme for greater collaboration, evidenced through increased discussion and meetings between lead organisations, as providing a forum for identifying gaps in STEM delivery.

Over two-fifths (24 out of 55) of our stakeholder survey respondents reported a positive impact of the programme on the identification of gaps in STEM delivery. It was said to have fostered greater understanding of the STEM landscape and, in particular, of the existing range of work taking place in schools and colleges. For one higher education institution, this has helped them identify complementary activities and areas where the HE sector might best provide support. For another, the existence of coherent action programmes has allowed them to identify areas that were not being covered, which has resulted in bids to various organisations. For one subject association, joint courses with the National Science Learning Centre have clearly identified 'a whole range of additional CPD opportunities'.

For the 16 stakeholder survey respondents who reported no impact of the programme on identifying the gaps in STEM delivery, this was generally believed to be achieved via the STEM agenda as a whole, of which the cohesion programme was reported to be a part.

10.5 Development of STEM programmes

Lead organisation interviewees were in agreement that the STEM Cohesion Programme has facilitated the development of their STEM programmes. The 'mere existence' of the programme was reported to have allowed a greater focus on engineering and technology. Organisations have been able to identify existing work taking place, re-visit their offers, identify any gaps or areas for development, and develop their programmes accordingly.

Over half the respondents to our stakeholder survey (30 out of 55) reported a positive impact of the programme on the development of their STEM programmes, while over one quarter (16 out of 55) reported no impact. This was most often because the responding organisation was not a delivery agency. For those reporting a positive impact, increased awareness and clarity about what other organisations are doing was said to have allowed stakeholders to find, and focus on, their own 'niche' or strengths in the STEM market, for example, STEM Ambassadors. In addition, the programme was reported to have facilitated the sharing of good practice and the rationalisation of activity.

10.6 Development of STEM policies

For AP4 and AP6[22], the STEM Cohesion Programme has helped to define the RAEng's relationship with the STEM agenda and explore the ways in which engineering can underpin education choices. It has enabled them to work out how, and why, engineering fits into this and to reconsider what the RAEng is offering. Another representative of a lead organisation referred to the programme as 'the umbrella' that ensures organisations think across the whole STEM agenda rather than just focusing on careers, for example.

Two-fifths of our stakeholder survey respondents (22 out of 55) reported that the programme has had a positive effect on the development of their STEM policies, while just under two-fifths (20 out of 55) reported no impact. For those indicating a positive impact on policy development, this was generally viewed as being a result of better and more frequent communication, as well as increased information sharing and awareness raising between organisations. However, a number of stakeholder respondents were at pains

[22] For details on each of the Action Plans, see Section Table 1.1

to point out that the programme's influence has been more indirect, for example, by creating a 'more structured marketplace' for STEM business to take place in, and that policy development has been largely driven by an organisation's own approach to strategic business planning according to its aims and objectives, or by government agencies such as the DfE and BIS. This was echoed by some of the respondents reporting no impact, who commented that the programme may have validated STEM policies, but has not directly contributed to their development.

10.7 Influence on funding decisions

Lead organisations were less emphatic about the impact of the STEM Cohesion Programme on influencing funding decisions. It was felt that there is now a better evidence base from which to make decisions, which has enabled better targeting of resources.

Just over a quarter of the stakeholders who responded to our survey (16 out of 55) reported a positive impact on funding decisions as a result of the programme, mainly through its emphasis on collaboration and providing value for money. For one charity, the programme has proved to be 'an excellent asset' for its funding applications. For one higher education institution, the programme has influenced how they set about funding their own business, for example, by providing a more coherent set of STEM programmes, many of which have been implemented as a result of the awarding of commercial contracts and HE STEM project grants. Just over a third of stakeholder survey respondents (20 out of 55) indicated that the STEM Cohesion Programme has not had any impact on funding decisions, usually because such decisions are determined by the organisation's own aims and objectives.

10.8 Difference the programme makes to schools and colleges

Effective coordination of information

In Year 3 of the evaluation, it is clear that lead organisations are continuing to work together as an inter-connected community with a shared communication strategy. The following examples of effective practice in the coordination of information to schools and colleges were highlighted in the interviews with representatives of lead organisations:

- The centralised STEM website, hosted by the National STEM Centre, which holds the UK's largest collection of STEM teaching and learning resources available through its physical library and eLibrary
- The STEM Directories, in both hard and online format, which comprise a collection of enhancement and enrichment schemes and activities provided by organisations from across the UK
- AP8 (careers) has set up a stakeholder advisory group that meets once a term, with more regular updates in between, to ensure the cross-fertilisation of ideas and avoid duplication. The group has had a wide membership, including employers, trade associations, quangos and careers organisations. As a result, information is said to be better coordinated and working practice more coherent, which will be reflected in the types of information available to schools. It is envisaged that the group will continue to meet once programme funding has ceased.
- Improved working with employers to share resources, for example, using employer websites to reach schools
- The National CPD database, established by the Training and Development Agency (TDA) for schools, which represents an authoritative source of information on CPD opportunities from participating providers. It provides CPD leaders and other members of the school workforce with information on all types of CPD provision, from a wide range of different providers. This is reported to have helped to coordinate science and maths CPD.
- The introduction of national standards for CPD, which provides a quality assured programme with a set of principles that all providers have signed up to and which, together with the central CPD database, ensures that schools can access the most appropriate information.

In addition, better coordination of information between schools as a result of the action programmes has been identified, for example, at a regional level, clusters of schools are reported to be working more closely together in order to improve the mapping and sharing of information.

Increased engagement of schools with STEM provision

For lead organisations, increased standardisation and centralisation of information was felt to have improved the offers of all STEM organisations, which, it was suggested, would have directly affected the engagement of schools. One lead organisation reported that they had ‘created engagement’ by investing in a design and technology offer where this had not previously existed. Another reported good attendance from schools at events and career workshops. For example, they had recently produced materials for the Farnborough Air Show and worked with the British Space Agency to

showcase what this agency does, what careers are available etc. Teachers' feedback showed that they valued receiving the information and learning more about career options, for example, that 'space careers are not just about astronauts'.

Respondents to our stakeholder survey were asked to note, if they were a provider, whether they had noticed any changes in the number of schools engaging with STEM provision over the last two years, in particular whether numbers had increased or whether they had stayed the same. Over a quarter (15 out of 55) indicated they were not providers. Of the remainder, just over two-fifths of respondents (23 out of 55) reported an increase in numbers, while a fifth reported no change. One higher education representative reported an identified reduction in the number of teachers participating in training programmes associated with the major National Curriculum development projects, for example, Twenty First Century Science, Salters Advanced Chemistry, Salters Nuffield Advanced Biology, referencing the effect of 'rarely cover'[23] policy as an influencing factor in this.

For those stakeholders identifying an increase in the number of schools engaging with STEM provision, a number reported this to be as a result of their own proactive marketing of STEM work and greater interaction with schools. It was believed that the STEM Cohesion Programme may have contributed to the increased engagement of schools in terms of raising general awareness of the STEM agenda.

> Most schools are now involved in our regional programmes (For example, the Science Learning Centre, STEM Brokerage, STEM Ambassadors). This has increased largely as a result of the action of staff, in the context of challenging targets set by national lead organisations. We have recruited well to our STEM subjects. For example our mathematics courses have gained an increase in student numbers going from 180 to 300 in the last 3 years. This is largely as a result of greater interaction with schools across all the STEM subjects.
>
> Higher Education representative

> We run the British Biology Olympiad and Biology Challenge, both competitions have had a rise in the number or participating schools over the last 2 years, in particular the biology challenge which reached 20,000 student entries in 2010 from over 300 schools.
>
> Subject society representative

[23] This policy aims to move towards a situation whereby teachers are only rarely asked to cover for absent colleagues.

The representative from one charitable trust, described as a non-provider of STEM activities, reported that, from the Trust's perspective, it was clear that school engagement with STEM provision had increased at both a local level, as evidenced through one of its community projects, and nationally, as evidenced through evaluation reports on its major projects, most notably, the Great Plant Hunt and Survival Rivals.

Increased attainment

Lead organisations were asked if they had any evidence of increased pupil attainment in STEM, for example, at KS3 and/or A level, as a result of the work of their particular action programme. Interviewees noted improvements in attainment in individual STEM subjects, but found it difficult to attribute this directly to the work of the different programmes. In addition, it was said to be difficult to talk about increased attainment in STEM as a whole, because 'STEM is not measured in a league table as a single measure'. Finally, one lead organisation indicated that increased attainment was a longer-term impact, commenting that it would take 'months and years' for the subject knowledge gained through the work of the STEM action programmes to translate into identifiable increases in attainment.

Increased interest in STEM study

Interviewees from lead organisations found it difficult, when asked, to comment on any impact of the work of the action programmes on increasing interest in STEM study and/or careers. Although a great deal of good work was being done in this area, for example, through STEM Ambassadors and bringing STEM employers into the classroom, isolating the 'difference' this has made, given the number of associated factors that could be influential in this, was believed to be problematic.

The role of the National STEM Careers Coordinator in working with stakeholders and the organisations involved in delivery was reported to have been 'invaluable' in terms of increasing awareness of what influences and interest learners, and in sharing useful facts.

11. Challenges and developments

Key findings summary

Challenges

- Lead organisations identified a number of challenges in Year 3 of the evaluation. These included: difficulties with engaging stakeholders (particularly schools); funding constraints and/or future uncertainties about funding (as a result of the change in government and a re-focusing of priorities); as well as a perceived lack of understanding of what STEM actually represents and a continuing lack of understanding and appreciation of the role of maths in STEM. These challenges were largely similar to those faced by these organisations in previous years of the evaluation.
- The status and capacity of careers provision in schools, continued to give cause for concern. A lack of cohesion between STEM and careers activities in schools was noted, as well as senior leadership teams not prioritising STEM careers information and guidance.
- The 'rarely cover' policy was identified by interviewees during the third year of the evaluation as leading to a reduction in the numbers of teachers attending external CPD events.

Ways in which the programme could be developed

- Suggestions for developing the STEM Cohesion Programme in the future included: increasing the engagement of stakeholders through the promotion of greater understanding of STEM, showcasing good practice; improving coordination across the key players involved, especially with schools having a broader range of sources from which to draw for CPD and E&E activities; and ensuring scope for ongoing review of the action programme framework. The need for joint forward planning in relation to emerging government policy and priorities was also highlighted by Lead organisation interviewees.
- Ensuring the sustainability of the programme was reported to rely on shared responsibility and commitment, together with a recognition that STEM cohesion should be funded as part of the working role of the principal leads involved, not just 'tacked on' to an existing job. Lead organisation interviewees also noted the need for the government departments that invest in STEM to be 'joined up' themselves, the need to draw in more stakeholders, the importance of embedding STEM more broadly and the ability to demonstrate evidence of effectiveness. Finally, for some lead organisations, sustainability of the programme could be affected by funding uncertainties, which had the potential to adversely affect the rate of progress.

This final chapter considers the challenges encountered by the STEM cohesion programme and then looks at ways in which the programme could be developed, including a focus on sustainability issues. It draws on the

qualitative interviews conducted with representatives from the lead organisations responsible for each of the APs.

11.1 What have been the main challenges for the STEM Cohesion Programme?

Representatives of the lead organisations were asked during the interviews to identify the main challenges they had encountered in relation to the last two years of the STEM Cohesion Programme. The following challenges were highlighted:

- difficulties engaging stakeholders, particularly schools
- funding constraints/uncertainties
- lack of understanding of STEM as a construct
- the role of careers within STEM
- impact of 'rarely cover' policy
- scale of the programme and meeting demand.

Difficulties engaging stakeholders

For lead organisations, securing involvement from STEM partners was seen as a continuing problem. There was felt to be a particular issue with school engagement, which was often compounded by funding difficulties, i.e. in terms of the associated costs for teachers' time and cover. The representative from AP8 (careers) registered again in Year 3 of the evaluation that many subject teachers do not always fully understand their role in careers awareness and thus do not see it as part of their job, 'it is not a school priority'. It was suggested that greater valuing of, and support for, STEM at senior management level would be beneficial in raising its status. Events for headteachers coordinated by the National STEM Centre recently have focused on raising the profile of STEM. Equally, the inclusion of a careers element in the curriculum syllabus could well provide the impetus for teachers to engage. This AP continued to note difficulties when seeking to reach employers – one solution, suggested in Year 2 of the evaluation, was to make use of 'gatekeeper' employers who already have a dialogue with a network of companies such as trade associations.

Funding constraints/uncertainties

By Year 3 of the evaluation, a number of lead organisation representatives were identifying funding constraints and/or future uncertainties about funding as a challenge. A changing financial climate nationally was felt to have led to difficulties at a regional level. AP4 and AP6 receive no public funding allocation and, as a result, their progress was reported to be set by their ability to fundraise. Equally, the recent change of government was believed to have led to a re-focusing of priorities, which could potentially leave some initiatives financially vulnerable.

Lack of understanding of STEM as a construct

In Year 3 of the evaluation, concern was raised about a perceived lack of understanding of what STEM actually represents. Confusion was said to have arisen because STEM is viewed as an integrated cross-curricular programme in its own right. STEM is a construct of four discrete curriculum areas, but the challenge, as reported by one lead organisation representative, is gaining universal recognition of STEM being 'greater than the sum of its parts'.

> The big challenge is a lack of clarity about the fact that STEM is both a recognition of the individual entities, but also adds value to those individual entities by encouraging cooperation between them.
>
> Lead organisation representative

Within this, a particular issue identified by lead organisations in Year 2 of the evaluation, and alluded to again in Year 3, was a continuing lack of understanding and appreciation amongst those working in STEM education of the role of maths in STEM. Maths can be said to underpin, or at least be an essential element of the other STEM subjects – science, technology and engineering. It was felt that this was not always accepted by STEM colleagues and, in order to highlight how maths does in fact 'pervade' STE, one particular action programme (AP2) had decided to develop small projects which encourage linkages between maths and technology, maths and engineering and so on. A step-by-step approach, based around small projects was believed to offer an achievable way of demonstrating the contribution that maths has to make to its partnered subject areas.

The role of careers within STEM

Action programme 8 aims to improve the quality of advice and guidance for students about STEM careers, to inform subject choice. Issues related to

capacity of careers provision in schools and its status generally continued to give cause for concern. For example, noted in Year 2 of the evaluation, was patchy careers provision in schools alongside a small careers workforce, working under pressure. Mentioned again in the third year of the evaluation was a lack of cohesion between STEM and careers activities in schools, as well as senior leadership teams that do not always prioritise careers. To raise the status and importance of careers within STEM, AP8 has presented to a range of stakeholders at national events such as the British Science Festival, and at regional headteacher events and conferences. Other suggestions for improving the situation were: providing case study demonstrations of its relevance, linking AP8 objectives to teaching and learning in STEM and linking careers to school improvement.

Impact of 'rarely cover' policy

In Year 2 of the evaluation, several representatives from lead organisations reported that out-of-school STEM provision had been hit by the introduction of 'rarely cover', which has seen a reduction in the numbers of teachers attending events. This had resulted in organisations having to 'work harder' to communicate the benefits of attending external CPD events, whilst at the same time looking at alternatives, such as arranging on-site CPD. Although they were not specifically asked to identify challenges, a number of stakeholder survey respondents from the wider STEM community highlighted this policy in their Year 3 survey returns as a particular issue affecting teacher involvement.

Scale of the programme and meeting demand

In Year 2 of the evaluation, the capacity to operate on a nationwide scale was cited as a challenge. For example, for AP10 (practical science), it had proved difficult in the first year to link all schools interested in the programme with a trainer; only 100 trainers were available and they did not cover all areas of England. This predicament was subsequently tackled in the second year by targeting those areas that missed out initially. The scale of the task had also been an issue for AP8 (careers), in particular when seeking to communicate with the large number of stakeholders – its solution was to use intermediaries, rather than to try to communicate with everyone directly. By Year 3 of the evaluation, the scale of the programme was not highlighted as being a particular challenge.

Other challenges

Other challenges for AP lead organisations identified in Year 2 of the evaluation included: obtaining a full picture of the breadth of enhancement and enrichment activities on offer and thereby being able to spot gaps or duplication (a gap analysis has now been commissioned); and the importance of impartiality when promoting STEM careers (to avoid being seen as STEM promoters with vested interests). In Year 3 of the evaluation, an ongoing challenge was reported to be ensuring that the good work and lessons learned to date are not lost, but built upon and extended.

11.2 How could the programme be improved upon or developed further?

Lead organisation representatives put forward the following suggestions for developing the STEM Cohesion Programme in the future.

Engagement of stakeholders

Securing the engagement of schools has already been highlighted as a challenge for the action programmes. To encourage the involvement of schools in the STEM agenda, it was proposed in Year 2 of the evaluation that the use of incentives should be discussed and considered. Furthermore, interviews conducted in Year 3 have identified that, whilst lead organisations are seeking to promote STEM, schools and colleges still do not necessarily have a clear understanding of the STEM concept. The representative of one lead organisation again reported a lack of awareness amongst subject teachers regarding the role they have to play in relation to careers awareness and, more generally, senior leader teams who do not see STEM careers as a priority. Greater awareness could also be achieved through the distribution of information packs which provide examples of what STEM activity encompasses, as well as showcasing good practice. This could help schools see ways in which they could potentially contribute to the STEM agenda or even illustrate how they are already engaging with this area.

