

STEM Subject Choice and Careers Lessons Learned (Part 2)



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Executive summary

The new case studies highlight the elements of careers content that can provide a significant improvement in widening careers awareness of young people to the possibilities of STEM subjects and careers. Through creative approaches and with informed content, teachers, enrichment providers and external partners can play a key part in raising STEM careers engagement and awareness.

Careers awareness does not happen without specific and informed interventions – STEM careers awareness will not be achieved incidentally. The disconnection between STEM subjects and young people considering their career options remains an obstacle on a number of levels - young people need the interest, they need to feel capable and have an identity that aligns with STEM - and many young people need help to achieve all three.

The project has created a wide range of resources that can be drawn on to grow STEM careers awareness and interest in schools. Always more than resources, the positive outcomes of the project have been built on principles that we believe should be followed by all who take the work forward.

- **Collaboration** – the project has brought the STEM community together with the education and careers community to ensure that there is understanding, acknowledgement, valuable contributions and support from all stakeholders.
- **Equality and diversity** – the project has placed equality and diversity high on the agenda of the project and we have had made good progress. However we recognise that much more remains to be achieved. Dismantling the barriers faced by many young people in entering and progressing in STEM careers has to be an essential part of any actions in the future.
- **Careers education, information, advice and guidance (EIAG)** – the importance of good careers EIAG in improving the attitudes and awareness of young people to STEM has been clearly established as part of the project. The involvement of qualified careers professionals in making a difference to young people's life chances must not be under-estimated. Provision of information sources online will not, on its own, address the shortfall of young people choosing STEM careers.
- **Placing young people at the heart of the strategy** – our starting point and our end point for this work has been to focus on the experience all young people have of STEM education and CEIAG, rather than materials, structures and resources.



¹ formerly the Department of Children, Schools and Families

² Qualifications and Curriculum Development Agency

Introduction

The new secondary curriculum

The STEM subject choice and careers project (2008–2011) has taken place during a period of large-scale curriculum changes in the English education system. The impacts of these changes on the project were generally positive and enabling.

A new secondary curriculum published by the QCDA in 2007 encouraged schools to be more innovative in their curriculum and timetable design at Key Stage 3. The increased possibilities for delivering subject knowledge and skills through thematic learning events and activities encouraged greater collaboration between STEM disciplines. In addition, QCDA identified seven cross-curriculum dimensions (including technology and the media, the global dimension and sustainable development) which provided a further spur for integrated and holistic curriculum development.

By focusing on the importance of designing and planning 'compelling learning experiences' for students, QCDA also encouraged schools to provide more inspiring activities and events. The long tradition in the STEM community of developing imaginative and enriching activities for students meant that schools had access to a wide range of very good resources.

Another welcome feature of the revised secondary curriculum was the creation of two non-statutory programmes of study for personal, social, health and economic education (PSHEe) – one centring on learners' personal wellbeing and the other on their economic wellbeing. Significant elements of careers-related learning were included in the economic wellbeing programme of study. For the first time, science, technology and maths teachers could map their careers learning objectives in exactly the same way as they mapped their subject learning ones when designing collaborative activities. The project has produced a pack on STEM and economic wellbeing to help them.



14–19 reforms and IAG

The project also benefited from the 14–19 reforms which increased choices and opportunities in academic and general learning, applied learning and apprenticeship-based learning. These reforms made post-16 options more complex. Students, for example, might have to decide between single, double or triple science. They might have to decide whether or not to apply to do one of the new diplomas in work-related subjects or apply for an apprenticeship. In particular, consortia of schools were obliged to improve information, advice and guidance (IAG) for year nine students to enable them to choose their options wisely. This undoubtedly made schools more responsive to the STEM project's initiatives on strengthening labour market understanding, and equality and diversity in subject choice.

The implementation gap

Research carried out as part of the timeline project as well as from case studies in the test-bed schools has provided evidence of how far schools had got in implementing these changes. The findings illustrate the inertia in schools that inevitably slows the response to policy shifts.

