

STEM and Economic Wellbeing (EWB)

Planning tools and resources for key stage 3

Science

Technology

Engineering

Maths

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This resource arises from the STEM Choice and Careers project undertaken by the Centre for Science Education at Sheffield Hallam University and Babcock, on behalf of the Department for Education (DfE).

1

Introduction

1.1 STEM subject choice and careers programme

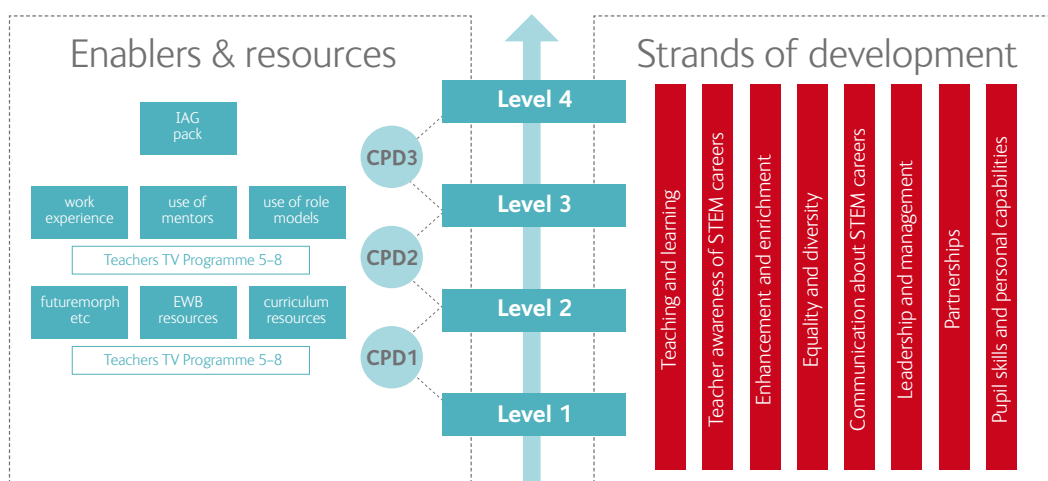
The STEM subject choice and careers action programme 8 (AP8) is one of eleven programmes of the national STEM programme (2008–2011). The aim of AP8 is to increase interest in and take-up of STEM study and careers.

The four key strands of the programme are:

- a communications campaign to engage young people, their parents, the workforce and relevant stakeholders to improve the take-up of science and maths subjects post-16.
- the Futuremorph website for young people aged 11–19 to help engage them in studying science and maths by demonstrating the huge range of career opportunities available by pursuing these subjects.
- careers awareness resources for schools, teachers and careers education and IAG professionals to complement the public facing elements.
- a Careers Awareness Timeline Pilot designed to establish a more coherent structure for young people to learn about careers relating to science and maths.

This pack on STEM and economic wellbeing (EWB) is part of the AP8 strategy to provide teaching support and resources to enable schools to take the next step wherever they are currently on the spectrum of little or no attention given to STEM careers and subject choice through to a whole school approach drawing effectively on external partnerships (see Box 1.1).

Box 1.1 STEM subject choice and careers AP8 strategy



The model describes four levels of school engagement with STEM careers. Eight strands have been identified in the development process from level 1 to level 4. An audit tool based on the strands of development can be used by schools to review their own progress (see Box 3.2). The model also shows how the resources developed by AP8 and the activities to support key stakeholders in the delivery of CPD will help schools progress through the levels.

1.2 The importance of STEM and EWB

The economic wellbeing (EWB) of individuals, families and communities is vital for a prosperous, healthy and fair economy and society. Science, technology, engineering and maths (STEM) make a huge contribution to economic wellbeing.

The relationship between STEM and EWB starts in school. STEM learning provides young people with the knowledge and skills essential for everyday life. It also delivers the underlying knowledge and skills needed in most jobs; and for those who seek it, it opens the doors to specialist science, technology, engineering and maths-related careers. STEM careers provide wide-ranging opportunities for young people to achieve personal economic wellbeing and to contribute to the wellbeing of others. Increasing the supply of highly-skilled and well-qualified young people in the STEM sectors has been identified as a national priority.

The role of EWB in strengthening STEM-related learning and attainment is to:

- strengthen young people's enjoyment, engagement and identification with STEM activity
- demonstrate the relevance of learning STEM subjects and skills by providing authentic ('real world') and topical contexts for learning
- improve access to STEM opportunities for young people by challenging stereotypes and promoting fairness, inclusion and diversity
- enable young people to explore STEM-related opportunities, make choices and decisions that are right for them and cope with transitions
- contribute to the personalisation of young people's STEM learning.

Developing STEM-EWB activities can be fun and rewarding for both learners and staff; but it is also challenging. Whose responsibility is it to lead and manage STEM-EWB activities? How do staff juggle competing priorities to plan and deliver an effective STEM-EWB programme? What organisational arrangements will work best? These activities involve bringing together two structurally complex dimensions of the curriculum. STEM, for example, brings together science, design and technology and mathematics with engineering which is not a subject at key stage 3 but may be part of the Diploma curriculum offer at key stage 4. Economic wellbeing is a non-statutory programme of study introduced in 2008. It combines careers education, enterprise education, work-related learning and financial capability and is linked with personal wellbeing in PSHE education.

This pack aims to help schools get to grips with designing and delivering effective STEM-EWB activities by building on the many examples of existing good practice.

1.3 What's in this online pack?

This pack is in three main parts:

- 'Economic wellbeing' provides an overview of economic wellbeing (EWB) and its connection with STEM subjects and careers
- 'Developing STEM and EWB' provides practical guidance and tools to support curriculum leadership and development of integrated STEM and EWB provision especially at key stage 3
- The annexes signpost ideas, materials and schemes to support teaching and learning in STEM and EWB.

1.4 How and why this pack was developed

This pack has been developed as part of the STEM Subject Choice and Careers Action Programme 8 undertaken by the Centre for Science Education at Sheffield Hallam University and Babcock, on behalf of the Department for Education.

Skills shortages in the Science, Technology, Engineering, Maths and Built Environment sectors are well documented. The three year STEM Careers Action programme is one of eleven that make up the National STEM Programme. For more information, go to www.nationalstemcentre.org.uk

Action Programme 8 is charged with improving the quality of advice and guidance about STEM careers to inform subject choice. The project is part of a substantial national investment to improve public perceptions of STEM and to increase the numbers of students choosing STEM subjects, courses and careers. The key message is that a decision to study STEM subjects can lead to a very wide range of interesting and well-paid careers, inside and outside the STEM arena.



The National STEM Careers Coordinator, Kate Bellingham, is leading and co-ordinating the programme, working with stakeholders and other delivery organisations. Kate is a science and technology broadcaster, as well as being a qualified engineer, a maths teacher and a patron of Women into Science, Engineering and Construction (WISE).

The Centre for Science Education and Babcock are developing a wide range of curriculum resources, careers workforce resources and continuing professional development activities over the life of the project under the theme of 'enthusing students, equipping professionals, supporting employers'.