Improved coordination

An ongoing issue was reported to be the need for effective coordination across the organisations involved in STEM provision. The STEM environment was said to be changing with schools assuming greater control and other individuals and large organisations joining ‘the mix’, so that schools will have a

broader range of sources from which to draw for CPD and E&E activities. For one lead organisation, the work of employers was said to be 'still too ad hoc'. This issue was currently being addressed through the development of a skills document for employers. The representative of this organisation commented that, rather than working directly with employers, it was better to work with employer 'gate keepers'.

Reviewing the action programme framework

As in Year 2 of the evaluation, there was recognition amongst representatives of lead organisations interviewed in Year 3 that, as the STEM Cohesion Programme evolves, there needs to be scope for reviewing the structure of the framework. Action programmes concerned with enhancement and enrichment activities have come together, due to their shared focus, but, from interviewees' comments, it would appear that further amalgamation would still be beneficial, across these and other action programmes, for example, those with a CPD remit. A review of the programme could also examine the balance between the different subject elements of STEM, and if necessary, elevate the status of those subjects that may be perceived as needing further attention or input, for example maths. The need for joint forward planning in relation to emerging government policy and priorities was also highlighted. In addition, the importance for future policy of research into how and when primary school pupils form enduring attitudes to science and technology was identified by one of the organisations responding to the stakeholder survey.

Securing a long-term future for the STEM Cohesion Programme

When asked about the sustainability of the STEM cohesion programme, lead organisations again referred to the need to build an organisational structure which would live beyond the time limit of the current contract. In Year 2 of the evaluation, lead organisations suggested that, in order for this to happen, participating organisations should be given greater and (equal) ownership of the STEM cohesion agenda, rather than operating as a group coordinated by a lead partner, under contract by the DCSF, now the DfE. By creating a 'genuine STEM cohesion community' with a sense of shared responsibility and commitment, member organisations could be more inclined to dedicate time and, importantly, resources to its ongoing activities.

In Year 3 of the evaluation, lead organisations also suggested that, in order to ensure a STEM cohesion programme, there needed to be recognition that

STEM cohesion should be funded as part of the working role of the principal leads involved, not just 'tacked on' to an existing job. Another suggestion was that the Government departments that invest in STEM would require to be 'joined up' themselves in order to drive purposeful collaboration forward. For example, the Department for Business, Innovation and Skills (BIS) funds STEM ambassadors and the Department for Education (DfE) funds regional science learning centres. In order to drive collaboration forward, it was felt that there should be a requirement from DfE for regional science learning centres to use STEM ambassadors, and a requirement from BIS for STEM ambassadors to understand what it is science learning centres do and be able to participate in their courses.

Representatives of lead organisations also referred to the importance of embedding STEM more broadly, and the need to draw in more stakeholders such as teaching organisations, employers, education organisations, the media, parent organisations, and organisations providing support for young people. The ability to demonstrate evidence of effectiveness, for example through the requirement for appropriate, publicly available, evaluation and case studies of effective practice, would also be beneficial in ensuring sustainability.

Finally, for most lead organisation interviewees, funding uncertainties emerged as a major issue in terms of sustainability. Interviewees pointed out that unless CPD funding was ring fenced, schools may not develop CPD sufficiently because of other competing priorities for funding. The representative from one lead organisation reported that, due to year-on-year increases in STEM attainment and a resurgence in the triple science offer, there was now, more than ever, a need for more dedicated STEM teachers and good CPD. Lack of, or a reduction in, funding would not stop the work from continuing but was likely to reduce the rate of progress, with the effect that this could have quoted as ranging from 'restrictive' to 'dire'.

Appendix 1: Sample information for the teacher survey

Table A.1 Breakdown of teachers by subject specialism: CPD and Enrichment survey[1] (Years 2 and 3)

Subject:	Year 2 (2009/10)		Year 3 (2010/11)	
	Respondents	%	Respondents	%
Mathematics	168	34	79	23
Science	185	38	154	45
Technology/engineering[2]	98	20	64	19
All subjects /combination of subjects	37	8	37	11
Not known/unstated	1	<1	12	3
Total	489	100%	346	100

Table A.2 Breakdown of teachers by subject specialism: Careers survey (Years 2 and 3)

Subject:	Year 2 (2009/10)		Year 3 (2010/11)	
	Respondents	%	Respondents	%
Mathematics	48	24	25	25
Science	96	48	46	47
Technology/engineering	49	25	23	23
All subjects/combination of subjects	8	3	1	1
Not known/unstated	-	-	4	4
Total	198	100	99	100

[1] In Year 1, the paper surveys collected subject details differently, so figures are not reproduced here.
[2] In year 3 of the survey, engineering was introduced as a subject category.

Table A.3 Breakdown of teachers by school type: CPD and enrichment survey (Years 2 and 3)

School type:	Year 2 (2009/10)		Year 3 (2010/11)	
	Respondents	%	Respondents	%
Primary	87	18	50	15
Secondary	278	57	205	59
FE College	122	25	91	26
Unknown	2	0.5	-	-
Total	489	100	346	100

Table A.4 Breakdown of teachers by school type: Careers survey (Years 2 and 3)

School type:	Year 2 (2009/10)		Year 3 (2010/11)	
	Respondents	%	Respondents	%
Primary	-	-	-	-
Secondary	198	100	98	99
FE College	-	-	1	1
Unknown	-	-	-	-
Total	198	100	198	100

Table A.5 Breakdown of teachers by subject specialism (Year 1: 2008/09)

Subject:	CPD and Enrichment survey		Careers survey	
	Respondents	Percentage	Respondents	Percentage
Mathematics	92	31%	74	32%
Science	115	38%	88	38%
Technology	92	31%	70	30%
Total	299	100%	232	100%

Table A.6 Breakdown of teachers by school type (Year 1: 2008/09)

School type:	CPD and Enrichment survey		Careers survey	
	Respondents	Percentage	Respondents	Percentage
Primary	8	3%	0	0%
Secondary	242	81%	232	100%
FE College	49	16%	0	0%
Total	299	100%	232	100%

Appendix 2: Sample information for the pupil survey

Year 3: Sample information for the pupil survey

Of the 238 pupils:

- All indicated their gender: 45 per cent were male, whilst 55 per cent were female
- 233 gave their age: 62 per cent of the pupils that answered were aged 14 years, whilst 36 per cent were aged 15 years
- 235 disclosed their ethnicity, and the majority of these (83 per cent) were white (see Table A.3 for more details).

Table A.7: Ethnicity of pupils completing survey

Response:	N	%
White	197	83
African	10	4
Mixed	8	3
Pakistani	7	3
Caribbean	6	3
Other	3	1
Chinese	2	1
Bangladeshi	1	0
Indian	1	0
Total	**235**	**100**

Due to rounding to whole numbers, percentages may not sum to totals.
Source: NFER pupil survey covering views on STEM subjects and careers, Year 3

Year 2: Sample information for the pupil survey

Of the 261 pupils:

- All indicated their gender, and 56 per cent were male, whilst 44 per cent were female
- 257 gave their age, and 58 per cent of the pupils that answered were aged 14 years, 39 per cent were aged 15 years, and a small minority of four per cent were aged 16 years
- 256 disclosed their ethnicity, and the majority of these (82 per cent) were white (see Table A.3 for more details)

Table A.8: Ethnicity of pupils completing survey

Response:	N	%
White	210	82
Pakistani	13	5
African	8	3
Mixed	7	3
Bangladeshi	4	2
Caribbean	4	2
Other	4	2
Chinese	3	1
Indian	3	1
Total	**256**	**100**

Due to rounding to whole numbers, percentages may not sum to totals.
Source: NFER pupil survey covering views on STEM subjects and careers, Year 2

Year 1: Sample information for the pupil survey

Of the 342 pupils:

- 340 indicated their gender, and 57 per cent were male, whilst 43 per cent were female
- 340 gave their age, and 66 per cent were aged 15 years, whilst the remaining 34 per cent were aged 14 years
- 337 disclosed their ethnicity, and the majority (87 per cent) were white (see Table A.3 for more details)

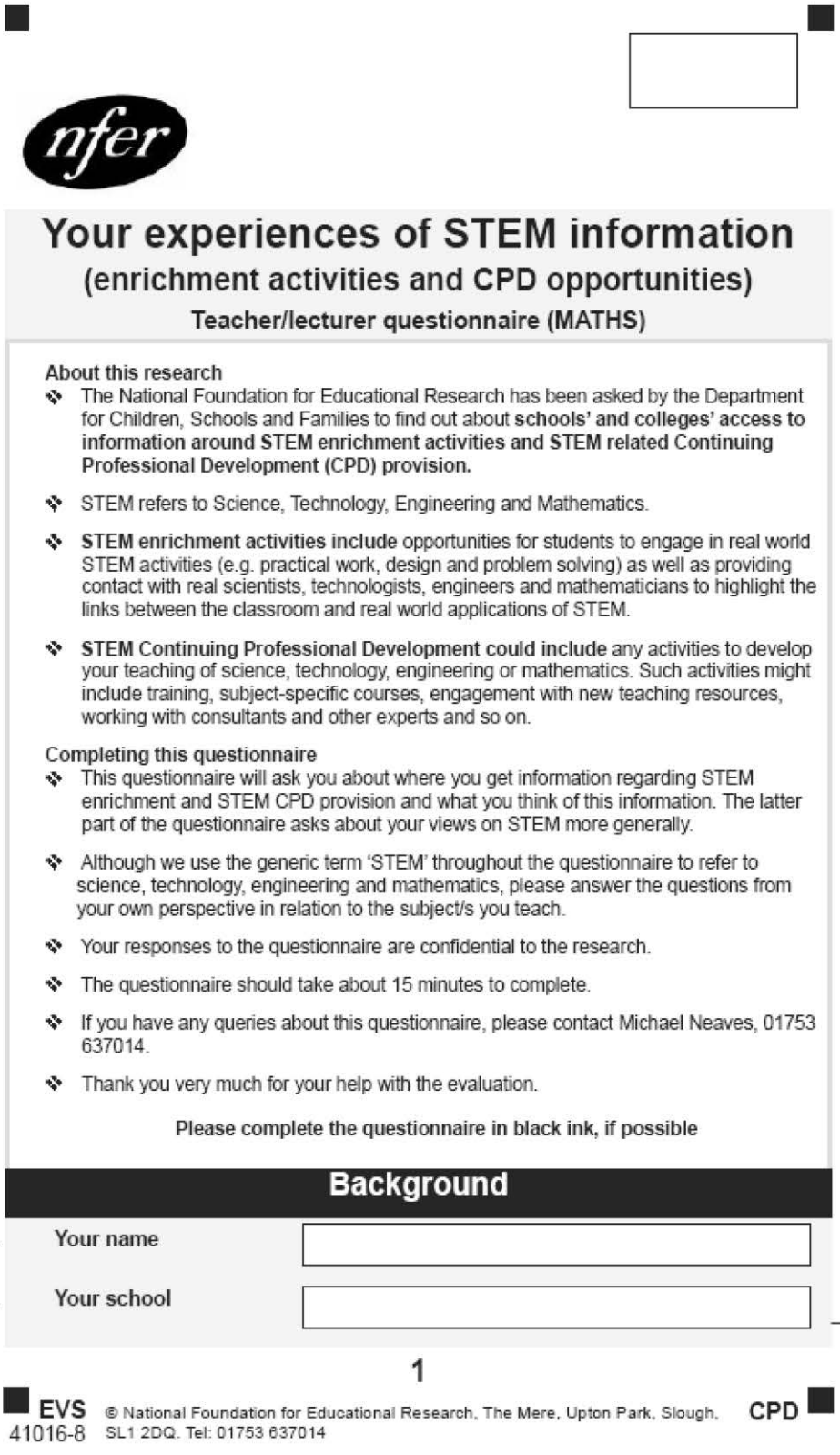
Table A.3: Ethnicity of pupils completing survey

Response:	N	%
White	292	87
Mixed	9	3
African	8	2
Bangladeshi	7	2
Pakistani	6	2
Indian	5	2
Caribbean	2	1
Chinese	2	1
Other	6	2
Total	**337**	**100%**

Source: NFER pupil survey covering views on STEM subjects and careers, 2009
337 pupils gave a valid response to this question.
Due to rounding to whole numbers, percentages may not sum to totals.

Appendix 3: Research Instruments

Year 1 Teacher Survey: Enrichment and CPD



nfer

Your experiences of STEM information
(enrichment activities and CPD opportunities)
Teacher/lecturer questionnaire (MATHS)

About this research

- The National Foundation for Educational Research has been asked by the Department for Children, Schools and Families to find out about **schools' and colleges' access to information around STEM enrichment activities and STEM related Continuing Professional Development (CPD) provision.**
- STEM refers to Science, Technology, Engineering and Mathematics.
- **STEM enrichment activities include** opportunities for students to engage in real world STEM activities (e.g. practical work, design and problem solving) as well as providing contact with real scientists, technologists, engineers and mathematicians to highlight the links between the classroom and real world applications of STEM.
- **STEM Continuing Professional Development could include** any activities to develop your teaching of science, technology, engineering or mathematics. Such activities might include training, subject-specific courses, engagement with new teaching resources, working with consultants and other experts and so on.

Completing this questionnaire

- This questionnaire will ask you about where you get information regarding STEM enrichment and STEM CPD provision and what you think of this information. The latter part of the questionnaire asks about your views on STEM more generally.
- Although we use the generic term 'STEM' throughout the questionnaire to refer to science, technology, engineering and mathematics, please answer the questions from your own perspective in relation to the subject/s you teach.
- Your responses to the questionnaire are confidential to the research.
- The questionnaire should take about 15 minutes to complete.
- If you have any queries about this questionnaire, please contact Michael Neaves, 01753 637014.
- Thank you very much for your help with the evaluation.

Please complete the questionnaire in black ink, if possible

Background

1. Your name
2. Your school

1

EVS 41016-8 © National Foundation for Educational Research, The Mere, Upton Park, Slough, SL1 2DQ. Tel: 01753 637014 CPD

3. **Please indicate which subjects you teach and at what level.**

	Subjects	Level
_____	1.	1.
_____	2.	2.
_____	3.	3
_____	4.	4.
_____	5.	5.

Awareness of STEM information and provision

4. **We would like you to think about your awareness and knowledge of STEM provision and rate the extent to which you agree or disagree with the following statements.**

		Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
a)	I am aware of **STEM enrichment activities for students**	☐	☐	☐	☐	☐
b)	I know **where to go for information** regarding STEM enrichment activities for students	☐	☐	☐	☐	☐
c)	I am aware of **STEM continuing professional development opportunities** for teachers/lecturers	☐	☐	☐	☐	☐
d)	I know **where to go for information** regarding STEM continuing professional development opportunities for teachers/lecturers	☐	☐	☐	☐	☐

Sources of information

5. **Please indicate below which sources of information you 1) are aware of and 2) have used to find out about STEM enrichment and CPD activities** (please tick all that apply)

		Aware of	Used for STEM enrichment	Used for CPD activities
a)	The STEM Directory - Science (2008/09)	☐ 1	☐ 2	☐ 3
b)	The STEM Directory - Mathematics (2008/09)	☐ 1	☐ 2	☐ 3
c)	The STEM Directory - Engineering and Technology (2008/09)	☐ 1	☐ 2	☐ 3
d)	STEMNET and their networks of STEMPOINTs (formerly SETNET and SETPOINTs)	☐ 1	☐ 2	☐ 3
e)	Learning outside the Classroom Manifesto/Partnership/website (e.g. www.lotc.org.uk)	☐ 1	☐ 2	☐ 3
f)	Science and Engineering Ambassadors	☐ 1	☐ 2	☐ 3
g)	After-School Science and Engineering Clubs (ASSECs) (e.g. materials and resources accessed via ASSECs) www.the-ba.net/the-ba/ccaf/Clubs	☐ 1	☐ 2	☐ 3

h)	Institute of Physics	☐ 1	☐ 2	☐ 3
i)	Institute of Biology	☐ 1	☐ 2	☐ 3
j)	LA Consultants and Advisers	☐ 1	☐ 2	☐ 3
k)	National Centre for Excellence in the Teaching of Mathematics (NCETM)	☐ 1	☐ 2	☐ 3
l)	NCETM Professional development directories (e.g. www.ncetm.org.uk)	☐ 1	☐ 2	☐ 3
m)	National Science Learning Centre	☐ 1	☐ 2	☐ 3
n)	Regional Science Learning Centres	☐ 1	☐ 2	☐ 3
o)	National Strategies - science and mathematics	☐ 1	☐ 2	☐ 3
p)	Network of Education Business Partnerships	☐ 1	☐ 2	☐ 3
q)	Royal Academy of Engineering	☐ 1	☐ 2	☐ 3
r)	Royal Society of Chemistry	☐ 1	☐ 2	☐ 3
s)	Specialist Schools and Academies Trust	☐ 1	☐ 2	☐ 3
t)	The Association for Science Education	☐ 1	☐ 2	☐ 3
u)	Triple Science Support Programme (e.g. www.triplescience.org.uk)	☐ 1	☐ 2	☐ 3
v)	Other *(please provide examples)*	☐ 1	☐ 2	☐ 3

6. **Are there any sources of information regarding STEM provision that you have found particularly helpful?** (please give the **top three** sources)

Effectiveness of information

7(i). Thinking about all the information available around STEM enrichment provision, please rate the extent to which you agree or disagree with the following statements.

		Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
a)	Information is **current and up-to-date**	☐	☐	☐	☐	☐
b)	Information is **clearly presented and categorised** (e.g. in a clearly understandable format)	☐	☐	☐	☐	☐
c)	Information includes **details about activities in my local area**	☐	☐	☐	☐	☐
d)	Information is **well coordinated** (i.e. clear where to go for information, limited duplication)	☐	☐	☐	☐	☐
e)	Information includes **sufficient detail regarding activities** (e.g. target audience, numbers involved, type of activity)	☐	☐	☐	☐	☐
f)	Information enables me to **judge and select** what might be appropriate/useful for me and my pupils/students	☐	☐	☐	☐	☐

7(ii). Thinking about all the information available around STEM continuing professional development provision, please rate the extent to which you agree or disagree with the following statements.

		Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
a)	Information is **current and up-to-date**	☐	☐	☐	☐	☐
b)	Information is **clearly presented and categorised** (e.g. in a clearly understandable format)	☐	☐	☐	☐	☐
c)	Information includes **details about activities in my local area**	☐	☐	☐	☐	☐
d)	Information is **well coordinated** (i.e. clear where to go for information, limited duplication)	☐	☐	☐	☐	☐
e)	Information includes **sufficient detail regarding activities** (e.g. target audience, specific focus)	☐	☐	☐	☐	☐
f)	Information enables **me to judge and select** what might be appropriate/useful for me and my staff	☐	☐	☐	☐	☐

8. Could you suggest any changes or improvements to the information available regarding STEM enrichment and CPD provision? (e.g. how information should be categorised, gaps in information, indication as to quality of provision)

STEM enrichment information:

CPD provision information:

Adequacy of STEM enrichment and CPD provision

9. Thinking about the STEM enrichment and CPD provision available, please rate the extent to which you agree or disagree with the following statements.

		Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
a)	I feel there is an **appropriate range of STEM enrichment** opportunities available (i.e. to cover different aspects without unnecessary duplication)	☐	☐	☐	☐	☐
b)	I feel there is an **appropriate range of STEM CPD** opportunities available (i.e. to cover different aspects without unnecessary duplication)	☐	☐	☐	☐	☐
c)	I often **engage with STEM enrichment activities** for my pupils/students	☐	☐	☐	☐	☐
d)	I often **engage with STEM CPD activities** to develop my teaching of STEM subjects	☐	☐	☐	☐	☐

10. Are you aware of any particular gaps or duplication in the provision? (please provide details)

11. Please list below any STEM enrichment or CPD activities that you experienced or engaged with during the academic year 2007/08.

STEM enrichment activities:

CPD activities:

Attitudes towards and experiences of STEM

12. **We are interested in exploring the impacts of STEM information and provision and so we would like you to think about your <u>attitudes towards, and experiences of, STEM</u> and rate the extent to which you agree or disagree with the following statements.**

		Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
a)	I feel confident in my **ability to build real work/world applications of STEM into my lessons**	☐	☐	☐	☐	☐
b)	I feel confident and able to **incorporate a wide range of practical work** into my teaching of STEM subjects	☐	☐	☐	☐	☐
c)	I feel confident in my **knowledge of the STEM careers** available for people with STEM qualifications	☐	☐	☐	☐	☐
d)	I feel confident in my **knowledge of routes and pathways** into FE, HE and careers relating to STEM (e.g. diplomas, apprenticeships, HE study)	☐	☐	☐	☐	☐
e)	I feel the school/department has adequate **links with STEM-related industries**	☐	☐	☐	☐	☐
f)	I feel the school/department has adequate **links with higher education institutions** around STEM education	☐	☐	☐	☐	☐
g)	I am able to **involve students of all abilities** in STEM enrichment activities	☐	☐	☐	☐	☐

Further comments

13. **Are there any additional comments you would like to make regarding the information available around STEM enrichment and CPD provision?**

Many thanks for your time

Year 1 Teacher Survey: Careers

nfer

Your experiences of STEM careers information

Key Stage 3 teacher questionnaire (MATHS)

About this research

- The National Foundation for Educational Research has been asked by the Department for Children, Schools and Families to find out about **teachers' access to information around STEM careers to enable them to advise and inspire young people.** Helping young people to become more aware of STEM careers will assist them in making informed career choices about opportunities relating to STEM subjects.
- STEM refers to Science, Technology, Engineering and Mathematics.
- Information around STEM careers could cover options for studying STEM subjects in the future, professions associated with STEM subjects, and routes into such careers. This information may be provided through printed materials, web sites, resources which build careers into the curriculum, enrichment activities with a careers dimension and continuing professional development (CPD) activities with a careers dimension.

Completing this questionnaire

- This questionnaire will ask you about the adequacy of STEM careers information available. The latter part of the questionnaire asks about your views on STEM more generally.
- Although we use the generic term 'STEM' throughout the questionnaire to refer to science, technology, engineering and mathematics, please answer the questions from your own perspective in relation to the subject/s you teach.
- Your responses to the questionnaire are confidential to the research.
- The questionnaire should take about 15 minutes to complete.
- If you have any queries, please contact Michael Neaves, 01753 637014.
- Thank you very much for your help with the evaluation.

Please complete the questionnaire in black ink, if possible

Background

1. **Your name**
2. **Your school**

3. **Please indicate which subjects you teach and at what level**

	Subjects	Level
_____	1.	1.
_____	2.	2.
_____	3.	3.
_____	4.	4.
_____	5.	5.

Awareness of STEM careers information and provision

4. **We would like you to think about your <u>awareness and knowledge of STEM careers information and provision</u> and rate the extent to which you agree or disagree with the following statements.**

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		1	2	3	4	5
a)	I am aware of **enrichment activities that cover STEM careers** (e.g. involve contact with STEM professionals, STEM careers fairs etc.)	☐	☐	☐	☐	☐
b)	I am aware of **CPD opportunities** for teachers (e.g. to help integrate careers into teaching) that cover STEM careers	☐	☐	☐	☐	☐
c)	I know where to go for **information about STEM careers**	☐	☐	☐	☐	☐
d)	I know where to go for **information on STEM careers-related enrichment** activities	☐	☐	☐	☐	☐
e)	I know where to go for **information on STEM careers-related CPD** opportunities	☐	☐	☐	☐	☐
f)	I know where to access **STEM careers classroom/curriculum resources**	☐	☐	☐	☐	☐
g)	I have **contact with representatives from STEM careers and professions** (e.g. industry, employers, universities)	☐	☐	☐	☐	☐

Sources of information

5. Please indicate below which sources of information you 1) are aware of and 2) have used to find out about STEM careers (please tick all that apply)

		Aware of this information source	Have used this information source
a)	The STEM Directory - Science (2008/09)	☐ 1	☐ 2
b)	The STEM Directory - Mathematics (2008/09)	☐ 1	☐ 2
c)	The STEM Directory - Engineering and Technology (2008/09)	☐ 1	☐ 2
d)	Future.Morph website (www.futuremorph.org)	☐ 1	☐ 2
e)	Enginuity website (www.enginuity.org.uk)	☐ 1	☐ 2
f)	Maths Careers website (www.mathscareers.org.uk)	☐ 1	☐ 2
g)	bebo website (www.scienceandmaths.net)	☐ 1	☐ 2
h)	DCSF communications campaign (e.g. radio adverts)	☐ 1	☐ 2
i)	STEMNET and their network of STEMPOINTs (formerly SETNET and SETPOINTs)	☐ 1	☐ 2
j)	National Science Learning Centre	☐ 1	☐ 2
k)	Regional Science Learning Centres	☐ 1	☐ 2
l)	Teachers TV	☐ 1	☐ 2
m)	Jobs4U website (www.connexions-direct.com/jobs4u)	☐ 1	☐ 2
n)	Other (please provide examples)	☐ 1	☐ 2

6. Are there any sources of information regarding STEM careers and careers-related provision that you have found particularly helpful? (please give the **top three** sources)

Effectiveness of information

7. Thinking about all the information available around STEM careers, please rate the extent to which you agree or disagree with the following statements.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		1	2	3	4	5
a)	Information is **current and up-to-date**	☐	☐	☐	☐	☐
b)	Information is **clearly presented and categorised** (e.g. in a clearly understandable format)	☐	☐	☐	☐	☐
c)	Information is **well coordinated** (i.e. clear where to go for information, limited duplication)	☐	☐	☐	☐	☐
d)	Information includes **sufficient detail regarding STEM careers** and what they involve	☐	☐	☐	☐	☐
e)	Information includes **sufficient detail regarding options for studying STEM** in the future (e.g. at university)	☐	☐	☐	☐	☐
f)	Information includes **sufficient detail regarding routes and pathways into STEM** careers (e.g. apprenticeships, diplomas, HE study)	☐	☐	☐	☐	☐
g)	Information includes **details about STEM careers-related enrichment activities** in my local area (e.g. involving contact with STEM professionals, STEM careers fairs etc.)	☐	☐	☐	☐	☐
h)	Information includes **details/resources to support me in integrating information about careers** into my STEM teaching	☐	☐	☐	☐	☐
i)	Information **enables me to judge and select** what might be appropriate/useful for my pupils/students	☐	☐	☐	☐	☐

8. Could you suggest any changes or improvements to the information available regarding STEM careers and careers-related provision? (e.g. how information should be categorised, gaps in information, indications as to the quality of provision)

Adequacy of STEM careers provision

9. Thinking about the STEM careers provision available (e.g. events, activities), please rate the extent to which you agree or disagree with the following statements.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		1	2	3	4	5
a)	I feel there is an appropriate range of STEM **careers provision** available (e.g. for my pupils and I)	☐	☐	☐	☐	☐
b)	I often engage with STEM **careers-related enrichment activities**	☐	☐	☐	☐	☐
c)	I often engage with STEM **careers-related CPD** for teachers	☐	☐	☐	☐	☐

10. Are you aware of any particular gaps or duplication in careers related provision?
(please provide details)

11. Please list below any STEM careers-related provision that you experienced or engaged with during the academic year 2007/08

Attitudes towards and experiences of STEM

12. **We are interested in exploring the impacts of STEM careers-related infomation and provision and so we would now like you to think about your attitudes towards, and experiences of, STEM careers information and rate the extent to which you agree or disagree with the following statements.**

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		1	2	3	4	5
a)	I feel confident in **my knowledge of the STEM careers** available for people with STEM qualifications	☐	☐	☐	☐	☐
b)	I feel confident in my **ability to build real work/world applications of STEM into my lessons**	☐	☐	☐	☐	☐
c)	I am able to **integrate careers-related information** into my teaching of STEM subjects and delivery of the curriculum	☐	☐	☐	☐	☐
d)	I feel confident in my **knowledge of STEM courses** in HE	☐	☐	☐	☐	☐
e)	I feel confident in my **knowledge of routes or pathways** into FE, HE and careers relating to STEM (e.g. diplomas, apprenticeships, HE study)	☐	☐	☐	☐	☐
f)	I feel the school/department has adequate **links with STEM-related industries**	☐	☐	☐	☐	☐
g)	I feel the school/department has adequate **links with higher education institutions** around STEM education	☐	☐	☐	☐	☐
h)	I feel there are adequate opportunities for my pupils to experience **work-related experiences/placements** of STEM careers	☐	☐	☐	☐	☐
i)	I am able to **involve pupils of all abilities** in STEM careers activities	☐	☐	☐	☐	☐
j)	I **collaborate with other teachers/staff** in school in relation to STEM careers (e.g. careers advisors, other STEM teachers)	☐	☐	☐	☐	☐

Further comments

13. **Are there any additional comments you would like to make regarding the information available around STEM careers and careers-related provision?**

Many thanks for your time

6

Year 2 and 3 Teacher Survey: Enrichment/CPD and Careers Surveys

Included below is the CATI schedule for the Year 2 and 3 teacher surveys. This one schedule includes the routing for both the enrichment/CPD survey and the careers survey.

Please also note that in Year 3 of the survey, an addition question: 'What does the term 'STEM' mean to you?' was asked.

Participant

Telephone

If true, set 'now' to question 'StartTime'
If true, set 'now' to question 'SurveyTime'

Telephone2 - Use as secondary telephone number if different.

If this is a replacement teacher record name here.

S1. Are you a Careers or a CPD/encrichment survey?

[If this is available on the database it will appear here: [SurveyType]. Code without asking]

- ❑ Careers
- ❑ CPDAndEnrichment

If <> 1, do not ask 'Careers'
If <> 2, do not ask 'Enrichment'

Careers

Introduction to the interview

• In this interview I have some questions about STEM careers information

S3. Before we start, could I just check what the term STEM means to you? (record response)

Background

Q1. Name

Q2. School name

Q3. Which subjects do you teach and at what level?

AWARENESS OF STEM CAREERS INFORMATION AND PROVISION

I'm now going to ask you about your awareness of STEM careers information and provision

I'm now going to ask you about your awareness of STEM careers information and provision

Q4. I would like you to think about your awareness of STEM careers information and provision and rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree.

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree
a) I am aware of enhancement and enrichment activities that cover STEM careers (e.g. involve contact with STEM professionals, STEM careers fairs etc.)	❑	❑	❑	❑	❑
b) I am aware of CPD opportunities for teachers that cover STEM careers (e.g. to help integrate careers into teaching)	❑	❑	❑	❑	❑
c) I know where to go for information about STEM careers	❑	❑	❑	❑	❑
d) I know where to go for information on STEM careers-related enrichment activities	❑	❑	❑	❑	❑
e) I know where to go for information on STEM careers-related CPD opportunities	❑	❑	❑	❑	❑
f) I know where to access STEM careers classroom/curriculum resources	❑	❑	❑	❑	❑
g) I have contact with representatives from STEM careers and professions (e.g. industry, employers, universities)	❑	❑	❑	❑	❑

SOURCES OF INFORMATION

I'm now going to ask you about STEM Careers Information Sources

Q5ai. Are you aware of any particular sources of information on STEM careers (e.g. any websites, resource packs, directories?) Could you list them for me? [DO NOT PROMPT]

(20 maximum responses)

- ❑ a) Online STEM directories - (http://www.stemdirectories.org.uk)
- ❑ b) The STEM Directory - Science (paper version)
- ❑ c) The STEM Directory - Mathematics (paper version)
- ❑ d) The STEM Directory - Engineering and Technology (paper version)
- ❑ e) Future.Morph website (www.futuremorph.org)
- ❑ f) Enginuity website (www.enginuity.org.uk)
- ❑ g) Maths Careers website (www.mathscareers.org.uk)
- ❑ h) STEMNET and their network of STEMPOINTs
- ❑ i) National Science Learning Centre
- ❑ j) Regional Science Learning centres
- ❑ k) National STEM Centre http://www.nationalstemcentre.org.uk
- ❑ l) 'STEM subject choice and careers' programmes shown on Teachers TV (3 programmes - one for science, maths and engineering)
- ❑ m) Jobs4U website (www.connexions-direct.com/jobs4u)
- ❑ n) www.Upd8.org.uk (includes three careers related activities from the Centre for Science Education – called 'Death of an Angel' 'Instant ice cream ' 'Bears in Trouble'
- ❑ o) STEM choices: a resource pack for Careers Education and information, advice and guidance practitioners (www.cegnet.co.uk)
- ❑ p) STEM subject choice and careers digital store cupboard (http://digitalstorecupboard.tintisha-web.co.uk/home)
- ❑ q) Centre for Science Education: STEM careers awareness (http://www.shu.ac.uk/research/cse/stem-careers.html)
- ❑ r) STEM Careers timeline (University of Warwick)
- ❑ S) Other
- ❑ None

If <> 19, do not ask 'Q5aiOtherCode'
If = 20, do not ask 'Q5aiiLoop'

Other - Please specify

- ❑ After School Clubs
- ❑ Armed Forces / RAF
- ❑ ASE
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)
- ❑ CSC
- ❑ DATA
- ❑ DES Standards Unit
- ❑ Design & Technology Association
- ❑ EBP - Warwickshire
- ❑ Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Ignite
- ❑ In house/school
- ❑ Institute of Electrical Engineers
- ❑ Institute of Materials
- ❑ Jigsaw Software
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Local / National companies
- ❑ Local Authority
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ NASA
- ❑ National Space Center
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used
- ❑ No understanding of STEM/STEM provision
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum Centre
- ❑ OCR Nationals in Science
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree/career knowledge
- ❑ QCA
- ❑ QIA Excellance Gateway/QIA/QIA national teaching & learning
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science Enhancement Programme
- ❑ Science Institutes

- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ SSAT
- ❑ Standars Units
- ❑ STEM Meetings
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ TES
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website
- ❑ Other

If <> 82, do not ask 'Q5aiOther'

Q5aiOther

Q5aii. Have you personally used this information source?

	Yes	No
a) Online STEM directories - (http://www.stemdirectories.org.uk)	❑	❑
b) The STEM Directory - Science (paper version)	❑	❑
c) The STEM Directory - Mathematics (paper version)	❑	❑
d) The STEM Directory - Engineering and Technology (paper version)	❑	❑
e) Future.Morph website (www.futuremorph.org)	❑	❑
f) Enginuity website (www.enginuity.org.uk)	❑	❑
g) Maths Careers website (www.mathscareers.org.uk)	❑	❑
h) STEMNET and their network of STEMPOINTs	❑	❑
i) National Science Learning Centre	❑	❑
j) Regional Science Learning centres	❑	❑
k) National STEM Centre http://www.nationalstemcentre.org.uk	❑	❑
l) 'STEM subject choice and careers' programmes shown on Teachers TV (3 programmes - one for science, maths and engineering)	❑	❑
m) Jobs4U website (www.connexions-direct.com/jobs4u)	❑	❑
n) www.Upd8.org.uk (includes three careers related activities from the Centre for Science Education – called 'Death of an Angel' 'Instant ice cream ' 'Bears in Trouble'	❑	❑
o) STEM choices: a resource pack for Careers Education and information, advice and guidance practitioners (www.cegnet.co.uk)	❑	❑
p) STEM subject choice and careers digital store cupboard (http://digitalstorecupboard.tintisha-web.co.uk/home)	❑	❑
q) Centre for Science Education: STEM careers awareness (http://www.shu.ac.uk/research/cse/stem-careers.html)	❑	❑
r) STEM Careers timeline (University of Warwick)	❑	❑
S) Other	❑	❑
None	❑	❑

Q5bi. Can I now check whether you are aware of any of the following information sources. Some of these might not be relevant to your particular subject, so I apologise, but for the purposes of consistency across respondents, I need to read out the full list.