Other factors outside the control of the project were also probably not conducive to the rapid take-up of these changes. The continuing emphasis on school accountability through performance and attainment tables undoubtedly discouraged some schools from curriculum risk-taking. Similarly, the continuing focus of the Connexions service on students at risk of becoming NEET (not in education, employment or training) meant that personal advisers were discouraged from supporting STEM careers-related curriculum initiatives in school. For example, in the way that careers advisers in the late 1980s and early 1990s had been change agents for the Technical and Vocational Education Initiative Extension (TVEIe).

Insights into STEM and careers-related learning

Nevertheless, the progress made in the project has shed new light on the mutual benefits of collaboration between STEM and careers professionals and the features of effective practice in careers-inspired learning.

Applying insights from careers theory, the project has helped STEM practitioners to realise that enjoyment of STEM subjects is a necessary but insufficient condition to ensure students persist in their STEM learning and choices. Capacity and identity are even more important. Students have to believe they are good enough to do the subject and, unfortunately, the STEM subjects are stereotyped in such a way that students feel discouraged from taking them if they don't think they are clever enough. A mental shift from being 'good' to being 'good enough' is needed so that more students are confident enough to choose STEM or STEM-related careers. Students also have to see themselves in a STEM role, for example, as a maths student or an engineer. This issue of 'who I am' and 'who I could possibly become' is central to encouraging more students to continue their STEM learning.

Policy legacy

Sustaining the benefits of the STEM subject choice and careers project has become a key focus of the project partners and stakeholders and part of the rationale for the two-part Lessons Learned publications.

Towards the end of the project, the policy plates shifted seismically with the global banking crisis and the coming to power of the coalition government. The new government signalled a return to a more traditional knowledge-based curriculum but with less prescription on schools. The statutory duty to provide impartial careers education introduced by the previous government (October 2010) remained but the new government have signalled its intention to remove the duty to provide careers education from the core curriculum and replace it with a statutory duty on schools to secure independent and impartial careers guidance.

The decision was made to replace the Connexions service with an all-age careers service by April 2012. Schools were to be free to secure the level of careers guidance they needed for their students either from the careers service or from a commercial provider who met a national standard. The government continued to support the previous government's initiative to unify and strengthen the careers profession. There was also considerable interest in deciding how best to ensure that careers advisers knew enough about STEM opportunities to help students while still remaining impartial.

During the transition to the new arrangements and beyond, regardless of whatever emerges from these shifts in policy direction, we hope that the learning from this project can inform and support any future STEM subject choice and careers interventions targeted at young people.

STEM careers in practice

The following short case studies continue from the first set and are used to illustrate different aspects of the eight key areas of school practice identified within our developmental framework. They also show how positive change can be achieved in schools now and in the future.

Case study seven – embedding STEM careers in science

Aims

- teaching and learning to create greater pupil engagement and to promote STEM careers awareness, including cross-departmental work
- teacher awareness of the application of STEM in the workplace and careers pathways

The issue

While the number and range of STEM careers resources has grown, teachers need and want to be able to adapt and change off-the-shelf resources to suit the individual needs of their pupils and class groups, but also to adapt ideas to make them their own.

Starting points

Kelly Simmons was one of the STEM careers lead practitioners (a partnership with SSAT) and she works at Bay House School in Gosport, Hampshire. The school is large with around 2,700 students aged 11–18, and has a wide catchment area with students from a wide range of backgrounds.

Kelly teaches chemistry (now chemistry lead coordinator) and she wanted to widen the interest in STEM careers. As she explained, the school had a great range of different STEM enrichment activities, but she found the same group of students turned up each time. She wanted to reach the students who were not interested in STEM subjects and activities. As she said, 'We need to be doing it in the classroom.'

What they did (activity)

Kelly drew on Future Morph and Science Upd8 activities for her teaching of years seven, eight and nine. She utilised the sessions after exams in order to be creative and add some fun to lessons. She also displayed a number of STEM careers posters around and outside her laboratory and sometimes invited in STEM ambassadors.