The other strands of the national STEM programme (2008-11) are:

- Careers Awareness Timeline Project, led by the Centre for Education and Industry, University of Warwick¹
- www.futuremorph.org – the Science Council-led STEM careers website aimed at young people, parents, teachers and advisers

For more information about this action programme:

- visit the Centre for Science Education website at <http://www.shu.ac.uk/research/cse/stem-careers.html>
- email stemcareers@shu.ac.uk to get in touch with the National STEM Careers Coordinator
- email info@careersinstem.co.uk or phone 0114 2254870 to receive news about curriculum resources and direct access for downloadable resources as they become available
- register/log on to the STEM Digital Storecupboard to access published resources at <http://www.digitalstorecupboard.tintisha-web.co.uk/home>
- go to the National STEM Centre for the full STEM careers collection of resources – www.nationalstemcentre.org.uk

The aims of the STEM and EWB pack are to:

- inspire schools to develop coherent and integrated approaches to STEM and EWB teaching and learning
- promote the relevance of STEM skills, subject choice and careers for the economic wellbeing of all students, especially for under-represented groups in STEM occupations
- to broaden the horizons of students and staff about the wide range of opportunities opened up by gaining STEM subjects and skills
- to promote innovatory practice in STEM and EWB, e.g. using people's stories to humanise and contextualise STEM learning and careers
- to make connections between the economic wellbeing issues that young people face and the solutions STEM can provide.

1. Two major reports have been published so far: Lengthening Ladders, Shortening Snakes– Embedding STEM Careers Awareness in Secondary Schools (October, 2009) http://www2.warwick.ac.uk/fac/soc/cei/stemcareers/approvedpdfsnakes_laddersreport_v6_lr1.pdf; and *STEM Careers Awareness Timelines: Attitudes and ambitions towards science, technology, engineering and maths (STEM at Key Stage 3)* by Jo Hutchinson, Peter Stagg and Kieran Bentley http://www.derby.ac.uk/files/icegs_stem_careers_awareness_timelines.pdf

1.5 Who this pack is for and getting started

The pack is for STEM and EWB curriculum leaders, teachers and support staff working together to meet the needs of their learners.

It will also be useful for STEM and EWB advisers, consultants and trainers in local authorities, Connexions services, education–business partnerships and STEM organisations working with schools.

You may wish to start by:

- familiarising yourself with the ideas in the pack
- exploring the scope for using some of the activities and resources with the groups that you teach.

STEM curriculum leaders could go on to:

- run a CPD session for your team(s) to raise awareness of the benefits of developing STEM and EWB activities; and invite EWB staff and key partners to take part (e.g. link Governor, careers coordinator, the Connexions personal adviser)
- implement an audit or SWOT analysis to take stock of what you are already doing and what you could do next
- talk to young people about what their needs are and feed this into curriculum planning
- include a target for embedding EWB in STEM teaching and learning in your future STEM development plan(s).

Curriculum leaders for EWB could:

- offer to help STEM curriculum leaders run 'STEM and EWB' sessions for their teams
- plan how students are going to receive a coherent programme of support for their EWB taking into account the multiple delivery channels
- plan how to enhance information, advice and guidance (IAG) related to young people's STEM choices
- include a target for embedding STEM in EWB teaching and learning in your next EWB development plan.

Advisers/curriculum development staff could:

- offer to help schools deliver STEM and EWB sessions
- provide feedback on young people's perception of STEM courses and careers.

2

Economic wellbeing

2.1 What is economic wellbeing?

We can look at economic wellbeing (EWB) in at least three different ways:

- **economic wellbeing as a personal construct**

Economic wellbeing has meaning for individuals in their everyday lives. They are more likely to report feelings of economic wellbeing if they can answer these questions positively:

- Am I getting on alright in my career and at work? i.e.:
 - earning a livelihood
 - managing my money
 - coping well with my job and everything around me
 - having autonomy and control over my career and my work
 - continuing to make progress
- Am I happy in my career and at work? i.e.:
 - feeling good (not stressed or depressed)
 - satisfied and content with my job and my life.

Helping learners to plan and prepare for their future economic wellbeing is one of the important long-term goals of education.

- **economic wellbeing in education policy**

The *Every Child Matters* initiative (2003)² identified economic wellbeing as one of five wellbeing outcomes that children and young people's services should help each individual to achieve. These services should help children and young people to:

- be healthy
- stay safe
- enjoy and achieve
- make a positive contribution
- achieve economic wellbeing.

The *Children's Plan* (2008) identified five aims for economic wellbeing' which will be achieved if young people:

- engage in further education, employment or training on leaving school
- are ready for employment
- live in decent homes and sustainable communities
- have access to transport and material goods
- live in households free from low income.

²For an update on current government policy, please go to <http://www.education.gov.uk>

- **The programme of study for economic wellbeing and financial capability**

Economic wellbeing and financial capability is an integral part of the 2007 revised secondary curriculum. QCA (later QCDA) published two non-statutory programmes of study for Personal, Social, Health and Economic education (PSHEe) at KS3 and KS4: one for 'personal wellbeing' and the other for 'economic wellbeing and financial capability'.

The economic wellbeing and financial capability (EWB) programme of study consists of four interrelated strands:

- careers education (statutory at KS3 and KS4)
- work-related learning (statutory at KS4)
- enterprise education
- personal financial capability.

The KS3 programme of study for EWB can be viewed at http://curriculum.qcda.gov.uk/uploads/QCA-07-3346-pEconoWell3_tcm8-393.pdf

The KS4 programme of study for EWB can be viewed at: http://curriculum.qcda.gov.uk/uploads/QCA-07-3347-pEconoWell4_tcm8-394.pdf

The importance statement in the programme of study explains that the purpose and scope of EWB is to enable young people to make progress, achieve and find fulfilment in their learning, work and career. EWB helps them to understand and explore opportunities open to them; and to develop competencies for happiness and success such as self-efficacy, resilience, enterprise, self-management, and responsible action and contribution. Boxes 2.1–2.4 describe the strands that make up EWB and provide sources of further information about each.



Box 2.1: Careers education**Careers education aims to help young people to:**

- understand themselves and the influences on them (self development)
- investigate opportunities in learning and work (career exploration)
- make and adjust plans to manage change and transition (career management)

Curriculum guidance

DCSF (2009). *Statutory Guidance: Impartial Careers Education*

(The Statutory Guidance includes a 12–point checklist and further information about key issues for headteachers. It explains the six principles of impartial careers education together with their associated outcomes. It also outlines the key information that students need and a summary of how the quality of careers education can impact on Ofsted inspection judgements).

<http://publications.education.gov.uk/DownloadHandler.aspx?ProductId=DCSF-00978-2009&VariantID=Statutory+Guidance%3a+Impartial+Careers+Education+PDF>

DCSF (2010). *Statutory Guidance: Impartial Careers Education Resources Pack*

(The Resources Pack includes a school development diagnostic; an audit tool for careers coordinators; parent and pupil questionnaires; briefings for governors, careers coordinators and staff; a careers education framework 7–19 of learning outcomes [extract included in Annex A of this pack], fact cards on main routes, Ways & Choices lessons on CD–Rom and videos on 14–19 choices for students and parents/carers).

<http://www.cegnet.co.uk>

QCA (2008). *Career, work–related learning and enterprise 11–19*

(This guidance includes the nine–element QCA curriculum framework for economic wellbeing 11–19 which is also included in Annex A of this pack).