(20 maximum responses)

- ❑ a) Online STEM directories - (http://www.stemdirectories.org.uk)
- ❑ b) The STEM Directory - Science (paper version)
- ❑ c) The STEM Directory - Mathematics (paper version)
- ❑ d) The STEM Directory - Engineering and Technology (paper version)
- ❑ e) Future.Morph website (www.futuremorph.org)
- ❑ f) Enginuity website (www.enginuity.org.uk)
- ❑ g) Maths Careers website (www.mathscareers.org.uk)
- ❑ h) STEMNET and their network of STEMPOINTs
- ❑ i) National Science Learning Centre
- ❑ j) Regional Science Learning centres
- ❑ k) National STEM Centre http://www.nationalstemcentre.org.uk
- ❑ l) 'STEM subject choice and careers' programmes shown on Teachers TV (3 programmes - one for science, maths and engineering)
- ❑ m) Jobs4U website (www.connexions-direct.com/jobs4u)
- ❑ n) www.Upd8.org.uk (includes three careers related activities from the Centre for Science Education – called 'Death of an Angel' 'Instant ice cream ' 'Bears in Trouble'
- ❑ o) STEM choices: a resource pack for Careers Education and information, advice and guidance practitioners (www.cegnet.co.uk)
- ❑ p) STEM subject choice and careers digital store cupboard (http://digitalstorecupboard.tintisha-web.co.uk/home)
- ❑ q) Centre for Science Education: STEM careers awareness (http://www.shu.ac.uk/research/cse/stem-careers.html)
- ❑ r) STEM Careers timeline (University of Warwick)
- ❑ S) Other
- ❑ None

If = , do not ask 'Q7Loop'
If = , do not ask 'Q5biiLoop'
If <> , do not ask 'Q5biOtherCode'
If = , do not ask 'Q6Sec'

Other - Please specify

- ❑ After School Clubs
- ❑ Armed Forces / RAF
- ❑ ASE
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)
- ❑ CSC
- ❑ DATA
- ❑ DES Standards Unit
- ❑ Design & Technology Association
- ❑ EBP - Warwickshire
- ❑ Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Ignite
- ❑ In house/school
- ❑ Institute of Electrical Engineers
- ❑ Institute of Materials
- ❑ Jigsaw Software
- ❑ Learn Direct

- ❑ Learning and skills council
- ❑ Local / National companies
- ❑ Local Authority
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ NASA
- ❑ National Space Center
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used
- ❑ No understanding of STEM/STEM provision
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum Centre
- ❑ OCR Nationals in Science
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree/career knowledge
- ❑ QCA
- ❑ QIA Excellance Gateway/QIA/QIA national teaching & learning
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science Enhancement Programme
- ❑ Science Institutes
- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ SSAT
- ❑ Standars Units
- ❑ STEM Meetings
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ TES
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website
- ❑ Other

If <> 82, do not ask 'Q5biOther'

Q5biOther

Q5bii. Have you personally used this information source?

	Yes	No
a) Online STEM directories - (http://www.stemdirectories.org.uk)	❑	❑
b) The STEM Directory - Science (paper version)	❑	❑
c) The STEM Directory - Mathematics (paper version)	❑	❑
d) The STEM Directory - Engineering and Technology (paper version)	❑	❑
e) Future.Morph website (www.futuremorph.org)	❑	❑
f) Enginuity website (www.enginuity.org.uk)	❑	❑
g) Maths Careers website (www.mathscareers.org.uk)	❑	❑
h) STEMNET and their network of STEMPOINTs	❑	❑
i) National Science Learning Centre	❑	❑
j) Regional Science Learning centres	❑	❑
k) National STEM Centre http://www.nationalstemcentre.org.uk	❑	❑
l) 'STEM subject choice and careers' programmes shown on Teachers TV (3 programmes - one for science, maths and engineering)	❑	❑
m) Jobs4U website (www.connexions-direct.com/jobs4u)	❑	❑
n) www.Upd8.org.uk (includes three careers related activities from the Centre for Science Education – called 'Death of an Angel' 'Instant ice cream ' 'Bears in Trouble'	❑	❑
o) STEM choices: a resource pack for Careers Education and information, advice and guidance practitioners (www.cegnet.co.uk)	❑	❑
p) STEM subject choice and careers digital store cupboard (http://digitalstorecupboard.tintisha-web.co.uk/home)	❑	❑
q) Centre for Science Education: STEM careers awareness (http://www.shu.ac.uk/research/cse/stem-careers.html)	❑	❑
r) STEM Careers timeline (University of Warwick)	❑	❑
S) Other	❑	❑
None	❑	❑

Q6Sec

Q6. Are there any sources of information regarding STEM careers and careers-related provision that you have found particularly helpful (please give the top three sources)

- ❑ After school Science and Engineering Clubs
- ❑ Armed Forces / RAF
- ❑ Association of British Opticians
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)/Careerscape
- ❑ CSC
- ❑ DATA
- ❑ EBP - Warwickshire/EBP/Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Faraday IET Challenge & volunteer engineering
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Institute of Biology
- ❑ Institute of Electrical Engineers

- ❑ Institute of Physics
- ❑ Jigsaw Software
- ❑ Kangaroo Maths
- ❑ LA consultant and advisors
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Learning outside the Classroom (LOTC)
- ❑ Local / National companies
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ Nagty
- ❑ NASA
- ❑ National Centre for Excellence in the Teaching of Maths (NCETM)
- ❑ National Science Learning Centre
- ❑ National Space Centre
- ❑ National Strategies - science and maths
- ❑ NCETM professional development directories
- ❑ Network of Education Business Partnerships
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used/none have been useful
- ❑ No understanding of STEM/STEM provision/unaware of resources/
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum/Exam Boards
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree knowledge
- ❑ QCA
- ❑ QIA Excellence Gateway/QIA
- ❑ Regional Science Learning Centre
- ❑ Royal Academy of Engineering (RAEng)
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Chemistry (RSC)
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science & Engineering Ambassodors
- ❑ Science Institutes
- ❑ Science Tech Club Inset Days
- ❑ Science/Engineering Boxes
- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ Specialist Schools and Academies Trust
- ❑ SSAT
- ❑ Standards Units/Standards Site/ DES Standards Site
- ❑ STEM Directory - Maths
- ❑ STEM directory - no subject specified
- ❑ STEM Directory - Science
- ❑ STEM Directory -Eng&Tech
- ❑ STEM Meetings/conferences
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ STEMNET
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ Tech Enhancement prog/crest awards/challenge events
- ❑ TES
- ❑ The Association for science education
- ❑ Triple Science Support Programme

- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website/youtube,youneng/enginuity
- ❑ None
- ❑ Other (specify) [ ]

If ??Q6??[1]=dk, Prompt interviewee with message 'Please enter at least one response'

Q6. Are there any sources of information regarding STEM careers and careers-related provision that you have found particularly helpful (please give the top three sources)

- ❑ After school Science and Engineering Clubs
- ❑ Armed Forces / RAF
- ❑ Association of British Opticians
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)/Careerscape
- ❑ CSC
- ❑ DATA
- ❑ EBP - Warwickshire/EBP/Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Faraday IET Challenge & volunteer engineering
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Institute of Biology
- ❑ Institute of Electrical Engineers
- ❑ Institute of Physics
- ❑ Jigsaw Software
- ❑ Kangaroo Maths
- ❑ LA consultant and advisors
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Learning outside the Classroom (LOTC)
- ❑ Local / National companies
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ Nagty
- ❑ NASA
- ❑ National Centre for Excellence in the Teaching of Maths (NCETM)
- ❑ National Science Learning Centre
- ❑ National Space Centre
- ❑ National Strategies - science and maths
- ❑ NCETM professional development directories
- ❑ Network of Education Business Partnerships
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used/none have been useful
- ❑ No understanding of STEM/STEM provision/unaware of resources/
- ❑ Non specific email or internet
- ❑ NRich

- ❑ Nuffield Curriculum/Exam Boards
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree knowledge
- ❑ QCA
- ❑ QIA Excellence Gateway/QIA
- ❑ Regional Science Learning Centre
- ❑ Royal Academy of Engineering (RAEng)
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Chemistry (RSC)
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science & Engineering Ambassodors
- ❑ Science Institutes
- ❑ Science Tech Club Inset Days
- ❑ Science/Engineering Boxes
- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ Specialist Schools and Academies Trust
- ❑ SSAT
- ❑ Standards Units/Standards Site/ DES Standards Site
- ❑ STEM Directory - Maths
- ❑ STEM directory - no subject specified
- ❑ STEM Directory - Science
- ❑ STEM Directory -Eng&Tech
- ❑ STEM Meetings/conferences
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ STEMNET
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ Tech Enhancement prog/crest awards/challenge events
- ❑ TES
- ❑ The Association for science education
- ❑ Triple Science Support Programme
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website/youtube,youneng/enginuity
- ❑ None
- ❑ Other (specify) [ ]

If ??Q6??[1]=dk, Prompt interviewee with message 'Please enter at least one response'

Q6. Are there any sources of information regarding STEM careers and careers-related provision that you have found particularly helpful (please give the top three sources)

- ❑ After school Science and Engineering Clubs
- ❑ Armed Forces / RAF
- ❑ Association of British Opticians
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths

- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)/Careerscape
- ❑ CSC
- ❑ DATA
- ❑ EBP - Warwickshire/EBP/Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Faraday IET Challenge & volunteer engineering
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Institute of Biology
- ❑ Institute of Electrical Engineers
- ❑ Institute of Physics
- ❑ Jigsaw Software
- ❑ Kangaroo Maths
- ❑ LA consultant and advisors
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Learning outside the Classroom (LOTC)
- ❑ Local / National companies
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ Nagty
- ❑ NASA
- ❑ National Centre for Excellence in the Teaching of Maths (NCETM)
- ❑ National Science Learning Centre
- ❑ National Space Centre
- ❑ National Strategies - science and maths
- ❑ NCETM professional development directories
- ❑ Network of Education Business Partnerships
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used/none have been useful
- ❑ No understanding of STEM/STEM provision/unaware of resources/
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum/Exam Boards
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree knowledge
- ❑ QCA
- ❑ QIA Excellence Gateway/QIA
- ❑ Regional Science Learning Centre
- ❑ Royal Academy of Engineering (RAEng)
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Chemistry (RSC)
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science & Engineering Ambassodors
- ❑ Science Institutes
- ❑ Science Tech Club Inset Days
- ❑ Science/Engineering Boxes
- ❑ SEA
- ❑ SEMTA

- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ Specialist Schools and Academies Trust
- ❑ SSAT
- ❑ Standards Units/Standards Site/ DES Standards Site
- ❑ STEM Directory - Maths
- ❑ STEM directory - no subject specified
- ❑ STEM Directory - Science
- ❑ STEM Directory -Eng&Tech
- ❑ STEM Meetings/conferences
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ STEMNET
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ Tech Enhancement prog/crest awards/challenge events
- ❑ TES
- ❑ The Association for science education
- ❑ Triple Science Support Programme
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website/youtube,youneng/enginuity
- ❑ None
- ❑ Other (specify) [ ]

If ??Q6??[1]=dk, Prompt interviewee with message 'Please enter at least one response'

Q6Note

EFFECTIVENESS OF INFORMATION

I'm now going to ask you some questions about how effective information is..

Q7. Now I would like you to consider how effective the information on STEM careers is. So thinking about all of the STEM careers information that you have seen or used, could you please rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree	Don't know
a) Information is current and up-to-date	❑	❑	❑	❑	❑	❑
b) Information is clearly presented and categorised (e.g. in a clearly understandable format)	❑	❑	❑	❑	❑	❑
c) Information is well coordinated (i.e. clear where to go for information, limited duplication)	❑	❑	❑	❑	❑	❑
d) Information includes sufficient detail regarding STEM careers and what they	❑	❑	❑	❑	❑	❑

involve						
e) Information includes sufficient detail regarding options for studying STEM in the future (e.g. at university)	❑	❑	❑	❑	❑	❑
f) Information includes sufficient detail regarding routes and pathways into STEM careers (e.g. apprenticeships, diplomas, HE study)	❑	❑	❑	❑	❑	❑
g) Information includes details about STEM careers- related enrichment activities in my local area (e.g. involving contact with STEM professionals, STEM careers fairs etc.)	❑	❑	❑	❑	❑	❑
h) Information includes details/resources to support me in integrating information about careers into my STEM teaching	❑	❑	❑	❑	❑	❑
i) Information enables me to judge and select what might be appropriate/useful for my pupils/students	❑	❑	❑	❑	❑	❑

Q8. Could you suggest any changes or improvements to the information available regarding STEM careers and careers-related provision? (e.g. how information should be categorised, gaps in information, indications as to the quality of provision)

ADEQUACY OF STEM CAREERS PROVISION

This next section is about STEM careers provision (rather than just focussing on sources of information). STEM careers provision might include things like CPD and enrichment activities with a careers dimension.

Q9. Thinking about the STEM careers provision available please rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree.

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree
a) I feel there is an appropriate range of STEM careers provision available (for my students)	❑	❑	❑	❑	❑
b) I often engage with STEM careers-related enrichment activities (for my students)	❑	❑	❑	❑	❑
c) I often engage with STEM careers-related CPD for teachers (to enable me to integrate STEM careers into my teaching)	❑	❑	❑	❑	❑

Q10. Are you aware of any particular gaps or duplication in careers related provision?

Q11. Can you list any STEM careers related provision that you experienced or engaged with during the last academic year (2009-10)

ATTITUDES TOWARDS AND EXPERIENCES OF STEM

Q12. Lastly, we are interested in exploring the impacts of STEM careers-related information and provision on your teaching, your students and your school/college. Please rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree
a) I feel confident in my knowledge of STEM careers available for people with STEM qualifications	❑	❑	❑	❑	❑
b) I feel confident in my ability to build real work or world applications of STEM into my lessons	❑	❑	❑	❑	❑
c) I am able to integrate careers-related information into my teaching of STEM subjects and delivery of the curriculum	❑	❑	❑	❑	❑
d) I feel confident in my knowledge of STEM courses in HE	❑	❑	❑	❑	❑
e) I feel confident in my knowledge of routes or pathways into FE, HE and careers relating to STEM (e.g. diplomas, apprenticeships, HE study)	❑	❑	❑	❑	❑
f) I feel the school/department has adequate links with STEM-related industries	❑	❑	❑	❑	❑
g) I feel the school/department has adequate links with higher education institutions around STEM education	❑	❑	❑	❑	❑
h) I feel there are adequate opportunities for my pupils to experience work-related placements of STEM careers	❑	❑	❑	❑	❑
i) I am able to involve pupils of all abilities in STEM careers activities	❑	❑	❑	❑	❑
j) I collaborate with other teachers/staff in school in relation to STEM careers (e.g. careers advisors, other STEM teachers)	❑	❑	❑	❑	❑

Q13. Are they any additional comments you would like to make regarding the information available around STEM careers and careers-related provision

Invitation to take part as a case study

For this research, we would to like to visit a sample of schools where teachers and students are making use of information on STEM careers. This would involve a half

day visit by a researcher to interview a further three teachers and speak to a group of students. The visit could happen any time between now and January 2011.

Would your school be interested in being a case study for the research?

- ❑ Yes
- ❑ No
- ❑ Maybe with more information

Interviewer, if the respondent has been very positive in their experiences of STEM careers information throughout the survey please tick this box

- ❑ Tick here

Enrichment

Introduction to the interview

• In this interview I have some questions about the information available to teachers/lecturers on STEM enrichment activities and CPD opportunities (continuing professional development)

S3. Before we start, could I just check what the STEM means to you (record response)

Background

Q1. Name

Q2. School name

Q3. Which subjects do you teach and at what level?

AWARENESS OF STEM INFORMATION AND PROVISION

Q4. I would like you to think about your awareness of STEM information and provision and rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree.