Her approach emphasised the practical element within the activities. She explained that that was the most enjoyed element for the students, particularly those who weren't that interested in STEM subjects. So the lesson might start with the video case study (Future Morph) followed by a discussion about the related careers followed by the practical exercise. She would also refer to the posters during lessons and signpost students to go and read them afterwards. She found that this approach also worked with her A level teaching. She described a lesson on manufacturing polymers where she was able to point to the chemist on the poster.

Kelly has also visited other schools to promote the STEM careers resources where they have also been well received, but she also explains that the time she has received to develop the work has been really valuable. Without the funding, the time is just not available to develop new ways of doing things.

Impact

The lessons were a success with the target groups of students and many are now being written into the curriculum. Kelly also explained how she had benefited from the careers work – with her own careers awareness being raised.

'Every time I do an Upd8 or Future Morph lesson I learn more about STEM careers and what that has done is open my eyes...I only have to look at a text book now and I can think about different roles in the industry - and I then find resources to match.'

Challenges

Kelly is planning to take the work forward with more teachers within her school, but without the funding to provide additional time she is concerned about teachers finding the time.

A number of activities require good IT provision for downloading activities and videos. This is challenging for schools without good provision and additional time for the teacher to prepare beforehand.

While the Connexions office within the school had access to the STEM careers resources and advertised Future Morph on their website, Kelly had not managed to work with them in partnership.

Messages for other schools

- placing STEM subjects in context ie with a careers element, can help to widen the interest in STEM subjects
- teachers need time to develop, adapt and share resources and styles of delivery for different student groups, but once they are aware they quickly take the skills and knowledge forward
- classroom displays can provide an excellent source of careers information for students if it is utilised by the teacher



Case study eight – adding careers to enrichment events and fairs

Aims

- use of enhancement and enrichment activities to promote greater engagement with STEM, and promotion of awareness of STEM careers
- establishment and utilisation of external partnerships to promote STEM subject choices and careers

There is a wealth of resource available to support schools running STEM enhancement and enrichment activities, with a comprehensive list contained in the STEM online directories. Enrichment events and fairs strengthen young people's enjoyment, engagement and identification with science and maths, and celebrate achievement. With the appropriate connections, the events can also build young people's personal commitment and confidence to explore and follow related future study and careers. This potential can be even more powerful if there is a progressive and inclusive programme in place for students.

The issues

Students need support and encouragement to reflect on the implications of their learning for their career choice. It will not necessarily happen automatically. By building in this support, alongside opportunities for career related discussion with mentors and signposting for further advice and information, it is possible to tap an event's full potential for raising aspirations and broadening horizons. Students inevitably have quite a narrow grasp of the range of career possibilities, usually based on their own family background and experiences. The rapid rate of development in science and technology makes this an even greater challenge.

Starting points

First launched in 2009, the Big Bang: Young Scientists and Engineers Fair is the UK's biggest celebration of science and engineering for young people.³

Key aims of the Big Bang are to celebrate and raise the profile of young people's achievement in science and engineering, and to encourage more young people to take parting STEM initiatives, with support from their parents and teachers.

What they did

One successful example of embedding career learning is the work undertaken in successive years at the Big Bang by EngineeringUK and the Science Council. With the support of specialist careers expertise from Babcock and Inspiring Futures, the 2010 event included careers activities and a careers information hub for follow-up advice. A Careers Quest was provided as a fun way for young visitors to explore career opportunities in science and maths by seeking out answers about motivations, entry requirements, prospects, job satisfaction and working conditions from the exhibitors. It provided a structure to help them think about their own career plans and ideas in more detail, and encouraged them to seek further advice and to make a careers action plan. For 2011, the Science Council has commissioned Babcock to create a general version of the Future Morph Careers Quest plus an adapted version for primary age visitors and for post-16 students.

³ http://www.thebigbangfair.co.uk/about_us.cfm

Impact

The evaluation of the Big Bang demonstrates a clear difference in careers awareness between those who have taken part in the Careers Quest, and those who attended the event without participating in the Quest.