<http://orderline.qcda.gov.uk/gempdf/1847218865.PDF>

Useful links**Association for Careers Education and Guidance**

<http://www.aceg.org.uk>

Institute of Career Guidance

<http://www.icg-uk.org/>

Cegnet website

<http://www.cegnet.co.uk>

National STEM Centre

www.nationalstemcentre.org.uk

PSHE Subject Association

<http://www.pshe-association.org.uk/>

STEM Subject Choice and Careers: Action Programme 8

<http://www.digitalstorecupboard.tintisha-web.co.uk/>

Box 2.2 Work-related learning

Work-related learning aims to help young people understand the nature of the world of work, the diversity and function of business, and its contribution to national prosperity. It is defined as:

- learning for work – developing skills for future enterprise and employability
- learning about work – acquiring knowledge and understanding of work and enterprise
- learning through work – by having the chance to learn from direct experience of work.

Curriculum guidance

DCSF (2009). *Work-related Learning Guide* (2nd edition)

<http://publications.education.gov.uk/default.aspx?PageFunction=productdetails&PageMode=publications&ProductId=DCSF-00417-2009>

QCA (2008). *Career, work-related learning and enterprise 11-19*

<http://orderline.qcda.gov.uk/gempdf/1847218865.PDF>

QCA (2005). *Work-related learning at key stage 4: support material for schools*

(Leaflets on science, design and technology, mathematics, guidance for coordinators, audit tools, ensuring quality, maximising learning, working with employers)

<http://www.qcda.gov.uk/resources/publication.aspx?id=0369434f-f1b2-41ad-aba3-4eb73845d004>

A Quick Guide for STEM Work Experience Placements

<http://www.digitalstorecupboard.tintisha-web.co.uk/work-experience-placements-pack>

Useful links

Education and Employers Taskforce

<http://www.educationandemployers.org/>

Institute for Education Business Excellence

<http://www.iebe.org.uk/>

TeachersTV *Role Models and Work Placements*

<http://www.teachers.tv/video/36674>

Box 2.3 Enterprise education

Enterprise education is made up of enterprise capability supported by financial capability and economic and business understanding.

- Enterprise capability is the ability to:
 - handle uncertainty and respond positively to change
 - create and implement new ideas and ways of doing things
 - make reasonable risk/reward assessments and act upon them in one's personal and working life
- Financial capability is the ability to manage your own finances and to become a questioning and informed consumer of financial services
- Economic and business understanding is the ability to understand the business context and make informed choices between alternative uses of scarce resources.

Curriculum guidance

DCSF (2010). *A Guide to Enterprise Education: For enterprise coordinators, teachers and leaders at schools*

http://www.dcsf.gov.uk/14-19/documents/guide_to_Enterprise_Education.pdf

OCA (2008). *Career, work-related learning and enterprise 11-19*

<http://orderline.qcda.gov.uk/gempdf/1847218865.PDF>

Useful links

Enterprise Education Trust/Business Dynamics

<http://www.enterprise-education.org.uk/home.php>

Economics, Business and Enterprise Association (EBEA)

<http://www.ebea.org.uk>

Evaluation of Enterprise Education in England (DfE, 2010)

<http://publications.education.gov.uk/DownloadHandler.aspx?ProductId=DFE-RR015&VariantID=Evaluation+of+Enterprise+Education+in+England+PDF&>

Enterprise Village

<http://www.enterprisevillage.org.uk/>

Get Enterprising: Home of the London 2012 Enterprise programme

<http://getset.london2012.com/en/getenterprising>

Global Entrepreneurship Week

<http://www.gew.org.uk/>

TeachersTV *Economic Wellbeing*

<http://www.teachers.tv/video/36359>

Box 2.4 Financial capability**Personal financial education aims are to enable young people to develop:**

- knowledge and understanding to inform judgments and decisions about managing money in their present and future lives
- appropriate attitudes that are reflected in taking personal responsibility for money management, questioning the claims of some financial products and evaluating available information before taking financial decisions
- financial skills that are demonstrated through day-to-day money management and planning for future financial needs, such as budgeting for weekly household items, monitoring bank accounts and credit cards and checking whether savings and investments are meeting financial goals

Financial capability aims to help young people to become questioning and informed consumers of goods and services, effectively managing their money and finances

Financial capability is included in the programmes of study for PSHE education, mathematics and citizenship.

Curriculum guidance

DCSF (2008). *Guidance on financial capability in the secondary curriculum: key stage 3 and 4*
This guidance includes a framework of learning outcomes which is reproduced in Annex A.
<http://publications.education.gov.uk/DownloadHandler.aspx?ProductId=DCSF-00645-2008&VariantID=Guidance+on+financial+capability+in+the+secondary+curriculum%3a+key+stage+3+and+4+PDF&>

Useful links**Personal Finance Education Group**

<http://www.pfeg.org>

Adding up to a lifetime

<http://www.addinguptoalifetime.org.uk/>

2.2 STEM and EWB

Developing effective links between STEM and EWB will contribute to the achievement of the statutory aims of the secondary curriculum to enable all young people to become:

- successful learners who enjoy learning, make progress and achieve
- confident individuals who are able to live safe, healthy and fulfilling lives
- responsible citizens who make a positive contribution to society.

STEM and EWB together can also contribute to young people' cross-curricular learning in relation to:

- functional skills (English, mathematics, ICT)
- personal, learning and thinking skills (PLTS) (independent enquirers; creative thinkers; reflective learners; team workers; self-managers; effective participants)
- cross-curriculum dimensions (identity and cultural diversity; healthy lifestyles; community participation; enterprise; global dimension and sustainable development; technology and the media; creativity and critical thinking)

Embedding EWB in STEM learning can have the following benefits:

- provision of authentic, topical and 'real world' contexts for learning
- additional resources
- enhanced learner perception of the relevance of STEM learning to their everyday and future lives and personal identities
- increased scope for personalising learning in STEM
- improved motivation and engagement of learners
- increased take-up of STEM subjects at options times.

Box 2.5 identifies some key hot spots and useful links in science, maths and design and technology for integrating STEM-EWB learning at KS3.

Box 2.5 Opportunities for STEM-EWB learning at KS3

Science

The science programme of study provides opportunities to plan sequences of work, learning outcomes and teaching approaches that support EWB:

The contribution of science to technological advances and innovation is at the heart of changes in the global economy. Studying science plays an essential role in contributing to young people's long-term economic wellbeing because it helps them develop practical and investigative skills, including the ability to obtain, analyse, evaluate and communicate data and information. These skills are essential in the workplace, whether in a scientific or non-scientific career.

The science programme of study encourages pupils to consider the varied career opportunities, both within science and in other areas that are provided by science qualifications, allowing pupils to see how they can contribute to the future success of the economy. (QCDA, 2007)

cont ...

Links with EWB are made explicit in the KS3 programme of study for science, including:

- experience science outside the school environment, including in the workplace, where possible (Curriculum opportunities 4e)
- use creativity and innovation in science, and appreciate their importance in enterprise (Curriculum opportunities 4f)
- recognise the importance of sustainability in scientific and technological developments (Curriculum opportunities 4g)

Useful links

The Association for Science Education

Professional association for science teachers and others involved in school science education

<http://www.ase.org.uk/home/>

British Science Association

For news of campaigns, festivals, science and engineering weeks, competitions, activity packs and other activities and events.