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree
a) I am aware of STEM enrichment activities for students	❑	❑	❑	❑	❑
b) I know where to go for information on STEM enrichment activities for students	❑	❑	❑	❑	❑
c) I am aware of STEM CPD opportunities for teachers/lecturers	❑	❑	❑	❑	❑
d) I know where to go for information on STEM continuing professional development opportunities for teachers/lecturers	❑	❑	❑	❑	❑

SOURCES OF INFORMATION

I'm now going to ask you about information sources

Q5ai. Are you aware of any particular sources of information on STEM enrichment and CPD activities (e.g. any websites, resource packs, directories?) Could you list them for me? [DO NOT PROMPT]

(30 maximum responses)

- ❑ a) Online STEM directories - (http://www.stemdirectories.org.uk)
- ❑ b) The STEM Directory – for Science (paper version) (2008/09) (http://www.stemdirectories.org.uk)
- ❑ c) The STEM Directory – for Mathematics (paper version) (2008/09)(http://www.stemdirectories.org.uk)
- ❑ d) The STEM Directory – for Engineering and Technology (paper version) (2008/09) (http://www.stemdirectories.org.uk)
- ❑ e) STEMNET and their networks of STEMPOINTs
- ❑ f) Learning outside the Classroom Manifesto/Partnership/website (e.g.www.lotc.org.uk)
- ❑ g) Science and Engineering Ambassadors
- ❑ h) After-School Science and Engineering Clubs (ASSECs) (e.g. materials and resources accessed via ASSECs) www.the-ba.net/theba/ccaf/Clubs
- ❑ i) Institute of Physics
- ❑ j) Stimulating physics
- ❑ k) Institute of Biology
- ❑ l) Local authority consultants and advisers
- ❑ m) National Centre for Excellence in the Teaching of Mathematics (NCETM)
- ❑ n) NCETM Professional development directories (e.g. www.ncetm.org.uk)
- ❑ o) National Science Learning Centre
- ❑ p) Regional Science Learning Centres
- ❑ q) National STEM Centre http://www.nationalstemcentre.org.uk
- ❑ r) National Strategies - science and mathematics
- ❑ s) Network of Education Business Partnerships
- ❑ t) Royal Academy of Engineering
- ❑ u) Royal Society of Chemistry
- ❑ v) Specialist Schools and Academies Trust
- ❑ w) The Association for Science Education
- ❑ x) Triple Science Support Programme (e.g.www.triplescience.org.uk)

- ❑ y) Getting Practical: A framework for practical science in schools
- ❑ z) _NRich Maths
- ❑ aa) _Further Mathematics Support Programme
- ❑ ab) _Bowland Mathematics
- ❑ ac) Other
- ❑ None

If <> 29, do not ask 'Q5aiOtherCode2'
If = 30, do not ask 'Q5aiiLoop2'

Other - Please specify

- ❑ After School Clubs
- ❑ Armed Forces / RAF
- ❑ ASE
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)
- ❑ CSC
- ❑ DATA
- ❑ DES Standards Unit
- ❑ Design & Technology Association
- ❑ EBP - Warwickshire
- ❑ Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Ignite
- ❑ In house/school
- ❑ Institute of Electrical Engineers
- ❑ Institute of Materials
- ❑ Jigsaw Software
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Local / National companies
- ❑ Local Authority
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ NASA
- ❑ National Space Center
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used
- ❑ No understanding of STEM/STEM provision
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum Centre
- ❑ OCR Nationals in Science
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree/career knowledge
- ❑ QCA
- ❑ QIA Excellance Gateway/QIA/QIA national teaching & learning

- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science Enhancement Programme
- ❑ Science Institutes
- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ SSAT
- ❑ Standars Units
- ❑ STEM Meetings
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ TES
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website
- ❑ Other

If <> 82, do not ask 'Q5aiOther2'

Q5aiOther2

Q5aii. Have you personally used this information source?

	STEM enrichment	CPD activities	Neither
a) Online STEM directories - (http://www.stemdirectories.org.uk)	❑	❑	❑
b) The STEM Directory – for Science (paper version) (2008/09) (http://www.stemdirectories.org.uk)	❑	❑	❑
c) The STEM Directory – for Mathematics (paper version) (2008/09)(http://www.stemdirectories.org.uk)	❑	❑	❑
d) The STEM Directory – for Engineering and Technology (paper version) (2008/09) (http://www.stemdirectories.org.uk)	❑	❑	❑
e) STEMNET and their networks of STEMPOINTs	❑	❑	❑
f) Learning outside the Classroom Manifesto/Partnership/website (e.g.www.lotc.org.uk)	❑	❑	❑
g) Science and Engineering Ambassadors	❑	❑	❑
h) After-School Science and Engineering Clubs (ASSECs) (e.g. materials and resources accessed via ASSECs) www.the-ba.net/theba/ccaf/Clubs	❑	❑	❑
i) Institute of Physics	❑	❑	❑
j) Stimulating physics	❑	❑	❑
k) Institute of Biology	❑	❑	❑
l) Local authority consultants and advisers	❑	❑	❑
m) National Centre for Excellence in the Teaching of Mathematics (NCETM)	❑	❑	❑
n) NCETM Professional development directories (e.g. www.ncetm.org.uk)	❑	❑	❑
o) National Science Learning Centre	❑	❑	❑
p) Regional Science Learning Centres	❑	❑	❑

q) National STEM Centre http://www.nationalstemcentre.org.uk	❑	❑	❑
r) National Strategies - science and mathematics	❑	❑	❑
s) Network of Education Business Partnerships	❑	❑	❑
t) Royal Academy of Engineering	❑	❑	❑
u) Royal Society of Chemistry	❑	❑	❑
v) Specialist Schools and Academies Trust	❑	❑	❑
w) The Association for Science Education	❑	❑	❑
x) Triple Science Support Programme (e.g.www.triplescience.org.uk)	❑	❑	❑
y) Getting Practical: A framework for practical science in schools	❑	❑	❑
z) _NRich Maths	❑	❑	❑
aa) _Further Mathematics Support Programme	❑	❑	❑
ab) _Bowland Mathematics	❑	❑	❑
ac) Other	❑	❑	❑
None	❑	❑	❑

Q5bi. Can I now check whether you are aware of any of the following information sources. Some of these might not be relevant to your particular subject, so I apologise, but for the purposes of consistency across respondents, I need to read out the full list.

(30 maximum responses)

- ❑ a) Online STEM directories - (http://www.stemdirectories.org.uk)
- ❑ b) The STEM Directory – for Science (paper version) (2008/09) (http://www.stemdirectories.org.uk)
- ❑ c) The STEM Directory – for Mathematics (paper version) (2008/09)(http://www.stemdirectories.org.uk)
- ❑ d) The STEM Directory – for Engineering and Technology (paper version) (2008/09) (http://www.stemdirectories.org.uk)
- ❑ e) STEMNET and their networks of STEMPOINTs
- ❑ f) Learning outside the Classroom Manifesto/Partnership/website (e.g.www.lotc.org.uk)
- ❑ g) Science and Engineering Ambassadors
- ❑ h) After-School Science and Engineering Clubs (ASSECs) (e.g. materials and resources accessed via ASSECs) www.the-ba.net/theba/ccaf/Clubs
- ❑ i) Institute of Physics
- ❑ j) Stimulating physics
- ❑ k) Institute of Biology
- ❑ l) Local authority consultants and advisers
- ❑ m) National Centre for Excellence in the Teaching of Mathematics (NCETM)
- ❑ n) NCETM Professional development directories (e.g. www.ncetm.org.uk)
- ❑ o) National Science Learning Centre
- ❑ p) Regional Science Learning Centres
- ❑ q) National STEM Centre http://www.nationalstemcentre.org.uk
- ❑ r) National Strategies - science and mathematics
- ❑ s) Network of Education Business Partnerships
- ❑ t) Royal Academy of Engineering
- ❑ u) Royal Society of Chemistry
- ❑ v) Specialist Schools and Academies Trust
- ❑ w) The Association for Science Education
- ❑ x) Triple Science Support Programme (e.g.www.triplescience.org.uk)
- ❑ y) Getting Practical: A framework for practical science in schools
- ❑ z) _NRich Maths
- ❑ aa) _Further Mathematics Support Programme
- ❑ ab) _Bowland Mathematics
- ❑ ac) Other
- ❑ None

If = , do not ask 'Q5biiLoop2'
If <> , do not ask 'Q5biOtherCode2'
If = , do not ask 'Q6Sec2'
If = , do not ask 'Q7Sec'

Other - Please specify

- ❑ After School Clubs
- ❑ Armed Forces / RAF
- ❑ ASE
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)
- ❑ CSC
- ❑ DATA
- ❑ DES Standards Unit
- ❑ Design & Technology Association
- ❑ EBP - Warwickshire
- ❑ Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Ignite
- ❑ In house/school
- ❑ Institute of Electrical Engineers
- ❑ Institute of Materials
- ❑ Jigsaw Software
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Local / National companies
- ❑ Local Authority
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ NASA
- ❑ National Space Center
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used
- ❑ No understanding of STEM/STEM provision
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum Centre
- ❑ OCR Nationals in Science
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree/career knowledge
- ❑ QCA
- ❑ QIA Excellance Gateway/QIA/QIA national teaching & learning
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science Enhancement Programme
- ❑ Science Institutes
- ❑ SEA

- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ SSAT
- ❑ Standars Units
- ❑ STEM Meetings
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ TES
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website
- ❑ Other

If <> 82, do not ask 'Q5biOther2'

Q5biOther2

Q5bii. Have you personally used this information source?

	STEM enrichment	CPD activities	Neither
a) Online STEM directories - (http://www.stemdirectories.org.uk)	❑	❑	❑
b) The STEM Directory – for Science (paper version) (2008/09) (http://www.stemdirectories.org.uk)	❑	❑	❑
c) The STEM Directory – for Mathematics (paper version) (2008/09)(http://www.stemdirectories.org.uk)	❑	❑	❑
d) The STEM Directory – for Engineering and Technology (paper version) (2008/09) (http://www.stemdirectories.org.uk)	❑	❑	❑
e) STEMNET and their networks of STEMPOINTs	❑	❑	❑
f) Learning outside the Classroom Manifesto/Partnership/website (e.g.www.lotc.org.uk)	❑	❑	❑
g) Science and Engineering Ambassadors	❑	❑	❑
h) After-School Science and Engineering Clubs (ASSECs) (e.g. materials and resources accessed via ASSECs) www.the-ba.net/theba/ccaf/Clubs	❑	❑	❑
i) Institute of Physics	❑	❑	❑
j) Stimulating physics	❑	❑	❑
k) Institute of Biology	❑	❑	❑
l) Local authority consultants and advisers	❑	❑	❑
m) National Centre for Excellence in the Teaching of Mathematics (NCETM)	❑	❑	❑
n) NCETM Professional development directories (e.g. www.ncetm.org.uk)	❑	❑	❑
o) National Science Learning Centre	❑	❑	❑
p) Regional Science Learning Centres	❑	❑	❑
q) National STEM Centre http://www.nationalstemcentre.org.uk	❑	❑	❑
r) National Strategies - science and mathematics	❑	❑	❑
s) Network of Education Business Partnerships	❑	❑	❑
t) Royal Academy of Engineering	❑	❑	❑
u) Royal Society of Chemistry	❑	❑	❑
v) Specialist Schools and Academies Trust	❑	❑	❑
w) The Association for Science Education	❑	❑	❑
x) Triple Science Support Programme	❑	❑	❑

(e.g.www.triplescience.org.uk)			
y) Getting Practical: A framework for practical science in schools	❑	❑	❑
z) _NRich Maths	❑	❑	❑
aa) _Further Mathematics Support Programme	❑	❑	❑
ab) _Bowland Mathematics	❑	❑	❑
ac) Other	❑	❑	❑
None	❑	❑	❑

Q6Sec2

Q6. Are there any sources of information regarding STEM enrichment and CPD activities that you have found particularly helpful (please give the top three sources)

- ❑ After school Science and Engineering Clubs
- ❑ Armed Forces / RAF
- ❑ Association of British Opticians
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)/Careerscape
- ❑ CSC
- ❑ DATA
- ❑ EBP - Warwickshire/EBP/Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Faraday IET Challenge & volunteer engineering
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Institute of Biology
- ❑ Institute of Electrical Engineers
- ❑ Institute of Physics
- ❑ Jigsaw Software
- ❑ Kangaroo Maths
- ❑ LA consultant and advisors
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Learning outside the Classroom (LOTC)
- ❑ Local / National companies
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ Nagty
- ❑ NASA
- ❑ National Centre for Excellence in the Teaching of Maths (NCETM)
- ❑ National Science Learning Centre
- ❑ National Space Centre
- ❑ National Strategies - science and maths
- ❑ NCETM professional development directories
- ❑ Network of Education Business Partnerships
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used/none have been useful
- ❑ No understanding of STEM/STEM provision/unaware of resources/

- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum/Exam Boards
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree knowledge
- ❑ QCA
- ❑ QIA Excellence Gateway/QIA
- ❑ Regional Science Learning Centre
- ❑ Royal Academy of Engineering (RAEng)
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Chemistry (RSC)
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science & Engineering Ambassodors
- ❑ Science Institutes
- ❑ Science Tech Club Inset Days
- ❑ Science/Engineering Boxes
- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ Specialist Schools and Academies Trust
- ❑ SSAT
- ❑ Standards Units/Standards Site/ DES Standards Site
- ❑ STEM Directory - Maths
- ❑ STEM directory - no subject specified
- ❑ STEM Directory - Science
- ❑ STEM Directory -Eng&Tech
- ❑ STEM Meetings/conferences
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ STEMNET
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ Tech Enhancement prog/crest awards/challenge events
- ❑ TES
- ❑ The Association for science education
- ❑ Triple Science Support Programme
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website/youtube,youneng/enginuity
- ❑ None
- ❑ Other (specify) [ ]

If ??Q6_2??[1]=dk, Prompt interviewee with message 'Please enter at least one response'

Q6. Are there any sources of information regarding STEM enrichment and CPD activities that you have found particularly helpful (please give the top three sources)

- ❑ After school Science and Engineering Clubs
- ❑ Armed Forces / RAF
- ❑ Association of British Opticians
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA

- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)/Careerscape
- ❑ CSC
- ❑ DATA
- ❑ EBP - Warwickshire/EBP/Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Faraday IET Challenge & volunteer engineering
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Institute of Biology
- ❑ Institute of Electrical Engineers
- ❑ Institute of Physics
- ❑ Jigsaw Software
- ❑ Kangaroo Maths
- ❑ LA consultant and advisors
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Learning outside the Classroom (LOTC)
- ❑ Local / National companies
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ Nagty
- ❑ NASA
- ❑ National Centre for Excellence in the Teaching of Maths (NCETM)
- ❑ National Science Learning Centre
- ❑ National Space Centre
- ❑ National Strategies - science and maths
- ❑ NCETM professional development directories
- ❑ Network of Education Business Partnerships
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used/none have been useful
- ❑ No understanding of STEM/STEM provision/unaware of resources/
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum/Exam Boards
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree knowledge
- ❑ QCA
- ❑ QIA Excellence Gateway/QIA
- ❑ Regional Science Learning Centre
- ❑ Royal Academy of Engineering (RAEng)
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Chemistry (RSC)
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science & Engineering Ambassodors
- ❑ Science Institutes
- ❑ Science Tech Club Inset Days
- ❑ Science/Engineering Boxes

- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ Specialist Schools and Academies Trust
- ❑ SSAT
- ❑ Standards Units/Standards Site/ DES Standards Site
- ❑ STEM Directory - Maths
- ❑ STEM directory - no subject specified
- ❑ STEM Directory - Science
- ❑ STEM Directory -Eng&Tech
- ❑ STEM Meetings/conferences
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ STEMNET
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ Tech Enhancement prog/crest awards/challenge events
- ❑ TES
- ❑ The Association for science education
- ❑ Triple Science Support Programme
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry
- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website/youtube,youneng/enginuity
- ❑ None
- ❑ Other (specify) [ ]

If ??Q6_2??[1]=dk, Prompt interviewee with message 'Please enter at least one response'

Q6. Are there any sources of information regarding STEM enrichment and CPD activities that you have found particularly helpful (please give the top three sources)

- ❑ After school Science and Engineering Clubs
- ❑ Armed Forces / RAF
- ❑ Association of British Opticians
- ❑ Association of Teachers of Maths
- ❑ ATM
- ❑ BA
- ❑ Barow Engineering Partnership
- ❑ Bowland Maths
- ❑ Business News/Guidance
- ❑ CEI
- ❑ CLEAPPS
- ❑ Connexions / Careers Service / Jobs websites (e.g. NewScientist, Nature Jobs, Jobs.ac.uk)/Careerscape
- ❑ CSC
- ❑ DATA
- ❑ EBP - Warwickshire/EBP/Education Business Partnerships
- ❑ Education Companies
- ❑ Edulink Website
- ❑ EMPTA
- ❑ Engineering Education Scheme
- ❑ Faraday IET Challenge & volunteer engineering
- ❑ Further Maths Network
- ❑ Gatsby
- ❑ IEE
- ❑ IET
- ❑ Institute of Biology
- ❑ Institute of Electrical Engineers
- ❑ Institute of Physics
- ❑ Jigsaw Software
- ❑ Kangaroo Maths

- ❑ LA consultant and advisors
- ❑ Learn Direct
- ❑ Learning and skills council
- ❑ Learning outside the Classroom (LOTC)
- ❑ Local / National companies
- ❑ Maths Association
- ❑ Maths in Motion
- ❑ Museums
- ❑ Nagty
- ❑ NASA
- ❑ National Centre for Excellence in the Teaching of Maths (NCETM)
- ❑ National Science Learning Centre
- ❑ National Space Centre
- ❑ National Strategies - science and maths
- ❑ NCETM professional development directories
- ❑ Network of Education Business Partnerships
- ❑ No sources of information for specific subjects (e.g. D&T, Food, Textiles)
- ❑ No STEM provision used/none have been useful
- ❑ No understanding of STEM/STEM provision/unaware of resources/
- ❑ Non specific email or internet
- ❑ NRich
- ❑ Nuffield Curriculum/Exam Boards
- ❑ Other Schools
- ❑ Personal Contacts
- ❑ PFEG
- ❑ Physics World
- ❑ Police Force
- ❑ Prior degree knowledge
- ❑ QCA
- ❑ QIA Excellence Gateway/QIA
- ❑ Regional Science Learning Centre
- ❑ Royal Academy of Engineering (RAEng)
- ❑ Royal Institution of Great Britain
- ❑ Royal Society of Chemistry (RSC)
- ❑ Royal Society of Engineering
- ❑ Royal Society of Physics
- ❑ SATIS
- ❑ SCC
- ❑ School Colleagues
- ❑ Science & Engineering Ambassodors
- ❑ Science Institutes
- ❑ Science Tech Club Inset Days
- ❑ Science/Engineering Boxes
- ❑ SEA
- ❑ SEMTA
- ❑ SETNET & SETPOINTS
- ❑ Small Piece Trusts
- ❑ Specialist Schools and Academies Trust
- ❑ SSAT
- ❑ Standards Units/Standards Site/ DES Standards Site
- ❑ STEM Directory - Maths
- ❑ STEM directory - no subject specified
- ❑ STEM Directory - Science
- ❑ STEM Directory -Eng&Tech
- ❑ STEM Meetings/conferences
- ❑ STEM Website
- ❑ StemCentre.org.uk
- ❑ STEMNET
- ❑ Subject learning coaches
- ❑ Teachers TV
- ❑ Tech Enhancement prog/crest awards/challenge events
- ❑ TES
- ❑ The Association for science education
- ❑ Triple Science Support Programme
- ❑ TSSP
- ❑ UCAS
- ❑ UK Rocketry

- ❑ Universities/Colleges
- ❑ www.schoolscience.co.uk
- ❑ www.technologystudent.com/D&T websites/Gadget Show Website/youtube,youneng/enginuity
- ❑ None
- ❑ Other (specify) ☐

If ??Q6_2??[1]=dk, Prompt interviewee with message 'Please enter at least one response'

Q6Note

EFFECTIVENESS OF INFORMATION

Effectiveness of Information

Q7i. Now I would like you to consider how effective the information is on STEM enrichment activities, specifically. In a moment I will ask you about information on STEM CPD opportunities.