Comments from young people

'They help you a lot in any job you choose to do.'

female, age 14

'They are interesting really good skills to know for later life as most jobs have some relation to these subjects.'

male, age 15

'They open doors to a wide range of careers and further education.'

female, age 13

'They give us opportunities to have interesting careers and lives!'

female, age 9

'They open doors to new opportunities.'

male, age 13

'Because the jobs here seem to do a variety of (the) things in one job. And it's interesting when you learn new things.'

female, age 12

The responses also show that the young people were clearly impressed by the importance of science and its role in the future of our world and a number of others referenced the other key messages, for example

'You can be anything you want with those skills and believing in yourself.'

female, age 13

'They help you a lot in any job you choose to do.'

female, age 14

'You get to use your creativity.'

male, age 10

'They lead you to good jobs and you could get a lot of money'

female, age 12

'You get lots of money and help people.'

female, age 12



Challenges

The messages and activities within events like the Big Bang need to be creatively designed to engage and inform young people and/or their families. Links between enrichment and enhancement organisers and career experts needs to be forged so that both parties see the benefits.

Messages for others

Key to this approach is the partnership between career experts and enrichment and enhancement organisers, and the development of a clear set of messages that the event or activity is seeking to communicate about STEM careers and courses.

The key STEM messages that should be promoted by the Quest are

1. A broad range of jobs are available within STEM and
 - there are different qualification routes and opportunities for variety of abilities
 - there are opportunities for girls – combat stereotypes
 - there are opportunities for creativity and design
2. Locations for work vary – it's often not a desk job
3. Good salaries are available
4. STEM professionals are rounded individuals
5. Jobs often involve working in teams
6. STEM skills and knowledge are very often valuable for non-STEM roles

Following this year's events, the bank of quest questions will be available from the Science Council for organisers of other events to adapt and use, along with some guidance notes.

Case study nine – continuing professional development (CPD) for teachers and careers advisers

Aims

- teacher awareness of the application of STEM in the workplace and careers pathways
- communication about STEM careers and the use of personal advisers

Through the project there have been a variety of different approaches to supporting the CPD of teachers and careers advisers in relation to STEM careers awareness. Delivering CPD within wider STEM events has been a successful way of reaching a wide audience.

The issue

The challenge of delivering CPD to teachers and careers professionals working in schools is well recognised. The STEM careers project adopted a multi method approach to widen the access to STEM careers messages in order to maximise dissemination. Some of the most popular events for teachers and careers professionals were those where the STEM careers content was delivered in partnership with other organisations and in conjunction with major employers.

Starting points

Regional STEM partnerships hosted conferences and CPD events and were keen to include workshops and presentations about the STEM careers project. In other cases the project itself stimulated and supported regional events through providing some pump priming funding, consultancy on programmes and approaches and resources and materials. Efforts were made to ensure that Kate Bellingham, as National STEM Careers Coordinator, presented to at least one event in each region. Kate's enthusiastic and inspiring style was highly valued, and she also produced a short video clip that could be used at events where she could not be present.

What we did

There was a range of particularly notable events which depended on collaborative leadership at a local level and effective partnership with a range of key players for their success. The organisers often involved the Connexions/ careers consultancy team working with the local authority STEM adviser, the STEM partnership, Aimhigher and key local employers. The flagship examples include the West Midlands STEM careers conference on 26 May 2010 at QinetiQ's Malvern Technology Centre in Worcestershire, two events in Suffolk hosted by BT at the research park in Martlesham Heath, an event at the University of Sussex, and a space-focused workshop at the Farnborough Air Show, run with the UK Space Agency.