<http://www.britishtscienceassociation.org/web/index.htm>

Institute of Physics

http://www.iop.org/activity/careers/Careers_schools_and_colleges/page_25768.html

The Nuffield Foundation

<http://www.nuffieldfoundation.org/>

Royal Society of Chemistry

<http://www.rsc.org/Education/index.asp>

Science learning centres

e.g. <http://www.ntu.ac.uk/cels/about/>; <http://www.shu.ac.uk/research/cse/>

For free resources that can be downloaded.

Society of Biology

<http://www.societyofbiology.org/education>

Design and technology

The design and technology programme of study provides many opportunities to support young people's EWB:

Design and technology is about applying knowledge of materials and processes to the design of products, and generating practical solutions that are relevant and fit for purpose. It's also about solving technical problems, responding creatively to briefs, and developing proposals in a range of material areas. The skills that pupils develop in these processes are highly valued by employers.

cont ...

Box 2.5 Opportunities for STEM-EWB learning at KS3 (cont)

When pupils analyse products they learn about economic and industrial issues. This lays the foundation for becoming economically aware. (QCDA, 2007)

Links with EWB are made explicit in the KS3 programme of study for design and technology, including:

- Understanding that designing and making has aesthetic, environmental, technical, economic, ethical and social dimensions and impacts on the world (Key concepts: designing and making 1.1a)
- Understanding that products and systems have an impact on quality of life (Key concepts: designing and making 1.1c)
- make links between design and technology and other subjects and areas of the curriculum (Curriculum opportunities 4g)

Useful links**Design and Technology Association**

<http://www.data.org.uk>

EngineeringUK

<http://www.engineeringuk.com>

Scenta - Engineering & technology careers & news

<http://www.scenta.co.uk/home.cfm>

Mathematics**Mathematics provides tools for understanding science, technology, engineering and economics. It has a distinctive contribution to make to young people's EWB:**

An understanding of mathematics, and confidence in using a variety of mathematical skills, are both key to young people's ability to play their part in modern society. The skills of reasoning with numbers, interpreting graphs and diagrams and communicating mathematical information are vital in enabling individuals to make sound economic decisions in their daily lives. Mathematics skills and habits of mind are highly prized by many employers and mathematics is a gatekeeper to many careers and professions. (QCDA, 2007)

cont ...

Box 2.5 Opportunities for STEM-EWB learning at KS3 (cont)**Links with EWB are made explicit in the KS3 programme of study for mathematics, including:**

- Applying suitable mathematics accurately within the classroom and beyond (Key concepts: competence 1.1a)
- Understanding that mathematics is used as a tool in a wide range of contexts. (Key concepts: applications and implications of mathematics 1.3b)
- The study of mathematics should enable pupils to apply their knowledge, skills and understanding to relevant real-world situations (Range and content)
- work on problems that arise in other subjects and in contexts beyond the school (Curriculum opportunities 4d)

Useful links**Association of Teachers of Mathematics**

<http://www.atm.org.uk/>

Maths careers

<http://www.mathscareers.org.uk/>

2.3 What's driving the STEM and EWB agendas?

STEM and EWB initiatives are part of a co-ordinated national agenda to make a positive difference to children's and young people's lives now and in the future with corresponding benefits to families, communities, wider society and the economy.

The key elements of the agenda are:

- improving motivation and progression by helping young people to see the relevance of their learning in school to their future lives
- promoting young people's personal capabilities and Personal, Learning and Thinking Skills for everyday living, learning and work
- reversing the decline in the take-up of STEM subjects by emphasising the transferability of STEM skills, the boost they give to employability (see Box 2.6) and the potential return on investment from learning STEM skills and choosing STEM-related careers
- boosting sustainable development and the global competitiveness of the UK economy.

Box 2.6: Employability

'Employability defines the knowledge, skills, attitudes and behaviours required by individuals to seek, obtain and sustain employment at all levels in the labour market.' (Skills for Business Network Definition, 2007).

The Alliance of Sector Skills Councils has designed an employability skills matrix that covers:

- communication
- use of numbers
- managing information
- demonstrating positive attitudes and behaviours
- being responsible
- being adaptable
- learning continuously
- working safely
- working with others
- thinking and solving problems
- participation in projects and tasks
- customer care.

In the context of EWB, it is important to note that employability is about young people getting and keeping work that is fulfilling. The CBI in 1999 defined employability as 'the possession by an individual of the qualities and competences required to meet the changing needs of employers and customers and thereby realise his or her aspirations and potential in work'. Economic wellbeing is linked to job quality; and young people will be better able to improve the quality of the job they have if they understand the relationship between job design and their own career happiness.

Useful links**UKCES. (2009). *The Employability Challenge***

<http://www.ukces.org.uk/our-work/strategy-and-performance/the-employability-challenge/>

LSN. (2008). *Employability skills examined*

<https://crm.lsnlearning.org.uk/user/order.aspx?code=080139>

CBI. (2007). *Employability and work experience – a quick guide for employers and students*

www.cbi.org.uk/pdf/timewellspentbrief.pdf

In 2009, the Department for Business Innovation and Skills (BIS) commissioned five independent expert groups to take forward particular issues relating to the science and society agenda. Two of the expert groups that published their reports early in 2010 raised issues that are particularly relevant to the STEM-EWB agenda (see Box 2.6).

Box 2.6 Reports of the expert groups

Science and Society: Science for careers expert group

The mission of the Science for Careers expert group is to attract more people, especially young people, to aspire to be a scientist and to raise awareness of the employment opportunities for those with science skills in every part of the economy and society.

Science for Careers (March 2010) is the group's 23-point action plan to work with a range of stakeholders and partners to:

- contribute to the development of the UK's science skills base
- help to ensure that science education in schools is exciting and challenging
- promote equality and diversity
- improve CEIAG for young people
- provide inspiring role models and mentors
- enable more young people and those that influence them to meet working scientists.

Download *Science for Careers*, the Report of the Science and Society Expert Group here <http://interactive.bis.gov.uk/scienceandsociety/site/careers/files/2010/03/BIS-R9199-URN10-767-FAW.pdf>

Science and Learning Expert Group

The Science and Learning Expert Group believes that 'it is not sufficient to provide first class education in science and mathematics: it is also essential in addition to explain to young people what opportunities in life and employment are enabled, enhanced and enriched by such education. This is not a matter for schools and colleges alone; it requires the input of Higher Education Institutions (HEIs) and employers' (*Science and Mathematics Secondary Education for the 21st Century*, the Report of the Science and Learning Expert Group, p.16).

cont ...

Box 2.6 Reports of the expert groups (cont)**Recommendation 19 of their report states:**

'All young people should receive planned systematic information, advice and guidance on STEM careers from KS2. This should be integrated into science lessons and enrichment, rather than being an 'add-on', complementing the support provided by external services and specialist careers teachers:

- teachers, including subject specialists and other staff who provide information, advice and guidance on science progression, should receive regular, up to date training and resources on how to provide this information and specifically on what jobs and further courses exist in STEM and related subjects;
- regional networks amongst schools and FE colleges should ensure that, within a locality, as many students as possible have access to high quality information, advice and guidance.