So thinking about all of the information that you have seen or used on STEM enrichment, could you please rate the extent to which you agree or disagree with the following statementson a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree	Don't know
a) The information is current and up-to-date	❑	❑	❑	❑	❑	❑
b) The information is clearly presented and categorised (e.g. in a clearly understandable format)	❑	❑	❑	❑	❑	❑
c) The information includes details about activities in my local area	❑	❑	❑	❑	❑	❑
d) The information is well coordinated (i.e. clear where to go for information, limited duplication)	❑	❑	❑	❑	❑	❑
e) The information includes sufficient details regarding activities (e.g. target audience, numbers involved, type of activity).	❑	❑	❑	❑	❑	❑
f) The information enables me to judge and select what might be appropriate/useful for me and my pupils/students	❑	❑	❑	❑	❑	❑

Q7ii. Now I would like you to consider how effective the information is on CPD activities.

So thinking about all of the information that you have seen or used on STEM CPD activities, could you please rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree	Don't know
a) The information is current and up-to-date	❑	❑	❑	❑	❑	❑
b) The information is clearly presented and categorised (e.g. in a clearly understandable format)	❑	❑	❑	❑	❑	❑
c) The information includes details about activities in my local area	❑	❑	❑	❑	❑	❑
d) The information is well coordinated (i.e. clear where to go for information, limited duplication)	❑	❑	❑	❑	❑	❑
e) The information includes sufficient detail regarding activities (e.g. target audience, specific focus).	❑	❑	❑	❑	❑	❑
f) The information enables me to judge and select what might be appropriate/useful for me and my staff	❑	❑	❑	❑	❑	❑

Q8a. Could you suggest any changes or improvements to the information available on STEM enrichment activities? (e.g. how information should be categorised, gaps in information, indications as to the quality of provision)

Q8b. Could you suggest any changes or improvements to the information available on STEM CPD provision? (e.g. how information should be categorised, gaps in information, indications as to the quality of provision)

ADEQUACY OF STEM ENRICHMENT AND CPD PROVISION

This next section is about STEM enrichment and CPD provision (rather than just focussing on information sources).

Q9. Thinking about the STEM provision available, please rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree.

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree
a) I feel there is an appropriate range of STEM enrichment opportunities available (i.e. to cover different aspects without unnecessary duplication)	❑	❑	❑	❑	❑
b) I feel there is an appropriate range of STEM CPD opportunities available (i.e. to cover different aspects without unnecessary duplication)	❑	❑	❑	❑	❑
c) I often engage with STEM enrichment activities for my students	❑	❑	❑	❑	❑
d) I often engage with STEM CPD activities to develop my teaching of STEM subjects	❑	❑	❑	❑	❑

Q10a. Are you aware of any particular gaps or duplication in enrichment provision?

Q10b. Are you aware of any particular gaps or duplication in CPD provision?

Q11a. Can you list any STEM enrichment activities that you experienced or engaged with during the last academic year (2009-10)

Q11b. Can you list any STEM CPD activities that you experienced or engaged with last academic year (2009-10)

ATTITUDES TOWARDS AND EXPERIENCES OF STEM

Q12. Lastly, we are interested in exploring the impacts of STEM infomation and provision on your teaching, your students and your school/college. Please rate the extent to which you agree or disagree with the following statements on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree.

	1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree
a) I feel confident in my ability to build real work/world applications of STEM into my lessons	❑	❑	❑	❑	❑
b) I feel confident and able to incorporate a wide range of practical work into my teaching of STEM subjects	❑	❑	❑	❑	❑
c) I feel confident in my knowledge of the STEM careers available for people with STEM qualifications	❑	❑	❑	❑	❑
d) I feel confident in my knowledge of routes and pathways into FE, HE and careers relating to STEM (e.g. diplomas, apprenticeships, HE study)	❑	❑	❑	❑	❑
e) I feel the school/department has adequate links with STEM-related industries	❑	❑	❑	❑	❑
f) I feel the school/department has adequate links with higher education institutions around STEM education	❑	❑	❑	❑	❑
g) I am able to involve students of all abilities in STEM enrichment activities	❑	❑	❑	❑	❑

Q13. Are there any additional comments you would like to make regarding the information available around STEM enrichment and CPD provision

Invitation to take part as a case study

For this research, we would to like to visit a sample of schools where teachers are making use of STEM enrichment and CPD information. This would involve a half day visit by a researcher to interview three teachers (maths, science, technology. The visit could happen next January or February.

Would your school be interested in being a case study for the research?

- ❑ Yes
- ❑ No
- ❑ Maybe with more information

Interviewer, if the respondent has been very positive in their experiences of STEM enrichment and CPD information throughout the survey please tick this box

- ❑ Tick here

Close

Validation

As part of our quality control procedures we routinely check 10% of our work. May I confirm your name and telephone number for this purpose please?

Note to interviewer: If asked, validation means that a supervisor may call to check a random selection of answers. If the respondent volunteers this information it will not be used for any other purpose nor given to any 3rd parties unless consent has been previously sought.

- ❑ Yes
- ❑ No

If <> 1, do not ask 'VerifyDetails'

Confirm Contact Details

Participant

Telephone

Finally, have you been happy with the way this interview has been conducted?

- ❑ Yes
- ❑ No

Comments

Interviewer name

RECORD THE FOLLOWING DETAILS:

Start time of interview

If True, set 'Now' to question 'FinishTime'

Interview finish time (time when you arrive at this screen)

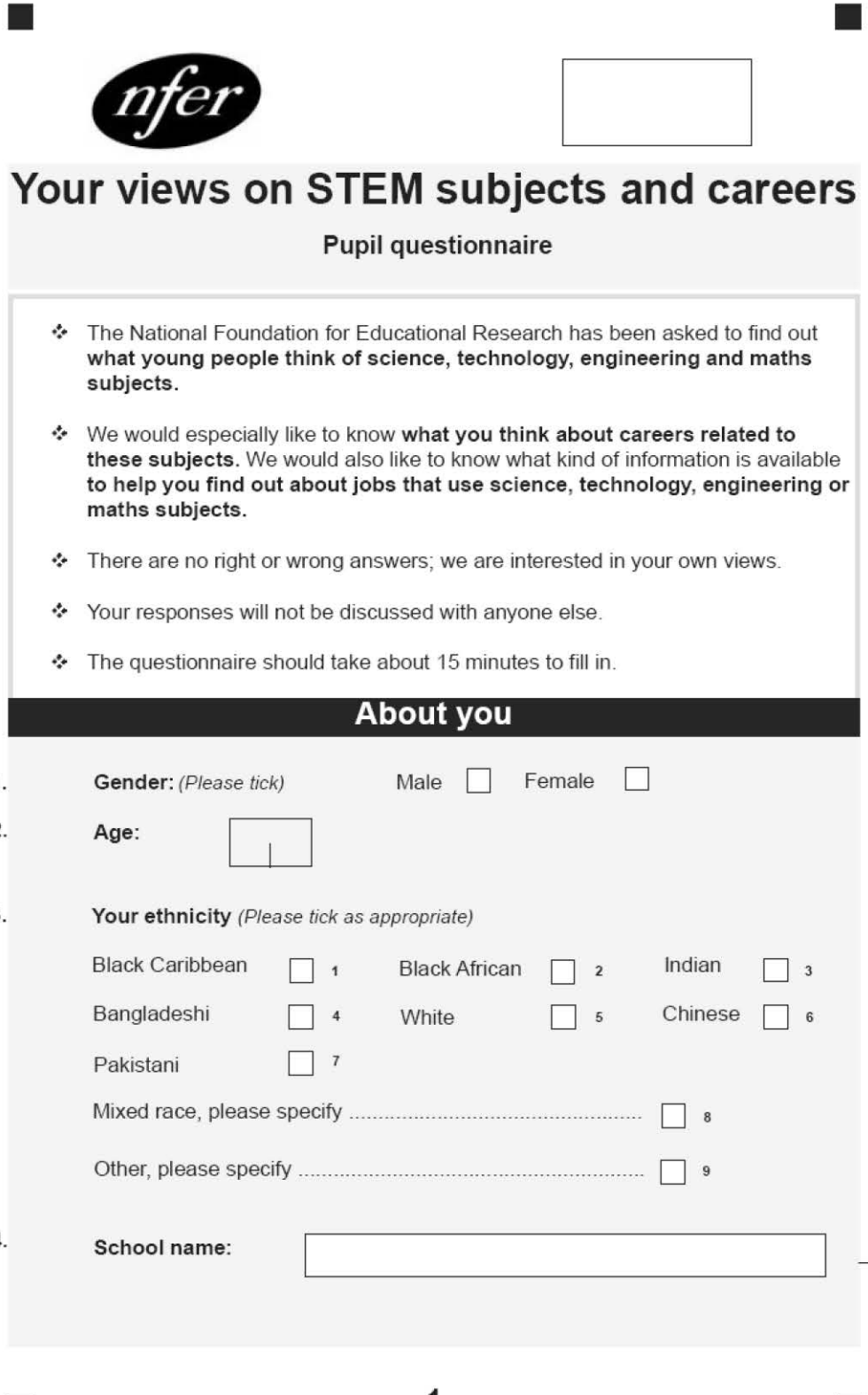
Duration of Interview (minutes)

Complete

- ❑ Complete
- ❑ Test

If = 2, goto 'End' (and do not keep the questionnaire)

Pupil Survey



nfer

Your views on STEM subjects and careers

Pupil questionnaire

- The National Foundation for Educational Research has been asked to find out **what young people think of science, technology, engineering and maths subjects.**
- We would especially like to know **what you think about careers related to these subjects.** We would also like to know what kind of information is available **to help you find out about jobs that use science, technology, engineering or maths subjects.**
- There are no right or wrong answers; we are interested in your own views.
- Your responses will not be discussed with anyone else.
- The questionnaire should take about 15 minutes to fill in.

About you

1. **Gender:** *(Please tick)* Male ☐ Female ☐

2. **Age:** ☐☐

3. **Your ethnicity** *(Please tick as appropriate)*

Black Caribbean ☐ 1 Black African ☐ 2 Indian ☐ 3

Bangladeshi ☐ 4 White ☐ 5 Chinese ☐ 6

Pakistani ☐ 7

Mixed race, please specify ..... ☐ 8

Other, please specify ..... ☐ 9

4. **School name:**

1

EVS PQ

Attitudes to science, technology, engineering and maths

5. We would like to ask about your views of science, technology, engineering and maths. Please read the following statements and circle the number closest to the statement that best matches your view *(e.g. if you feel that you quite enjoy science, you would circle number 2. Whereas if you really do not enjoy science, you would circle 4. If you do not study a particular subject please circle 'don't study it').*

a)	I enjoy science	1	2	3	4	I do not enjoy science	
b)	I enjoy technology	1	2	3	4	I do not enjoy technology	Don't study it
c)	I enjoy engineering	1	2	3	4	I do not enjoy engineering	Don't study it
d)	I enjoy maths	1	2	3	4	I do not enjoy maths	
e)	I am aware of many jobs/careers involving science	1	2	3	4	I am not aware of jobs/careers involving science	
f)	I am aware of many jobs/careers involving technology	1	2	3	4	I am not aware of jobs/careers involving technology	
g)	I am aware of many jobs/careers involving engineering	1	2	3	4	I am not aware of jobs/careers involving engineering	
h)	I am aware of many jobs/careers involving maths	1	2	3	4	I am not aware of jobs/careers involving maths	
i)	I feel I know enough about jobs that use science, technology, engineering and maths	1	2	3	4	I don't feel I know enough about jobs that use science, technology, engineering and maths	
j)	I think scientists, technologists, engineers and mathematicians do interesting/useful jobs	1	2	3	4	I don't think scientists, technologists, engineers and mathematicians do interesting/useful jobs	

Future plans

6. Please read the following statements and circle the number closest to the statement that you feel applies to you... *(if you are not sure whether you would like to study these subjects in the future or take a job that involves these subjecs, please circle 'don't know')*

a)	I would like a job involving science, technology, engineering or maths	1	2	3	4	I would not like a job involving science, technology, engineering or maths	Don't know
b)	I would like to study science in the future	1	2	3	4	I would not like to study science in the future	Don't know
c)	I would like to study technology in the future	1	2	3	4	I would not like to study technology in the future	Don't know
d)	I would like to study engineering in the future	1	2	3	4	I would not like to study engineering in the future	Don't know
e)	I would like to study maths in the future	1	2	3	4	I would not like to study maths in the future	Don't know

7. **Please tick the highest level to which you intend to take science...?** *(please tick one box only) ...*

Up to GCSE level ☐ 1 Up to A-level ☐ 2 Up to degree level ☐ 3

8. **Please tick the highest level to which you intend to take technology...?** *(please tick one box only) ...*

Up to GCSE level ☐ 1 Up to A-level ☐ 2 Up to degree level ☐ 3 Not at all ☐ 4

9. **Please tick the highest level to which you intend to take engineering...?** *(please tick one box only) ...*

Up to GCSE level ☐ 1 Up to A-level ☐ 2 Up to degree level ☐ 3 Not at all ☐ 4

10. **Please tick the highest level to which you intend to take maths...?** *(please tick one box only) ...*

Up to GCSE level ☐ 1 Up to A-level ☐ 2 Up to degree level ☐ 3

11. **Have you got any ideas about what you would like to do for a career/in the future?**

Science, technology, engineering and maths careers information

12. **We would now like to ask how you find out about careers involving science, technology, engineering and maths. Please read the list below and tick which sentences apply to you** *(please tick all that apply)*

a)	I don't know anything about what a job involving science, technology, engineering or maths would be like *(if you tick this answer, please go straight to Question 13 now)*	☐ 1
b)	Teachers have talked about these careers in lessons	☐ 2
c)	Careers involving science, technology, engineering or maths have been talked about in careers lessons or in PSHE lessons	☐ 3
d)	I have talked to the careers advisor/personal advisor in school about these careers	☐ 4
e)	I have read leaflets/booklets about careers/jobs related to science, technology, engineering or maths	☐ 5
f)	I have experienced events outside school which involved people from jobs that use science, technology, engineering or maths	☐ 6
g)	I have experienced events inside school which involved people from jobs that use science, technology, engineering or maths (e.g. giving talks, demonstrations)	☐ 7
h)	My parents/other relatives have talked to me about careers in these areas	☐ 8
i)	Neighbours/family friends have talked to me about careers in these areas	☐ 9
j)	I have found out about these careers from websites and the internet (e.g. Futuremorph, the maths career website, engenuity)	☐ 10

Science, technology, engineering and maths careers information continued.....

k) Other *(please tell us how else you find out about jobs which use science, technology, engineering and maths in the box below)*

13. **Think about the information you have received on careers that use science, technology, engineering and maths. Read the following statements and circle the number closest to the statement that best matches your views about this information** *(e.g. if you think the information gave you a good understanding of careers in these areas you would circle number one. Whereas if the information didn't give you a good understanding, circle 4).* ***If you haven't received any information about these types of careers please go to question 14***

a)	The information gave me a good understanding of careers that involve science, technology, engineering and maths	1	2	3	4	The information did not give me a good understanding of careers that involve science, technology, engineering and maths
b)	The information has helped me understand what I would need to do to get a job involving science, technology, engineering or maths	1	2	3	4	The information has not helped me to understand what I would need to do to get a job involving science, technology, engineering or maths
c)	The information has helped me to understand what subjects I need to study to get into a career involving science, technology, engineering or maths	1	2	3	4	The information has not helped me to understand what subjects I need to study to get into a career involving science, technology, engineering or maths

14. **What is the best way to learn about careers and jobs that involve science, technology, engineering and maths?** *(please say below)*

15. **If you would like to do a job related to science, technology, engineering or maths in the future, has anything in particular helped you to find out about that career?** *(please say below)*

Further Comments

16. **Is there anything else you would like to say about how you learn about careers involving science, technology, engineering and maths?**

THANK YOU VERY MUCH FOR YOUR TIME

School case-study instruments

Evaluation of the STEM cohesion programme

STEM TEACHER INTERVIEW SCHEDULE

- Thank you very much for agreeing to be interviewed for the research
- As you may be aware the DCSF are taking steps nationally to improve the availability and coordination of STEM information for teachers. So that includes information on STEM CPD, STEM enhancement and enrichment opportunities and STEM careers.
- The NFER have been asked by the DCSF to undertake research to explore STEM teachers' experiences of the availability and coordination of this information.
- I understand you may have used STEM related information to access provision (e.g. CPD, E&E, careers) and I'd like to ask you about your experiences of this.
- The question areas I'd like to cover are:
    - Specific examples of STEM information you have used
    - Experiences of the E&E, CPD, careers support accessed
    - The schools engagement with STEM generally
- The interview will take 30 minutes, is that okay?
- The interview is confidential and anonymous and no individuals or schools will be named in any reporting. Would you mind if I record the interview in order to ensure I gather all the information accurately?