These events included plenary sessions, workshops and resources on promoting STEM subjects and careers to young people. They were the main way for distributing the STEM Choices pack. Workshops for teachers and advisers included

- how to integrate careers work into STEM lessons
- making effective use of and accessing widely available resources such as the Futuremorph website
- meeting STEM ambassadors from industry
- talking to engineers and scientists working on cutting edge developments in sectors as diverse as space, games design, the NHS and telecommunications

Sample Programme – Space Careers, Farnborough Airshow (adapted from 2010)

11am – welcome and introduction

Kate Bellingham, National STEM Careers Coordinator

11.15am – STEM and space in the UK

Employers and significant stakeholders describe the industry

11.45am – space careers – resources to engage young people

Claire Nix, STEM careers project

12.15pm – case studies

Panel of STEM ambassadors working in space industries

1pm – networking Lunch

Impact

The breadth and range of careers professionals and teachers who attended reached the targets we had set ourselves during the life of the project, but the audiences we reached were well beyond teachers and careers professionals. These wider STEM ‘communicators’ are some of our best ambassadors. In addition, the demand for STEM careers content has grown over time with many organisations now requesting repeat sessions as well as an increase in new requests to attend events across the UK.



Challenges

As the transition to new education and careers policy starts, the positive messages created about STEM subjects and careers should not be lost. The need for STEM careers events will continue. It is to be hoped that our STEM communicators will continue to disseminate key STEM careers messages as well as promoting the resources.

In order to support the continuity of CPD in STEM careers, the project team is developing an online STEM careers module alongside a STEM labour market information (LMI) online module. The project team are working with a range of partners to take this forward.

Messages to others

- a variety of CPD methods need to be used to reach teachers and careers professionals. The project has delivered formal face-to-face CPD, but has also increasingly developed alternative delivery models.
- careers professionals and teachers are generally enthusiastic about learning more about STEM roles in industry from those who work in them. (Visit STEMNET to find out about STEM ambassadors www.stemnet.org.uk)



Case study ten – raising awareness of engineering and engineering careers through the teaching of science and mathematics

Aims

- raise awareness of engineering and engineering careers through the use of engineering contexts in the teaching and learning of mathematics and science
- integrate careers strategies into the teaching and learning of mathematics and science

The issue

Engineering is not part of the curriculum in many schools. As such, science and mathematics teachers may introduce students to engineering through engineering contexts and teaching and learning experiences which both enable the students to develop their knowledge and understanding of science or mathematics, and develop awareness that

- science and mathematics are used in engineering
- science and mathematics are really important to study if you want to be an engineer
- engineering-based jobs are really exciting, satisfying and rewarding
- engineers make a significant contribution to society
- engineers use the skills they are developing (scientific skills, mathematical skills and personal capabilities)
- engineers work in multidisciplinary teams
- there are many different engineering careers, and various subjects and qualifications needed to do those jobs

Starting points

CTC Kingshurst Academy is one of the six STEM careers project test bed schools. Kingshurst Academy was the first CTC to be established. It continues to be a highly innovative college, with an emphasis on active learning, problem solving, the development of interactive group work, the use of ICT across all subjects, and increasing links between different subjects. The STEM careers project test bed work was coordinated by Richard Parkes, head of science.



What they did

Richard worked with maths teacher Eva Cowlshaw and science teacher Amy Lucas on a series of three coordinated lessons to introduce year nine students to engineering careers using the context of structural engineering in theme park rides.

The activities they used were adapted from the Engineering Everywhere project theme 'Engineering Thrills', the Cre8ate Maths project 'Rigid Structures' activities (for further information about the two projects and their resources please refer to the links below) and a theme park structural engineer job application and interview classroom simulation activity.

The three lessons were filmed for a Teachers TV programme, 'STEM subject choices and careers: Engineering', which can be viewed on the Teachers TV website. The curriculum materials and guidance notes for the lessons are available with the video for download. The programme is one of eight programmes in a series entitled 'STEM subject choice and careers' available on the Teachers TV website.

Activity

Eva used the Engineering Thrills video as a starter for the first lesson. This set the context for the series of three lessons. The video introduces the Pepsi Max ride at Blackpool and the engineers involved in designing and building the ride.

During Eva's mathematics lesson the students investigated rigid structures and bracing in two dimensions using geostrips. Their relevance in structural engineering was emphasised during the debriefing of the student presentations and feedback. The activities involved the use of mathematical vocabulary, particularly that associated with polygons and the properties of quadrilaterals and triangles. Pupils discovered that many rigid structures are made up of triangles.