Download *Science and Mathematics Secondary Education for the 21st Century*, the Report of the Science and Learning Expert Group (February 2010) here

<http://interactive.bis.gov.uk/scienceandsociety/site/learning/files/2010/02/Science-and-Learning-Expert-Group-Report-Annexes-31.pdf>

2.4 What are the main EWB requirements and expectations on schools?

The main requirements and expectations on schools are:

- to include statutory work-related learning (WRL) within the curriculum for all learners at key stage 4, using the statutory definition of WRL and having regard to QCDA guidance
- to provide a planned programme of impartial careers education for all learners in years 7-11 (1997 Act; 2003 regulations, 2008 Act) and including information about apprenticeships and all post-16 options
- to provide access to up-to-date guidance materials and materials relating to careers education and careers opportunities (1997 Act)
- to co-operate with careers advisers (personal advisers) (1997 Act).

3

Developing STEM-EWB approaches

The focus of part 3 is on formalising the leadership, planning and development of the school's STEM-EWB provision to further strengthen its effectiveness.

3.1 Leadership and strategy

Much good work in STEM-EWB practice is ad hoc. The overall impact on learners could be improved relatively easily through effective leadership and a deliberate strategy. The Careers Awareness Timeline Project is developing our understanding of many of these issues (see Box 3.1).

Box 3.1 Initial findings from the audit of the timeline pilot schools

From p.12–13, *Lengthening Ladders, Shortening Snakes– Embedding STEM Careers Awareness in Secondary Schools* (October, 2009)

http://www2.warwick.ac.uk/fac/soc/cei/stemcareers/approvedpdfsnakes_laddersreport_v6_lr1.pdf

What's going well

- The widespread existence of commitment in principle to STEM careers
- Most schools participate in more STEM career activity than they had recognised
- Some schools have set up STEM groups including careers guidance staff
- The increasing numbers of schools who are appointing a STEM coordinator
- The widespread use of enhancement and enrichment activities
- Schools' willingness to develop better relations with external partners

Significant challenges

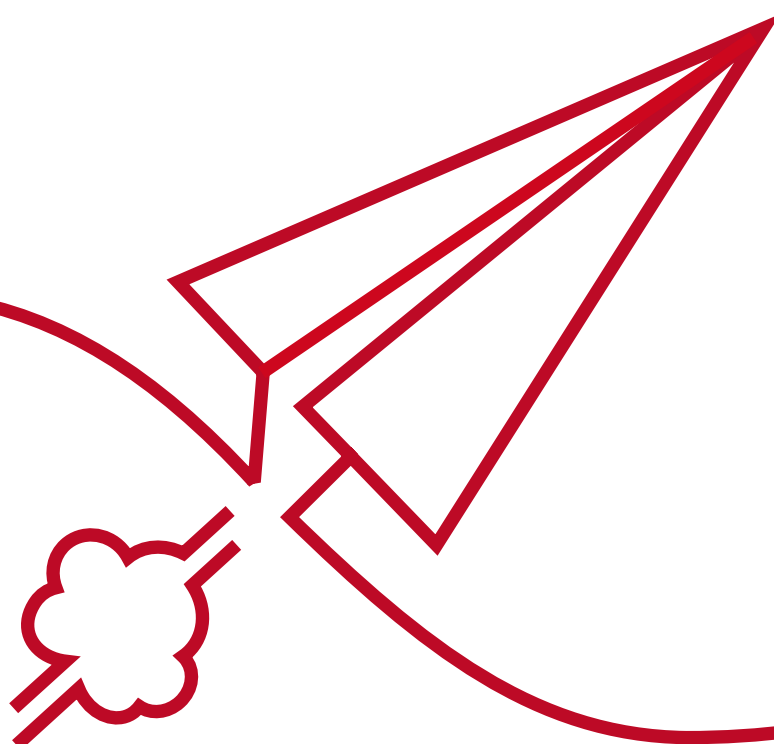
- STEM departments do not work together
- STEM departments have very little contact with careers staff and careers professionals
- Enhancement and enrichment activities are not evaluated for career learning potential
- Many schools do not have a strategy for supporting learning about engineering
- The opportunities for STEM careers-related CPD for staff are very limited, with teacher placements being rare
- Parents are neither approached nor involved

Cramlington Learning Village, one of the timeline pilot schools, has adopted a strategic approach to STEM careers awareness at Key Stage 3. Their timeline is included in Annex C.

Effective leadership by school, STEM and EWB leaders is vital to securing long-term improvement. Strategies that can have an impact on the whole school include:













- Strengthen the profile of STEM–EWB activities in the cultural life of the school, e.g. by celebrating individual achievements and holding special events
- Identify senior staff and governors to oversee and facilitate developments
- Ensure curriculum provision for STEM–EWB is coherent, authentic, topical, relevant and meaningful
- Embed STEM–EWB awareness and experiences in the curriculum for all learners and extended school activities for targeted groups, e.g. Gifted and Talented
- Organise CPD for teaching and support staff to ensure that they are confident and competent in their knowledge of STEM–EWB
- Ensure that STEM–EWB activities help to raise aspirations, broaden horizons, challenge stereotyping and open up access for all young people, e.g. organising effective work experience at key stage 4
- Make effective use of available resources and people, especially parents/carers, employers and gatekeepers/enablers, e.g. STEM and education–business organisations and the Connexions Service.

The audit tool developed by the STEM subject choice and careers programme can be used by the school for strategic planning and development (see Box 3.2).





Box 3.2 STEM subject choice and careers development tool**How to use the tool:**


- identify where you are on each of the aspects of school practice (A–H)
- identify the changes needed to make the transition from your current level to the next on each of the eight aspects
- identify the mechanisms or interventions to help you achieve change
- identify existing resources and sources of support for making the transition
- identify any gaps in the help available and how they can be plugged.

	Level 1	Level 2	Level 3	Level 4
A. Teaching and Learning	No explicit or planned reference to STEM contexts and careers in curriculum planning. Individual teachers might make occasional reference to STEM careers if opportunities arise. 	Some STEM teachers make use of work related contexts to achieve greater pupil engagement in STEM subjects. 	Widespread use of work related contexts to support curriculum planning and delivery by teachers across the STEM subjects. 	Whole school approach to use of work related contexts to support curriculum planning and delivery across all the STEM subjects. 
B. Pupil personal skills and capabilities	No verbal awareness of their own personal skills or capabilities. No planned acknowledgement of personal skills or capabilities within the curriculum. Teachers rarely make reference to personal skills. 	Reasonable awareness of personal skills & capabilities development and is able to give examples. Teachers occasionally use associate language in ad-hoc way. Reference to skills is driven by individual teacher enthusiasm rather than whole school action. 	Good awareness of personal skills and capabilities and can give examples and identify what made them worthwhile. Explicit progressive and inclusive provision is given to personal skills & capabilities in subject lessons, whole school and curriculum activities by most staff. 	Strong awareness of personal skills and capabilities and can give examples, identify worthy features and describe why they are useful. They work with other pupils to peer assess and coach others, and actively seek out opportunities to develop further. They experience personal skills & capabilities embedded into school and lesson activities by most staff; parents know about them. 
C. Teacher Awareness of STEM careers	Low level of subject teacher awareness of STEM career pathways and use of STEM subjects in the workplace 	Some STEM teachers are aware of career pathways and use of STEM subjects in the workplace. Use is made of futuremorph, mathscareers, jobs4u, etc. 	Widespread knowledge and use of STEM subjects in the work place and career pathways. Teachers confident to answer front line enquiries from students and to help them make effective use of the wide range of web and hard copy STEM careers information. 	Whole school approach to updating teachers on STEM applications and career pathways. Positive use of this knowledge to enthuse and engage students. Direct links to futuremorph, mathscareers, jobs4u, etc. Teachers actively support students' career exploration and refer them for further guidance. 