1 Background

1.1 Could you tell me what subjects you teach and at what level?

1.2 How long have you been in teaching?

1.3 Do you hold any particular responsibilities in relation to STEM subjects in school?

2 Specific example/s of using STEM information

Researcher note: Where teachers have been involved in a large number of activities, may be better to focus on just a few for sections 2 and 3. For teachers that completed the careers survey, focus on careers related activities more.

2.1 In the last year (since September 2008), what STEM related activities have you accessed or been involved in? [researcher to probe based on survey responses]

1. Any STEM **CPD** activities?
2. Any STEM **enhancement and enrichment** activities?
3. Any STEM **careers** related activities (e.g. talks from STEM ambassadors/industry reps; trips to HE; careers fairs; integrating careers materials into the curriculum)

Check:
- What pupils/year groups/teachers have these activities involved?
- Have any of the activities involved parents?

2.2 Have these activities/the activity involved an existing provider/source of support or a new contact?

2.3 How did you find out about the activities/resources/CPD you've told me about? *[get names of specific information sources]*

2.4 Was that an information source that you had used before or new to you?

2.5 What did you think of the [specific] information source/s?
e.g.
- was the information up-to-date;
- easy to use;
- sufficiently detailed;
- enabled you to make appropriate selection etc.

2.6 Could the information source/s be improved?
e.g.
- clearer?
- advice on quality/user ratings?

3 Experiences of STEM E&E, CPD, careers support and resources

3.1 How effective did you find the STEM E&E, CPD, careers resources/support/activities that you accessed through the [information source]?
e.g.
- Quality of provision?
- Would they recommend it to others?
- To what extent was the provision matched to their/pupils' needs?

3.2 What difference did the activity/resource make to you personally?
e.g:
- Any impact on your teaching practice?
- Any impact on your awareness of STEM study and career opportunities?
- Any impact on your ability to bring STEM careers examples into the curriculum?

3.3 What difference did this activity/resource make to your pupils?
e.g.
- Any changes in their perceptions of, and knowledge of, STEM study and career opportunities?
- Are they more likely to participate in STEM study and/or employment post-16 **(**any particular activities affected this?)
- Any difference to their attainment in STEM?

3.4 What difference did the activity/resource make to other teachers/the wider school?

3.5 Are you aware of whether there have been any changes in parents' perceptions of, and knowledge of, STEM study and career opportunities?
Probe: In what ways? What is helping bring this about?

4 Schools general engagement with STEM

4.1 On a scale of 1 to 5, how engaged would you say the school is with STEM, in terms of its willingness and interest to experience STEM related activities through CPD, E and E and careers provision (i.e. 1 is not at all engaged, through to five which is highly engaged)

4.2 **Has the school's level of engagement with STEM changed over recent years?**
Probe:
- In what ways? (e.g. more activities? more integrated? stronger careers focus?
- Are you intending to get involved in different types or a wider range of initiatives in the year ahead?
- If not changed, why not?

4.3 [if appropriate] **What has helped/encouraged you/the school to get more involved in STEM over recent years?**
Probe:
- When did the schools engagement with STEM begin (roughly) and what facilitated that involvement initially?

5 Information generally available on STEM related activities

5.1 **Generally, what are the avenues you would normally use to find out about STEM activities (e.g. CPD, E&**E)?
e.g. Internet, directories, local STEMPOINTS, direct mailings/information from providers
- [if not covered] Have you used the directories? Why/why not?
- Does the school have its own internal systems for circulating information about STEM?

5.2 **Generally, how effective and helpful have you found the information available on STEM [CPD, E&E, careers]?**

5.3 [if not covered above] **Are there any information sources that you have found particularly helpful?** *(If yes, why?)*

5.4 **Over the last year or so, have you noticed any changes in the information available around STEM [i.e. CPD, E&E, careers]**?
e.g
- better coordinated; less overwhelming; more information; less inundated?

5.5 **Do you feel there is sufficient and appropriate STEM [CPD, E&E, careers] provision for you to access?**
e.g.

- Any duplication in what is available? Any gaps? Some STEM subjects poorly represented? Is there enough provision or always booked up? Is provision accessible to you (e.g. in terms of location and cost?)

6 Improvements

6.1 Generally, how could the current STEM information sources be improved?

e.g.

- clearer?; advice on quality/user ratings?; personal contacts?

6.2 Are there any areas where you feel insufficiently informed about STEM or would like more information?

e.g.

- Lack information around industry contacts?; work placements?; lack information on engineering or maths enrichment specifically?

6.3 Is there any other information or support that you need in order to enrich students STEM experiences and increase their participation in STEM?

6.4 Generally, how do you think other schools and teachers could be encouraged to access information and engage in STEM E&E, careers and CPD activities?

e.g.

- what needs to be in place to ensure that schools can take full advantage of all the STEM opportunities available?

Evaluation of the STEM cohesion programme

PUPIL FOCUS GROUP SCHEDULE

- Thank you very much for agreeing to speak to me today
- I'd like to ask you about what you think of STEM – which is science, technology, engineering and mathematics. I would particularly like to discuss what you think about careers related to these subjects.
- The discussion will take approximately 20 minutes, is that okay?
- The discussion is confidential amongst the group, what you say is only used to help with the research and no individuals will be identified. Would you mind if I record the discussion in order to ensure I gather all the information accurately?

1 Attitudes towards STEM subjects

1.1 How enjoyable/interesting do you find STEM subjects in school?

Probe:

- Why enjoyable and interesting? / Why not enjoyable and interesting?

1.2 Do you enjoy/like the way science, technology and maths are taught?

1.3 Do you find what you learn in these subjects useful/relevant?

Probe:

- For now/for the future?
- Do teachers help you see how these subjects are relevant/useful in everyday life?

1.4 Do you feel that you can do well in STEM subjects?

1.5 How difficult do you find Science, Technology, Maths?

2 Aspirations to study STEM

2.1 How interested are you in studying STEM subjects in the future?

Probe:

- Why? Why not?
- To what level?

3 Attitudes towards STEM careers

3.1 What kinds of jobs/careers do you associate with STEM subjects?

Probe:

- Can you give me any examples of what you think STEM jobs are? (e.g. do you see them as professions like medicine, dentistry, vet, engineer?)
- What kinds of jobs do you think you can get from studying STEM subjects?
- Are you familiar with jobs such as Aerospace Engineer; analytical chemist; Robotics Technician; Software Engineers; Microbiologists; Environmental Engineers; Laboratory Technicians; Physicists?

3.2 What is your 'image' of science careers, how do you regard them? (e.g. what comes to mind when you think of someone who has a career in/relating to science?)

Probe:

- Interesting?
- Well paid?
- Clear routes in? Range of routes in? Vocational and academic?
- Desirable? Status?
- Geeky?
- Practical?
- Any differences across the sector? (e.g. any 'science' careers you regard more highly than others? E.g. why think more highly of medicine, dentistry careers than chemists, physicists etc.?)

3.3 What is your 'image' of technology and engineering careers, how do you regard them? (e.g. what comes to mind when you think of someone who has a career in/relating to technology or engineering?)

Probe:

- Interesting?
- Well paid?
- Clear routes in? Range of routes in? Vocational and academic?
- Desirable? Status?
- Geeky?
- Practical?
- Manual/oily rag/dirty?
- Any differences across the sector? (e.g. any technology and engineering careers you regard more highly than others?)

3.4 What is your 'image' of mathematics careers, how do you regard them? (e.g. what comes to mind when you think of someone who has a career in/relating to maths?)

Probe:

- Interesting?
- Well paid?
- Clear routes in? Range of routes in? Vocational and academic?
- Desirable? Status?
- Geeky?
- Practical?
- Any differences across the sector? (e.g. any maths careers you regard more highly than others?)

3.5 Are you interested in a career relating to STEM?

Probe: why? Why not? What sort of career?

4 STEM careers information

4.1 Have you received any careers information about further study or careers in STEM? [Researcher to have idea of STEM careers activity undertaken in the school]

Probe:

- From who?
- Where would you go for information on STEM careers?
- Met/had talks from people from STEM careers/industry (STEM ambassadors)?
- Got involved with a STEM club?
- Any trips to a university STEM department? (e.g. experiments, lectures/talks, careers fairs)

- Used any STEM websites?

4.2 What did you think about this information/event/activity?

Probe:

- Any good/bad aspects?
- Did they help you in any way? (e.g. provided you with more information about the range of STEM study and careers options available? Made you any more interested in STEM study? Inspired you to consider further study or particular jobs?)

4.3 Do science, technology and maths lessons ever cover careers aspects?

Probe:

- Do teachers ever mention careers in science, technology and maths lessons?
- Are science, technology and maths lessons linked to the real-world (to give you a sense of what these careers might involve/how STEM is applied in the real world)?

4.4 Do you feel you have had enough information/experiences to help you understand STEM career opportunities?

Probe:

- Is there anything else you would like?

5 Changes in STEM

5.1 Over the last year or so have you noticed STEM subjects being mentioned more in the media (e.g. studying STEM or opportunities for STEM related careers)?

Probe:

- What changes?
- Where heard about it?
- Has it affected what you think of STEM?

5.2 Over the last year have you noticed STEM areas/subjects being mentioned more in school (e.g. studying STEM or opportunities for STEM related careers)?

Probe:

- What changes?
- Where heard about it?
- Has it affected what you think of STEM?

5.3 That's all my questions, is there anything else anyone would like to add about your views and experiences of STEM?

Thank you very much for your time and comments

Evaluation of the STEM cohesion programme

PARENT FOCUS GROUP/INTERVIEW SCHEDULE

- Thank you very much for agreeing to speak to me today.
- The government is undertaking some work with the aim of raising awareness of and participation in science, technology, engineering and mathematic subjects and careers. As part of our research into finding out how this is going I'd like to ask you about what you think of science, technology, engineering and Mathematics. I would particularly like to discuss with you what you think about careers related to these subjects.
- Science, technology, engineering and maths are often referred to collectively as 'STEM' because they are quite closely related disciplines and face some similar problems (e.g. in terms of decline in their uptake over the past 15-20 years).
- The discussion/interview will take approximately 10-20 minutes, is that okay?
- The discussion/interview is confidential [amongst the group], what you say is only used to help with the research and no individuals will be identified. Would you mind if I record the discussion in order to ensure I gather all the information accurately?

1 Attitudes towards STEM careers

1.1 Firstly, what kinds of jobs/careers do you associate with STEM subjects (Science, Technology, Engineering and Maths?)

Probe:

- Can you give me any examples of what you think STEM jobs are? (e.g. do you see them as professions like medicine, dentistry, vet, engineer?)
- What kinds of jobs/careers do you think students can go into from studying STEM subjects?
- Are you familiar with jobs such as Aerospace Engineer; analytical chemist; Robotics Technician; Software Engineers; Microbiologists; Environmental Engineers; Laboratory Technicians; Physicists?

1.2 What is your 'image' of science careers, how do you regard them? (e.g. what comes to mind when you think of someone who has a career in/relating to science?)

Probe:

- Interesting?
- Well paid?
- Clear routes in? Range of routes in? Vocational and academic?
- Desirable? Status?
- Geeky?
- Practical?
- Any differences across the sector? (e.g. any 'science' careers you regard more highly than others? E.g. do you think more highly of medicine, dentistry careers than chemists, physicists etc.?)

1.3 What is your 'image' of technology and engineering careers, how do you regard them? (e.g. what comes to mind when you think of someone who has a career in/relating to technology or engineering?)

Probe:

- Interesting?
- Well paid?
- Clear routes in? Range of routes in? Vocational and academic?
- Desirable? Status?
- Geeky?
- Practical?
- Manual/oily rag/dirty?
- Any differences across the sector? (e.g. any technology and engineering careers you regard more highly than others?)

1.4 What is your 'image' of mathematics careers, how do you regard them? (e.g. what comes to mind when you think of someone who has a career in/relating to maths?)

Probe:

- Interesting?
- Well paid?
- Clear routes in? Range of routes in? Vocational and academic?
- Desirable? Status?
- Geeky?
- Practical?
- Any differences across the sector? (e.g. any maths careers you regard more highly than others?)

1.5 What were your own experiences of STEM subjects at school?

Probe:

- Enjoyable?
- Practical?
- Difficult?
- Relevant?
- How taught?
- Has this influenced your view of STEM subjects?

1.6 Would you be supportive of your child studying or pursuing a career relating to STEM?

Probe:

- Why? Why not? What sort of career?
- Would you *actively encourage* your child to study/pursue a career relating to STEM? Why/why not?

1.7 Would you feel able to advise your child about what a STEM career might be like and involve?

2 STEM careers information

2.1 Have <u>you</u> ever seen or used any careers information about STEM further study or careers? [Researcher to be aware of any STEM activities involving parents]

Probe:

- Where/who was this information from? (e.g. teacher, careers adviser, event)?
- Any events been to? What event? How found out about it?
- Websites [e.g. Futuremorph; scienceandmaths.net]
- People you know who work in STEM areas? Your own work?
- Adverts/media?
- Where have you got your insights about STEM from?

2.2 What did you think about this information/event/activity?

Probe:

- Any good/bad aspects?

- Did they help you in any way? Useful? (e.g. alert you to opportunities available?)

2.3 Do you feel you have sufficient access to information on STEM study and careers if you want it (including information and experiences of STEM)?

Probe:

- Do you know where to go for information if you want it? (e.g. do you know about the Futuremorph website?)
- Is there anything you would like to help you find out more about STEM subjects/careers? (e.g. involvement in school events?; family STEM activities?)

2.4 Are you aware whether <u>your child</u> has received any information about STEM further study and careers or been involved in any STEM careers activities? [Researcher to be aware of any STEM activities in the child's school]

Probe:

- Any events? Talks?
- Do you know what they thought of this? Interesting? Excited by it?
- How effective? Appropriate timing?
- Did they have any effect on your child (e.g. inspire them to consider further study/careers in STEM? make them more aware of the importance of these careers and what they involve? improve their understanding of STEM subjects?)

2.5 Do you feel your child has enough access to information relating to STEM study and careers (including information and experiences of STEM)?

Probe:

- Generally, how do you feel about the quality and effectiveness of careers education and advice in your child's school? What does it comprise? Does it help them to find out about different careers?

2.6 What more could be done to raise young people's understanding of the opportunities for further study and careers in STEM?

Probe:

- Work experience? Media adverts? Activities in school? Changes to curriculum? Contact with people in STEM careers?

3 Changes in STEM

3.1 **Over the last year or so have you noticed STEM areas/subjects being mentioned more in the media (**e.g. in terms of studying STEM or opportunities for STEM related careers)

Probe:

- What changes?
- Where heard about it?
- Has it affected what you think of STEM?

3.2 **Over the last year or so have you noticed STEM areas/subjects being mentioned more in school (**e.g. in terms of studying STEM or opportunities for STEM related careers)

Probe:

- What changes?
- Where heard about it?
- Has it affected what you think of STEM?

3.3 **That's all my questions, is there anything else anyone would like to add about your views and experiences of STEM?**

Thank you very much for your time and comments

Lead organisation interview schedules

Evaluation of the STEM cohesion programme

Lead organisations interview schedule

INTRODUCTION

THE NFER has been asked to evaluate the **STEM cohesion programme –** we are looking at the coordination role of the lead organisations and the impact of the whole programme on schools, teachers and pupils. ***(INTERVIEWER NOTE: there may be other evaluations of individual strands, but NFER is conducting a programme wide evaluation).***

As one of the lead organisations responsible for an Action Programme we wanted to interview you about the progress so far and to get your views of the potential impact of the programme.

The interview will last approx 30-40 mins.

Everything you say will be treated as confidential and we will not name any individuals in any reports.

OK to proceed?

INTERVIEWER NOTE: try to keep interviewee focussed on their particular action programme (rather than talking about others)

1 PROGRESS OF THE ACTION PROGRAMME

1.1 Can you briefly run through the progress made so far in relation to your particular action programme?

e.g.

- planned coordination activities
- provisions of resources (e.g. directories, websites)
- launch dates
- whose involved
- next steps

– (Are you undertaking any of your own evaluation, in relation to the action programme?) – *if yes, could we see the findings?*

2 IMPACTS OF THE ACTION PROGRAMME (now or in the future)

Could you comment on whether your action programme has made a difference to the following areas (or whether it will in the future):

INTERVIEWER NOTE: (Explain that this section is so we can identify the types of questions we need to ask in our surveys/ interviews. We appreciate the AP may not yet have had an impact, but we need to find out what the intended outcomes are)

Schools and colleges access to information

e.g.

2.1 Are teachers/lecturers able to access information/resources more easily?

2.2 Is the information they receive better coordinated? (e.g. less duplication)

2.3 Is the information better presented? (e.g. information well classified e.g. by region, specialist area, etc).

Awareness of provision

e.g.