Amy introduced her science lesson by showing the students a video of an ejector seat ride at a theme park. The students carried out a scientific enquiry to investigate the forces and speeds involved in the ride by using a model ejector seat constructed from a hollow ball, small pieces of dowel, elastic, metre rules, retort stands and light gates. They investigated the effects of starting elastic stretch on the speed and maximum height before free fall of the ejector seat. Using the outcomes of their investigations, the students made recommendations with regard the design of an ejector seat ride.

Eva and Amy taught the third lesson together in which, as a follow-up careers activity, they ran the job interview simulation (the activity sheets are available with the STEM subject choice and careers: Engineering video on the Teachers TV website). They divided the class into two groups and gave each member of one group the interviewee materials, including a guidance sheet and application form. They gave each member of the other group the interview panel guidance sheet and recording grid.

In groups of three or four the interview panels prepared their questions and decided who would chair the panel and who would ask each of the questions they finally selected. The interviewees/applicants prepared their applications and prepared for their interview by thinking of the questions they could be asked and preparing their answers. They did this in a separate room. The preparation took 25 minutes.

The interviews were carried out in front of the whole class by selecting one panel and three interviewees (you could alternatively run it in small groups by linking three interviewees with each panel). Eva and Amy debriefed the simulation by asking the chair of the panel to report who they selected and why, and then by asking the students what they had learned during the three lessons.

Impact

'The context and the contextual nature of the lesson really brought it to life for the students, so it gave them an opportunity to use their maths in a slightly different way and in a practical way as well. It is nice to use materials and get them making something rather than just doing it in their exercise books. Initially they think that maths is something they need to do to finish school and get a job, but from this lesson, particularly, they could see the applications, the types of engineering they could do, and the maths they use.'

Eva Cowlshaw, mathematics teacher

'Lots of kids enjoy roller coasters and they don't think of it as a job. I think it would be an interesting job.'

Year nine student

'By teaching the science through the engineering context, the students learned that science is used in lots of careers choices that they could make in the future.'

Amy Lucas, science teacher

'I thought an engineer was an engineer. I found out today that there are lots of different engineering careers and they work in teams to make it work'

Year nine student

Challenges

The resources and the practical activities were new to Eva and Amy. They needed time to plan and trial the practical activities, and in particular make sure the ejector seat model worked with the light gates for the scientific enquiry. The lessons could have been taught in isolation, but Eva and Amy wanted the students to be able to appreciate the links between mathematics and science and their application and importance in engineering.

Messages for other schools

The teachers found the use of the engineering context extremely beneficial in bringing the subject to life and making the students more aware of careers in engineering, the way engineers work, and the applications and importance of science and mathematics in engineering. The curriculum materials they used and other context-based materials can be obtained free from the following websites.

cre8ate maths

www.cre8atemaths.org.uk

cre8ate maths is an exciting new maths project which takes as its starting point the key employment sectors of Yorkshire and Humberside. The maths education resources developed for the project use stimulating and motivating contexts that aim to engage and motivate pupils. The key characteristics of all the resources are that they link current mathematical thinking with real world applications.

Engineering Everywhere

www.engineeringeverywhere.org.uk

The aim of the Engineering Everywhere project is to introduce students to engineering through the teaching and learning of science. The resources developed for students aged 14–16 include eight engineering themes. Each theme is introduced through two short videos. Four link activities consolidate the learning in a short, fun way and there are also three new innovative practical activities for each theme. The complete resource is in the form of a DVD can be obtained free by completing the electronic application form on the website.

The series of eight STEM subject choice and careers videos can be viewed and downloaded from the Teachers TV website at www.teachers.tv

Case study eleven – outside partnerships and events

Aims

- development of pupil personal skills and capabilities
- effective practice in equality and diversity
- development of pupil personal skills and capabilities

The issue

There is a continuing need for creative and inspiring experiences in STEM outside school. One such inspiring experience could be within work experience. Work experience can be used to challenge stereotypes, develop personal skills and provide valuable career learning to any student, whatever their final career choice. The project has been able to showcase a number of examples of good quality and well structured experiences provided by a range of organisations.