D. Enhancement and enrichment

Rare use made of enhancement and enrichment activities. Individual STEM teachers might make use occasional STEM visitors from industry. 


Some use made of STEM enhancement and enrichment activities with some pupils, though this tends to be only with those already committed to STEM subjects. 

Good use of STEM enhancement and enrichment activities with substantial numbers of students. High level of awareness amongst staff of the opportunities and benefits of this approach and of STEM Directories 


Whole school approach to STEM enhancement and enrichment. Progressive programme for Key Stages 3, 4 and post-16.

Support for students to reflect on learning and the connections to and implications for career choice. 

E. Equality and diversity

No explicit plan to tackle limited and stereotypical views of STEM courses and careers. 


Efforts made to tackle student and parents' stereotypical views of STEM courses and careers by some teachers through role models and curriculum materials.

Some recognition of equality duties. 


Good recognition of equality duties.

Active use of role models and mentors to promote equality in STEM subjects and careers.


Targets set to achieve representative participants in STEM enrichment activities.

Strategy in place to deliver an inclusive STEM curriculum. 


Creative, whole school approach to equality duties that engage all students in successful experiences of, and progression, in STEM courses and ensure that all pupils are able to fully achieve their potential.

Differentiated activities to engage under-represented student groups in STEM courses and activities. 


F. Communication about STEM careers

No explicit efforts made to raise awareness of STEM careers by teachers or personal advisers. 


Individual teachers try to raise awareness of STEM careers in class and with individual pupils in response to interest.

Personal advisers run group work and provide information, advice and guidance on STEM opportunities in response to requests. 


There are comprehensive efforts by STEM teachers through displays, visiting speakers, discussions, and information for individual pupils to raise awareness of STEM courses and careers.


Personal advisers make positive efforts to broaden pupils' knowledge of STEM opportunities through group sessions, presentations at events, etc. 

There is a whole school strategy for communication about STEM choice and careers with pupils and parents. This is evident in the careers library, schools intranet and displays, as well as newsletters and events.


There is a widespread commitment to the social and economic benefits of STEM careers. Personal advisers contribute to this strategy 


G. Leadership and management

No explicit lead on STEM choice and careers. 


STEM faculty heads are aware of potential and make efforts to encourage students to progress in STEM subjects. 


STEM faculty heads have started to define a strategy for encouraging pupils to explore STEM careers and develop interest in further STEM study through curriculum development and enrichment and enhancement activities.

Some monitoring of student participation and achievement in STEM subjects to monitor effect. 


Whole school STEM engagement and careers policy in place in partnership with other key agencies. Monitoring of effectiveness is undertaken by studying participation and achievement in STEM subjects and career choice. 

H. Partnerships

No explicit links are in place with partners such as Connexions, local universities, Aimhigher and STEM enrichment providers to support STEM subject choice and careers. 

Some individual teachers have links with partners to enhance delivery. 

STEM Faculties have good links with key partners from higher education, Connexions, Aimhigher and industry to enhance student learning.

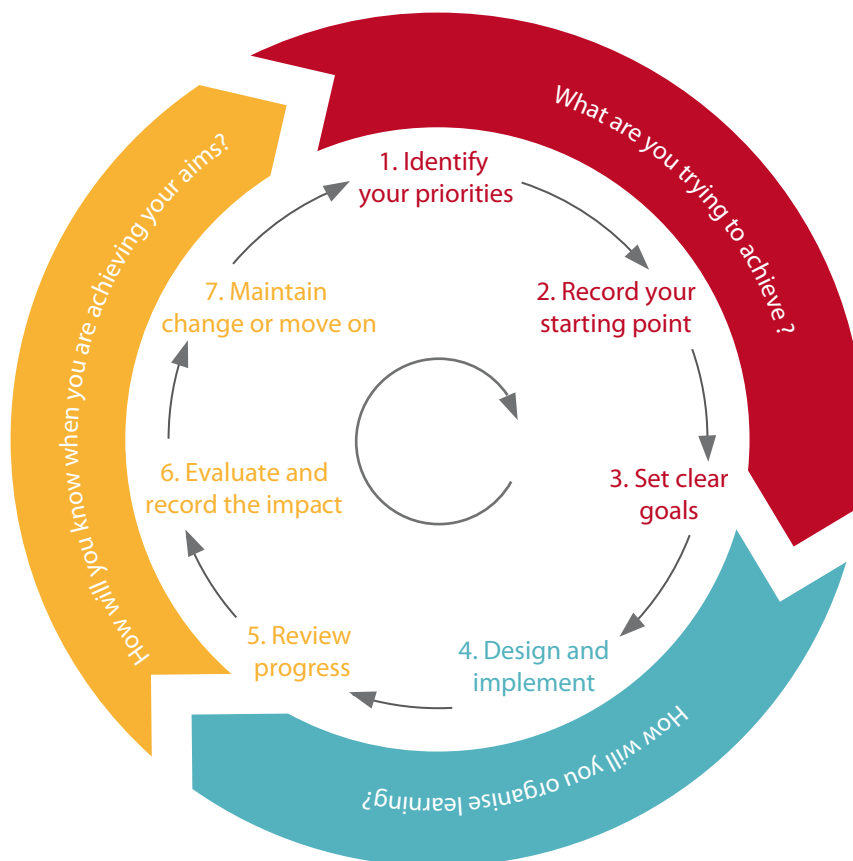
These are celebrated within the school and wider community. 

The STEM careers policy is developed, delivered, reviewed and celebrated in close collaboration with key partners including Connexions, Aimhigher, local universities and industry. 

3.2 Curriculum planning and development

The QCDA model for disciplined curriculum innovation (see Fig. 3.1) offers curriculum working parties a sound process for strengthening STEM–EWB collaboration.

Fig 3.1: Disciplined curriculum innovation (QCDA, 2008)



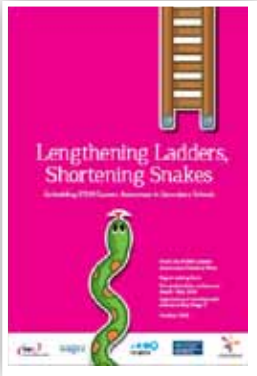
The model is in three parts:

What are you trying to achieve?

Step one focuses on identifying priorities. The school's priorities can come from different sources, e.g.:

- The programmes of study, i.e. the importance statement, key concepts (big ideas), key processes (essential skills), range and content (breadth) and curriculum opportunities (links)
- The specific needs and interests of young people in the school
- Authentic triggers such as topical events and local opportunities.