2.4 *(if appropriate to AP)* Has teacher's/lecturer's awareness of STEM enhancement and enrichment activities increased?

2.5 *(if appropriate to AP)* Has teacher's/lecturer's awareness of STEM careers related enhancement and enrichment activities increased?

2.6 *(if appropriate to AP)* Has teacher's/lecturer's awareness of STEM CPD opportunities increased?

Range of provision

2.7 Is a greater range of provision now available to schools?

Engagement with provision

e.g.

2.8 Has there been an increased uptake of provision by schools and colleges (e.g. has the information removed barriers to participation, are a greater number and a wider range of schools involved)

2.9 Are schools/colleges using a wider range of providers and benefitting from different types of provision (including increased employer/HE links)?

Teacher's/lecturer's knowledge, confidence and skills

2.10 Has the AP affected teachers/lecturers knowledge, skills and confidence in relation to:

- *(if appropriate to AP)* **STEM subjects** (e.g. opportunities to update subject knowledge, improved understanding of other STEM subject subjects)
- *(if appropriate to AP)* **STEM careers** (e.g. knowledge of possible STEM careers, ability to raising young people's awareness of STEM careers, knowledge of STEM courses at FE and HE)
- *(if appropriate to AP)* **teaching STEM subjects** (e.g. demonstrating how STEM is used the real work, ability to inspire and engage pupils in STEM)
- *(if appropriate to AP)* **practical work** (e.g.confidence and skills in undertaking practical work in class, use of new approaches to practical work)

Pupils

2.11 To what extent will the AP impact on student's attainment

2.12 To what extent with AP impact on student's progression in STEM (in terms of future study or careers)?

Parents

2.13 Will the AP have any impact on parent's knowledge of STEM careers?

Other impacts

2.14 Can you think of any other impacts that might arise from your particular action programme that we haven't already covered?

3 IMPACT ON THE ACTION PROGRAMME FRAMEWORK

Thinking specifically of the whole **action programme framework**:

3.1 Has it led or will it lead to a clearer articulation of policy priorities?

3.2 Has it offered a means of influencing policy priorities?

3.3 Has it affected the work of your organisation in any way:

e.g.

- Has it helped you plan your work to avoid duplication and meet needs and gaps? (e.g. in terms of what to fund or what to provide)

3.4 Are you aware of any linkages across the different action programmes (e.g. lead organisations working together)? Has this had any positive impacts?

4 Challenges/Lessons learnt

4.1 What have been the main challenges so far in relation to this particular action programme?

5 Improvements/developments

5.1 Are there any aspects of the Action programme that could be improved upon or need further development?

(e.g. remaining gaps in the support/information that is available to schools/colleges?)

6 Successes/effective practice

6.1 What would you highlight as the main successes of the action programme so far?

6.2 Are there any examples of effective practice in relation to organising existing activity and improving the coordination of information?

June 2009 Follow-up

I am contacting you in relation to the STEM cohesion programme, which we are evaluating for the DCSF**. In August 2009, NFER will be producing the first evaluation report and we wanted to get an update from you since we last spoke in Autumn 2008.**

- I would be very grateful if you could answer the questions below *(please type in your responses).*
- If you prefer, you can give your responses verbally. Simply e mail a suitable time and someone will call you to take your comments.
- In relation to Question 1, if you've have already produced **progress reports** then we would be happy to receive these.

1 Can you please provide **a brief update** on the activities of your action programme since we last spoke in Autumn 2008?

2 What would you highlight as the **main successes** of the action programme so far? (including impact on teachers, pupils, school, colleges?)

3 Are there **any examples of effective practice** in relation to improving the coordination of STEM information to schools/colleges?

4 What have been the **main challenges** so far in relation to your particular action programme?

5 Are there any aspects of the action programme that could be **improved upon or need further development**? (e.g. remaining gaps in the support/information available to schools/colleges?)

6 Thinking specifically of the whole **action programme framework** (with its 11 action programmes), has it led to a clearer articulation of policy priorities? (why/why not?)

7 Has the **framework affected the work of your organisation in any way**? (e.g. Has it helped you plan your work to avoid duplication and meet needs and gaps, in terms of what to fund or what to provide; has it helped develop STEM policies, etc)

8 Are you aware of **any linkages** across the different action programmes (e.g. lead organisations working together)? Has this had any positive impacts?

9 Any other comments?

February 2010 Follow-up

I am contacting you in relation to the STEM cohesion programme, which we are evaluating for the DCSF**. At the end of April, NFER will be producing the second evaluation report and we wanted to get an update from you since we last contacted you in June 2009.**

- I would be very grateful if you could answer the questions below
- Can you either type in your answers or if you prefer, we are happy to take your comments over the phone (simply e mail a date and time and someone will call you back)
- Could you please let me know your preferred methods of response by Monday 22nd February
- Comments will then need to provided either verbally or in writing by **Wednesday March 31st.**

Please send any e mail correspondence to both myself and to my colleague Jennie Harland.

YEAR 2: Evaluation of the STEM cohesion programme: Lead organisation update

1 Can you please provide **a brief update** on the activities of your action programme since June 2009? (alternatively, please attach any existing progress reports you have produced in the last year)

2 **What difference** has your action programme made to teachers/pupils/schools/college?

For example, do you have any evidence of:

- Increased awareness and use of STEM information sources (by teachers/lecturers)?
- Increased engagement with STEM provision (e.g. CPD, careers related, enhancement and enrichment activities)?
- Increased attainment in STEM?
- Increased interest in STEM study/STEM careers?

3 Are there **any examples of effective practice** in relation to improving the coordination of STEM information to schools/colleges?

4 What have been the **main challenges** so far in relation to your particular action programme? (how have these or could these be addressed?)

5 Are there any aspects of the action programme that could be **improved upon or need further development**? (e.g. remaining gaps in the support/information available to schools/colleges?)

6 Has the **action programme framework affected the work of your organisation in any way**?

For example, has it :

- helped in the planning of work to avoid duplication?
- Helped in the development of your STEM programmes generally?
- Assisted in the development of STEM policies?
- Influenced funding decisions?
- Improved understanding of the national STEM agenda?
- Enabled the identification of gaps in STEM delivery?

7 Are you aware of **any linkages** across the different action programmes (e.g. lead organisations working together)? Has this had any positive impacts?

8 Any other comments about the STEM cohesion programme and the action programme framework?

Final year follow-up

Evaluation of the STEM cohesion programme

Lead organisations interview schedule

Final year

- What would you say have been the **main achievements of your Action programme** over the last 2 years?

- Can you think of **any examples of effective practice** in relation to improving the coordination of STEM information to schools/colleges?

- Over last two years, what have been the **main challenges** in relation to your particular action programme? (how have these or could these be addressed?) What have been the main lessons learnt?

- Are there any aspects of your action programme that could be **improved upon or need further development**? (e.g. remaining gaps in the support/information available to schools/colleges?)

- Thinking of the whole STEM cohesion programme and its different **action programme**s, can you comment on whether it has……
    - helped in the planning of work to avoid duplication of STEM related information and provision?
    - helped in the development of your STEM programmes generally?
    - assisted in the development of STEM policies?
    - influenced funding decisions?
    - improved understanding of the national STEM agenda – lead to a clear understanding of policy priorities?
    - enabled the identification of gaps in STEM delivery?
    - encouraged links between STEM organizations?

- **What difference** has your action programme made to teachers/pupils/schools/colleges?

  For example, do you have any evidence of:

  - Increased awareness and use of STEM information sources (by teachers/lecturers)?
  - Increased engagement with STEM provision (e.g. CPD, careers related,enhancement and enrichment activities)?
  - Increased attainment in STEM?
  - Increased interest in STEM study/STEM careers?

- Are you aware of **any linkages** across the different action programmes (e.g. lead organisations working together)? Has this had any positive impacts?

- What do you see as the next steps for the STEM cohesion programme? Areas for development in relation to STEM information and provision?

- How can the work of the STEM cohesion programme be sustained in the future?

- Any other comments about the STEM cohesion programme and the action programme framework?

STEM Stakeholder Surveys

Initial Stakeholder survey

Evaluation of the STEM cohesion Programme

The NFER has been asked to evaluate the **STEM (Science, Technology, Engineering and Maths) cohesion programme.** As an organisation whose work relates to the STEM arena we would be particularly interested in your **awareness and understanding** of the programme and how it has **impacted** or may **impact** on your activities.

This questionnaire has been sent to organisations and individuals that have very different roles in relation to the STEM agenda and as such not all questions may be relevant to you. Please only complete those questions that are appropriate to you and your organisation's activities in relation to the STEM agenda.

Your responses to the questions will remain anonymous and we thank you in advance for taking the time to complete this questionnaire.

Please either complete this questionnaire in Word and return it to b.haines@nfer.ac.uk or print the questionnaire and return it by post or fax to: The National Foundation for Educational Research, Northern Office, Genesis 4, Innovation Way, Heslington, York, YO10 5DQ. Fax: 01904 433436

About you and your organisation

1. What is the name of your organisation?

2. What is your job title?

Awareness of the STEM Cohesion Programme

4. To what extent are you aware of the STEM cohesion programme and its action programmes? (*Please insert a cross(X) in the relevant box).*			
No awareness	Limited awareness	Some awareness	Fully aware

5. To what extent are you aware of the action programme's lead organisations? *(Please insert a cross (X) in the relevant box)*			
No awareness	Limited awareness	Some awareness	Fully aware

6. Have you had contact with any of the following lead organisations in relation to the STEM Cohesion Programme and its action programmes? *(Please insert a cross(X) in the relevant box)*

Lead Organisation	**Regular Contact**	**Some Contact**	**No Contact**
National Centre for Excellence in the Teaching of Mathematics (NCETM)			
National Science Learning Centre			
SCORE [24]			
Royal Academy of Engineering (RAEng)			
Advisory Committee for Mathematics Education (ACME)			
The National STEM Careers Co-ordinator (at Sheffield Hallam University)			

[24] SCORE- Science community representing education convened by the Royal Society. The other founding partners are the Institute of Physics, the Royal Society of Chemistry, the Institute of Biology, the Biosciences Federation, the Science Council and the Association for Science education.

Impacts of the STEM Cohesion Programme

7. Have the STEM action programmes and/or support or guidance from lead organisations impacted on your organisation in the any of the following ways: (Please insert a cross (X) in the relevant box).

	Positive Impact	No Impact	Not Applicable	No impact yet, but may impact in the future
Developing links with other STEM organisations				
Avoiding duplication of work with other organisations				
Development of your STEM work programmes (e.g. work with schools/colleges, teachers, work experience placements, training provision)				
Development of your STEM policies				
Your understanding of the national STEM agenda				
Influencing funding decisions				
Identifying gaps in STEM delivery and new opportunities for your organisation to contribute to the STEM agenda				

8. Please provide further details of <u>the most significant impacts</u> that the STEM Cohesion Programme has or will have on your organisation.

9. Please provide any other comments that you have in relation to the STEM Cohesion Programme and its aims and impacts to date.

Many thanks for completing this questionnaire.

Please return the questionnaire to b.haines@nfer.ac.uk or print the questionnaire and return it by post or fax to: The National Foundation for Educational Research, Northern Office, Genesis 4, Innovation Way, Heslington, York, YO10 5DQ. Fax: 01904 433436

Final Stakeholder survey

Evaluation of the STEM Cohesion Programme

The National Foundation for Educational Research (NFER) is evaluating the **STEM cohesion programme** (STEM refers to Science, Technology, Engineering and Mathematics). The evaluation has been commissioned by the Department for Education. As an organisation whose work relates to the STEM programme, we would be particularly interested in your **awareness and understanding** of the programme and how it may have affected you and your organisation

ABOUT THIS SURVEY

- This survey has been sent to organisations and individuals that have very different roles in relation to the STEM agenda and as such, not all questions may be relevant to you. Please only complete those questions that are appropriate to you and your organisation's activities in relation to the STEM agenda.
- Your responses to the questions will be treated confidentially and remain anonymous. We thank you in advance for taking the time to complete this questionnaire.
- Please either complete this questionnaire in Word and return it to k.halsey@nfer.ac.uk or print the questionnaire and return it by post or fax to: The National Foundation for Educational Research, Northern Office, Genesis 4, Innovation Way, Heslington, York, YO10 5DQ. Fax: 01904 433436

Q1. To what extent are you aware of the:

(Please insert a cross(X) in the relevant box)

	No awareness	Limited awareness	Some awareness	Fully aware
STEM cohesion programme and it's Action Programmes?	☐	☐	☐	☐
Lead organisations for each Action Programme?	☐	☐	☐	☐
National STEM Centre and it's eLibrary?	☐	☐	☐	☐

Q2. Over the past two years, have you had contact with any of the following lead organisations in relation to the STEM Cohesion Programme and its action programmes?

	Regular contact	Some contact	No contact
National Centre for Excellence in the Teaching of Mathematics (NCETM)	☐	☐	☐
National Science Learning Centre	☐	☐	☐
SCORE	☐	☐	☐
Royal Academy of Engineering (RAEng)	☐	☐	☐
Advisory Committee for Mathematics Education (ACME)	☐	☐	☐
The National STEM Careers Co-ordinator (at Sheffield Hallam University)	☐	☐	☐

Q3. What has been the <u>main</u> impact of the STEM Cohesion Programme and its action programmes for you and your organisation?

Q4. Has the STEM Cohesion Programme, its action programmes and/or support or guidance from lead organisations impacted on your organisation in any of the following ways:

	Positive impact	No impact	N/A	*If possible, please provide examples below:*
Development of links with other STEM organisations	☐	☐	☐	
Avoiding duplication of work with other organisations	☐	☐	☐	
Development of your STEM programmes (e.g. work with schools/colleges, teachers, work experience placements, training provision)	☐	☐	☐	
Development of your STEM policies	☐	☐	☐	
Your understanding of the national STEM agenda	☐	☐	☐	

Influencing funding decisions	☐	☐	☐	
Identifying gaps in STEM delivery and new opportunities for your organisation to contribute to the STEM agenda	☐	☐	☐	

Q5. If you are a provider of STEM activities, have you noticed any changes in the number of schools engaging with STEM provision over the last two years?

I am not a provider ☐ **Yes, I have noticed an increase** ☐ **No changes** ☐
(please give details below)

Name: **Organisation:**

Many thanks for completing this questionnaire

References

Bennett, J and Hogarth, S. (2006) Annual National Survey of Year 9 Students' Attitudes to Science: Year 1 Report August 2006. Report commissioned by Astra-Zeneca. York: University of York, Department of Educational Studies

CBI. (2010). *SET for growth: Business priorities for science, engineering and technology* [online]. Available: http://educationandskills.cbi.org.uk/uploaded/SET_for_growth.pdf

Cleaves, A. (2005). 'The formation of science choices in secondary school', *International Journal of Science Education*, **27**, 4, 471–486.

Dalgety, J. and Coll, R.K. (2004). 'The influence of normative beliefs on students' enrolment choices', *Research in Science and Technological Education*, **22**, 1, 59–80.

Francis, B., Hutchings, M. and Read, B. (2004). *Science in girls' schools: factors that contribute to girls' engagement and attainment*. Report on the research commissioned by the Association for Maintained Girls' Schools. London: Institute for Policy Studies in Education.

HEFCE (2005) *Strategically important and vulnerable subjects: final report of the advisory group* [online]. Available: http://www.hefce.ac.uk/Pubs/hefce/2005/05_24/05_24.pdf [15th August 2007]

HM Treasury, Department for Trade and Industry and Department for Education and Skills (2004). *Science & Innovation Framework (2004–2014)* [online]. Available: http://www.hm-treasury.gov.uk/media/95846/spend04_sciencedoc_1_090704.pdf [24 November, 2006].

Jenkins, E.W. and Nelson, N.W. (2005). 'Important but not for me: students' attitudes towards secondary school science in England', *Research in Science and Technological Education*, **23**, 1, 41–57.

Khourey-Bowers, C; & Simonis, D, G. (2004). Longitudinal study of middle grades chemistry professional development: Enhancement of personal science teaching self-efficacy and outcome expectancy. *Journal of Science Teacher Education* (2004) 15(3), pp.175-195.

London Development Agency (2006). Science, Technology, Engineering, Mathematics (STEM): Achieving world class skills for London. Prepared for The London Skills Commission. London: London Development Agency and the Learning and Skills Council (LSC).

Murray, I. and Reiss, M. (2005). 'The student review of the science curriculum', *School Science Review*, **87**, 318, 83–92.

Roberts, G. (2002). *SET for success: The supply of people with science, technology, engineering and mathematics skills* [online]. Available: http://www.hm-treasury.gov.uk/media/F/8/robertsreview_introch1.pdf

Semta. (2010) *Skills and the future of UK science, engineering and manufacturing technologies: The 2010 realities, expected developments and key priorities.* [online]. Available: http://www.semta.org.uk/pdf/Semta%20UKSector%20Skills%20Assessment%20FebPublish%202010.pdf

Stagg, P., Laird, R. and Taylor, P. (2003). *Widening Participation in the Physical Sciences: an investigation into factors Influencing the Uptake of Physics and Chemistry. Final report.* Warwick: The University of Warwick, Centre for Education and Industry.

UK Commission for Employment and Skills (UKCES). *Skills for jobs: today and tomorrow: The National Strategic Skills Audit for England 2010, Volume 1 Key Findings.* [online] Available: http://www.ukces.org.uk/upload/pdf/NSSA_Volume%201_FINAL_BOOKMARKED_110310.pdf

Ref: DFE-RR147

ISBN: 978-1-84775-984-9

July 2011