Starting points

The Royal Air Force (RAF) has developed a range of initiatives aimed at encouraging applications from a broader pool of applicants into all trades and professions.

In the STEM arena there are particular programmes which the RAF has engaged in, including work experience residential weeks for girls. They were offered at RAF Cosford in Shropshire and the programme was developed with support from WISE⁴ and the UKRC⁵.

The programme has been adapted for delivery with boys from under-represented backgrounds (in relation to STEM) and with girls who take part in a week focused on logistics activities at RAF Cranwell and RAF Halton respectively.

What they did

The RAF approach has been one where management commitment to the delivery of bespoke programmes for girls into engineering, designed to highlight the fact that more could be done to increase the number of applications for STEM roles. Gender equality training was initially delivered to senior managers at RAF Cranwell, then to instructors at RAF Cosford. The aim was to highlight how activities could be adjusted and involve more hands-on participation in an exciting and engaging way.

Consultants from WISE and the UKRC supported the RAF team in identifying areas of the programme which could be made more participative so that the girls had the opportunity to experience practical activities like removing an aircraft wing and wiring a test board. A workbook was written to tell them what they would be doing each day and help them identify the skills learned and how they might use them in their career planning.

At the end of the week's experience, the families and teachers of the girls were invited to attend a celebration event where the participants presented PowerPoint slides outlining what they had learned. The girls who undertook the engineering and logistics experiences also gained CREST awards and these were presented at the celebration event.

The RAF invested in a range of different interventions to support the programme, such as an alternative style of diary for the learners to record their thoughts throughout the week. The programme was designed to encourage girls to try something new and to step outside of their comfort zone. Training officers at RAF Cosford were all specially briefed and became aware of the importance of using inclusive methods to encourage girls into non-traditional areas.

⁴Women in Science, Engineering and Construction Campaign

⁵UK Resource Centre for Women in SET

Activity

Key features of the RAF programme included

- ensuring that trainers who would come into contact with the girls were aware of the programme and how their input could affect their future career choices
- linking up with nationally recognised organisations like WISE, UKRC, the Girls' Venture Air Corps and Generating Genius for advice and support in delivering the programmes
- providing a bespoke workbook which included career planning materials and information about what the learners would be doing each day, and a diary to record their thoughts about the week
- a celebration event where families and teachers could find out more about what the girls learned during the week
- showcasing the programme throughout the organisation and in broader networks to ensure that clear messages about the RAF's commitment to encouraging a wider range of applications was clear

Impact

The number of young people who have benefited from these programmes is in excess of 80 to date, with more programmes planned for this year at all three RAF bases. The RAF kindly agreed to allow the model and workbooks to be adapted for use at 1710 Squadron in Portsmouth (a combined Royal Navy/Ministry of Defence unit) with three school girls this year. The programme is set to continue.

The model is used as an example of good practice to wider audiences. The RAF project was shortlisted for a National Careers Award (through the Institute of Career Guidance) this year. An article has recently been published in the Centrelink magazine which is read by work experience organisations and schools nationally.

The workbooks are very popular within the RAF and provide a reference point for organising work experience placements in other areas of the organisation.

Challenges

There is no national programme of work experience in the RAF. Each base has its own arrangements and agreements with local schools and colleges.

The role of work experience coordinator is often undertaken by someone who may only do it once, therefore it is often driven by a small team of specialists based as RAF Cranwell who are committed to making it happen. The DRIT⁶ team has done an incredible job of convincing senior managers of the benefits of offering targeted work experience taster weeks, but the challenge is one of sustainability, particularly in an era of defence cuts.

Messages for others

The approach the DRIT team has taken within the RAF is logical and sequential. Having written a policy which indicated that more females were needed in science, technology, engineering and maths professions and trades, the team won the support of senior managers and ensured that those delivering the training were aware of the benefits for the organisation too.