Various tools will be useful to you in helping to identify priorities, e.g.:



Snakes and ladders

'Snakes and ladders' is a variant of a SWOT analysis and can be used by STEM and EWB staff to identify priorities for curriculum development. It involves identifying obstacles (snakes) and opportunities (ladders). In discussion, the team decide how to build on opportunities and how to overturn obstacles. You can review the activity in use in *Lengthening Ladders, Shortening Snakes – Embedding STEM Careers Awareness in Secondary Schools* (October, 2009)

http://www2.warwick.ac.uk/fac/soc/cei/stemcareers/approvedpdfsnakes_laddersreport_v6_lr1.pdf

Comparison tool

The QCDA website has a handy 'Subject comparison tool' which enables you to compare key aspects of learning (e.g. processes) in two subjects at a time (e.g. EWB and science). Go to <http://curriculum.qcda.gov.uk/key-stages-3-and-4/subjects/subjectcomparison/index.aspx>

Mapping grids and audit tools

Mapping and auditing activities can be undertaken against elements of provision, processes and outcomes.

Annex A provides three examples of learning outcomes frameworks that are currently in use to support curriculum mapping and planning of EWB. Choose the tool that best fits your purpose.

Step two prompts you to record the starting point which provides the school with a baseline from which to evaluate the impact of the new priorities.

Step three involves setting clear goals which will define what your learners will be like when you have achieved your priorities.

How will you organise learning?

Step four is about designing and implementing the curriculum changes to help you achieve your goals. Box 3.3 is a worked example of a planning framework for organising learning to create what QCDA refers to as 'compelling learning experiences'. A compelling learning experience:

- has clear learning outcomes relating to what learners need to know and understand, the skills they will acquire and areas of personal development
- is real and relevant connecting learning at school to the world beyond the classroom
- has a real audience and purpose
- provides contexts that draw together several aspects of learning connecting different subject disciplines, focusing on a specific subject, or linking learning through cross-curricular dimensions or the development of personal, learning and thinking skills

- gives learners a sense of autonomy having the chance to think critically, make decisions, take responsibility and manage risks
- offers opportunities for cooperation and collaboration
- broadens horizons and raises aspirations offering contexts that challenge learners and encourage them to step outside their comfort zone.

Source: http://curriculum.qca.org.uk/uploads/Compelling%20learning%20experiences%20leaflet%20QCA-08-3607_tcm8-12822.pdf

Box 3.4 illustrates some key teaching and learning approaches that can support compelling learning experiences in STEM-EWB.

How will you know when you are achieving your aims?

Step five involves progress reviews that will let you know whether you are achieving your aims. For large-scale curriculum development, repeated progress reviews may be necessary to help refine your plans if necessary. Day-to-day and periodic assessment of young people's learning based on assessment for learning principles will provide strong evidence for progress reviews.

Step six is about evaluating and recording the impact of the curriculum development and involves assessing the difference between where learners are now and where they were at step two ('the distance travelled').

Step seven is about deciding in the light of your evaluation whether you need to maintain your approach, change the approach or move on to your next priority. Either way, you need to give careful thought about how you re-motivate staff who are involved in the curriculum development.

Box 3.3 – Planning compelling learning experiences in STEM-EWB: an example

Title	Earthquakes
Potential lines of enquiry	<ul style="list-style-type: none"> • Find out the causes of earthquakes • Discuss attitudes to risk – Why do people live in earthquake zones? Investigate social and economic impact of earthquakes, e.g. tsunamis • Profile organisations carrying out work in this area • What are research scientists trying to find out about earthquakes? • Carry out experiments to produce and measure mini-earthquakes • Conduct an experiment to show how base isolators prevent or minimise damage to buildings in an earthquake (see 'How safe is my house?' activity on Science Learning website) • Design a product that can help save lives before, during or after an earthquake (Dragons' Den-type activity from http://www.slideshare.net/pberry5082/bristol-meeting-march-2009) • Find out what these people do around earthquakes: seismologist, volcanologist, geographer, geologist, geophysicist, seismic engineer, architect, firefighter (search and rescue)

Links to relevant PoS.	<p>KS3 Science – The environment, Earth and universe (3.4a, 3.4c)</p> <p>KS3 Geography – physical geography, physical processes and natural landscapes (3f), interactions between people and their environments (3h)</p> <p>KS3 Design and Technology – The study of designing (3b–e)</p> <p>KS3 Mathematics – Statistics (3d)</p>
Opportunities to involve other subject/cross-curriculum dimensions	<p>Potential to extend this themes across all subjects, e.g. History: Pompeii and Herculaneum AD79, Lisbon 1755, San Francisco 1906</p> <p>English: media reporting, science communication, narrative</p> <p>Citizenship: civil defence, emergency-relief fund-raising</p>
Resources	<p>Science Learning – Sparking Fresh Thinking (New Zealand)</p> <p>http://www.sciencelearn.org.nz/Contexts/Earthquakes</p> <p>Earth Learning Ideas (under Natural Hazards)</p> <p>http://www.earthlearningidea.com/</p> <p>US Geological Survey</p> <p>http://earthquake.usgs.gov</p>
Compelling learning experience	<p>The impact of earthquakes on people, buildings and the environment and how we can use STEM knowledge and skills to discover new ways of reducing their effects.</p>



Box 3.4: STEM-EWB teaching and learning

Effective STEM-EWB provision draws on the full range of teaching and learning methods including:

Introductory activities

Introductory activities are important for awareness-raising and communication. Examples include:

• assemblies

e.g. use assemblies to draw attention to topical issues and to present visitors. Consider having a 'featured' 'job of the week'.

• online activities

e.g. maintain interesting pages on the school VLE and website including links to interesting activities such as choosing which scientist wins £500 to communicate their work on the 'I'm a scientist – Get me out of here' website <http://imascientist.org.uk>

• classroom, laboratory and workshop displays

e.g. display posters, students' project work, news stories and competitions

Curriculum-based activities

Curriculum-based activities are important for taking the learning deeper, promoting understanding and enabling learners to apply what they are learning to their own situation.

Thematic or enquiry-based projects are a powerful way of promoting effective learning linking STEM and economic wellbeing. The characteristics of effective practice include:

- Young people are consulted about the theme and the focus of the enquiry question(s) so that they are motivated and can see the relevance of what they are doing
- The project involves a powerful experience related to the theme
- Young people are engaged in structured learning activities that prepare them for the experience and facilitate progression in learning
- Young people find a state of flow – total absorption and engagement at different stages in the project
- The enquiry is related to solving a problem – problem-based learning facilitates the acquisition of transferable skills
- The final stage of the project involves a performance or presentation to consolidate learning
- Reflection and review is built in to facilitate assimilation and the identification of future learning needs.