Bespoke materials were developed for the learners and a specific programme of hands-on activities put in place to help them explore STEM-related roles. The workbook has career planning exercises and encourages reflection on learning. This may be increasingly important as schools are responsible for the provision of careers education delivery and this may not be consistent.

The RAF ensures that all the young people that take part in these particular schemes have some tools and resources to take away for the future. Other organisations can learn from and adapt the policies and practice.

⁶ Directorate of Recruitment and Initial Training

Next Steps: STEM Careers Awareness 2012

The DfE announcement in March 2011 that Ministers did not intend to renew or extend the STEM careers awareness programme was not entirely unexpected. However, what it highlighted for the partners involved in delivering the programme for the last three years was the imperative of securing the policy legacy so that the significant investment of public funds will not have been wasted.

With this in mind, we have identified seven key legacy elements for schools that if followed will continue to strengthen the effectiveness of STEM careers awareness in 2012 and beyond.

1. The quality of leadership and management

Governors, headteachers and senior leadership teams have a key role in formulating policy and strategy for STEM careers awareness and creating a culture in which STEM career-related learning and guidance can thrive. Our developmental model (see p6-11 of Lessons Learned;Part 1) provides a framework for progressive change and innovation. In keeping with the spirit of current educational reforms, organisational self-reliance and freedom is built into the model.

2. Effective curriculum leadership and management

An explicit and intentional curriculum design for STEM career-related learning will help to secure effective outcomes. Embedding career development activities in STEM subject teaching is demanding. It involves co-ordinating inputs across a range of subjects and courses to ensure breadth and balance, coherence and progression. Our experience with the test-bed schools is that it takes time and practice.

3. Inspired teaching

Learners respond well to teaching that is fun, challenging and out of the ordinary. The STEM careers awareness programmes on the Teachers TV website and the curriculum materials for science, maths and design and technology illustrate approaches that go way beyond routine theoretical lessons in science or pointless CV writing in careers!

4. Impartial IAG

Impartial information, advice and guidance gives learners the best possible chance of getting on a progression pathway that is right for them rather than one which suits the interests of a department or the school. Schools that developed a model of first-in-line helpers (e.g. STEM subject teachers trained in person-centred, one-to-one support and referral) backed up by internal and external STEM careers specialists were the most successful in improving their STEM curriculum offer and take-up.

5. Making effective use of resources

Teachers and schools, once they know about stimulating resources and can see how careers and context can be a useful part of STEM lessons, want to adapt them to make them their own and utilise them to suit their needs. The schools we have worked with have taken the resources and ideas we have initiated to heart and developed them to fit their need. These positive results have illustrated success in engagement of a wider audience to STEM subjects, but unless real support is there for schools and teachers to develop practice, it is unlikely to flourish away from the enthusiasts.

6. Sustained partnerships

We acknowledge that one off enrichment events or individual one-off career interviews can have an impact on individual young people and their career choice. However, the evidence suggests that it is the long term partnerships developed and sustained over time between schools, careers service and other external organisations that provide the real added value to the widest audience and widen access to STEM subjects and careers. Schools need the resources and motivation to build these partnerships.

7. Commitment to equality and diversity

By integrating equality and diversity into all project outputs, we developed a holistic approach to increase the likelihood that all young people will positively consider STEM careers and qualifications. Unless STEM becomes open to a wider audience, participation will continue to be limited to a minority. The full breadth of equality and diversity resources are illustrated⁷ within our online toolkit, which signposts schools to practical ways of creating change. This resource needs to grow with support from partner organisations.

⁷ www.stem-e-and-d-toolkit.co.uk

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Test bed Schools

Collingwood College, Surrey

Thomas Deacon Academy, Peterborough

CTC Kingshurst Academy, Birmingham

Pleckgate High School, Blackburn

Ecclesfield School, Sheffield

Comberton College, Cambridge

SSAT STEM Careers Lead Practitioner schools

Helsby High School, Cheshire

Wilmington Grammar School for Girls, Kent

Thomas Hepburn Community College, Gateshead

Francis Bacon Maths and Computing College, St Albans

Bay House School, Gosport

The Long Eaton School, Nottingham

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