Ideas for thematic projects include:

- Environment enterprise. Green Day is a climate change activity kit for schools which can be downloaded from the CABE website <http://www.cabe.org.uk/publications/green-day>
- Sustainable careers for sustainable lives. *The Practical action: Technology changing poverty* website has a wealth of ideas for projects and activities based on sustainable design and technology <http://education.practicalaction.org/> The resources created by the UK Carbon Footprint project are another source of lesson ideas <http://www.google.co.uk/carbonfootprint/schools.html>
- What jobs will we be doing in 2030? Two useful links are: <http://www.guardian.co.uk/science/2010/jan/14/futurists-predict-radical-job-changes>, <http://www.realcoolfutures.com/index.php>

Investigations are another powerful way of enabling students to explore relevant issues. Examples include:

- Comparing the strength of hair samples after they had been washed in cheap and expensive hair conditioners
- Fake – students play the role of a trainee forensic scientist. It can be downloaded from the upd8 website <http://www.upd8.org.uk/activity/294/Fake-Forensics-activity-from-Wikid.html>
- How much will it cost me to qualify for the career I'd like to have? Point students towards the Uniaid cost calculator <http://www.studentcalculator.org.uk/original/>
- What's involved in choosing sciences? Life Lab (Science Oxford Next) is a useful resource <http://www.scienceoxfordnext.com/lifelab/about/>
- What's in the Higher Diploma in Engineering? Where is it taught? How is it assessed? What can you do next after taking the Higher Diploma? Point them towards the www.engineeringdiploma.com website and the local 14–19 online prospectus (get the web address of your local prospectus from http://www.direct.gov.uk/en/Dio11/DoItOnline/DoItOnlineByCategory/DG_170372)
- The young people, teachers and parents areas of the Planet Science website have useful EWB lesson resources <http://www.planet-science.com/>
- What's the return on investment from choosing STEM subjects and careers? Useful resources for this topic include:

bestCourse4me

<http://www.bestcourse4me.com>

Destinations of Leavers (HESA, 2009)

http://www.hesa.ac.uk/dox/dlhe_longitudinal/0405/Long_DLHE_0405_WEB.pdf

Choosing the right STEM degree course

http://www.score-education.org/2projects/progression_routes.htm

Uniaid Student Calculator

<http://www.studentcalculator.org.uk/original/>

The STEM subject choice and careers programme has created a number of investigation activities:

Working Internationally

Students must use maths and geography to solve the problem of where an international organisation should locate its offices to ensure good communications.

http://www.mathscareers.org.uk/_db/_documents/StemCareers_WorkInternationally1.pdf

Taking a risk: Paying the price of piracy

Students make probability calculations, find out how insurance works and learn what an actuary does.

http://www.mathscareers.org.uk/_db/_documents/StemCareers_TakingARisk1.pdf

Carbon footprints

Students carry out mathematical investigations to learn about the average UK citizen's carbon footprint from activities such as commuting and think about effective ways of communicating messages about sustainable development

http://www.mathscareers.org.uk/_db/_documents/StemCareers_CarbonFootprints.pdf

Additional resources for Maths-EWB investigations are available free from:

- CSE/Yorkshire Forward <http://www.cre8atemaths.org.uk/>
- Maths Careers <http://www.mathscareers.org.uk/>

Visits

The Industrial Trust, Business & Education South Yorkshire and JIVE have developed a quick guide to designing an industrial visit to inspire young people:

<http://www.letstalkset.org.uk/resources/Inclusive%20industrial%20visits.pdf>

Other useful guides are:

- Chapter 12 (on science) of Learning to Live: Museums, young people and education. Kate Bellamy and Carey Oppenheim (eds.) <http://www.ippr.org.uk/publicationsandreports/publication.asp?id=665>
- Safe workplace visits made easy: An online guide for businesses arranging educational visits to the workplace <http://www.safevisits.org.uk/>

Work-related experiential learning activities

Work-related experiential learning activities are important for giving learners the opportunity to develop their confidence, skills and understanding.

Examples include:

- Careers fair
- Performances. The use of drama and acting to communicate STEM and EWB concepts and ideas is particularly effective with younger pupils
- Challenges. Competitive challenges based on real world problem-solving are a powerful and fun way of introducing young people to the risks and rewards of STEM jobs in business and academia.

Examples of STEM and EWB challenges include:

- Ashfield Music Festival
http://www.iop.org/education/teacher/extra_resources/ashfield/page_39512.html
- ideas for the terraforming of Mars
- rapid response engineering challenge (teams build emergency shelters, bridges, etc. in response to an imagined natural disaster such as a hurricane)
- a Dragon's Den type enterprise activity with a panel of judges who provide feedback to the groups taking part and pick the best product
- a construction challenge: building a bridge with uncooked spaghetti or modelling straws to span a 40cm gap and testing it to destruction
- complete and build a rollercoaster with construction toys
- the Jaguar cars Maths in Motion Challenge <http://www.mathschallenge.co.uk>
- making rockets using effervescent antacid tablets
- a CREST awards scheme challenge
- Packaging design (designing a blank, making a box for a deluxe sports ball, auditing graphic skills) http://www.mathscareers.org.uk/_db/_documents/StemCareers_PackagingDesign.pdf

Advising activities

Advising activities are important for giving learners the opportunity to personalise their learning and make individual plans. Examples include:

- Small-group work activities run by Connexions personal advisers on relevant topics, e.g. how to get into medicine
- The *Briefing Pack for STEM careers ambassadors* from the STEM Subject Choice and Careers pack includes advice on becoming an effective role model (see Annex B)
- *BrightsideUNIAD* charity runs e-mentoring projects in partnership with universities and Aimhigher for 14–25 year olds from socially disadvantaged backgrounds, e.g. to help young people aspire to careers in medicine, physics, etc.
http://www.brightsideuniaid.org/what_we_do/ementoring

3.3 Engaging partners

Effective STEM-EWB activities depend on well-developed links between schools and STEM-EWB stakeholders including employers, gatekeepers and enablers.

A STEM-EWB audit of school-employer links is a useful way of assessing the effectiveness of existing links and how they could be developed further.

The Engaging Employers audit proforma in Annex D is based on the 'routemap' in *Discovering Talent, Developing Skills – Helping STEM Employers Engage with Schools and Colleges* by Kate Bellingham (OPSI, 2010)

Download the *Discovering Talent, Developing Skills* report from http://www.nationalstemcentre.org.uk/res/documents/page/discovering_talent.pdf

The Education and Employers Taskforce has developed two websites for employers and teachers to promote the benefits of school-employer engagement: <http://www.the-guides.org/>

3.4 Monitoring, review and evaluation

Strengthening the effectiveness and improvement of STEM-EWB activities requires a combination of approaches. Section 3.2 explained how disciplined curriculum innovation can help. The use of evaluation, quality standards and local award schemes and school self-evaluation linked to the Ofsted inspection process can also contribute to an effective monitoring, review and evaluation strategy.

Specific resources to support monitoring, review and evaluation of STEM-EWB activity are sparse; but generic techniques can be adapted for the purpose.

(i) Likert scale

Scale of 1–4 on: enjoyment, interest, understanding, learning, motivation

(ii) Mind maps

Students do mind maps before and after the activity.

Look to see if the use of scientific and economic/career concepts has increased in the post-activity mind maps. Also see if there is a reduction in emotions that indicate helplessness, fear, anxiety, ignorance!

Useful resources include:

- *Ofsted, self-evaluation and CEIAG* (CEIAG Support Programme Briefing, January 2010)
In section 3.1 above, it was suggested that STEM-EWB activity should be a whole-school priority. Where this is the case, it can be evaluated through the school self-evaluation process. The CEIAG briefing discusses how schools can use self-evaluation and inspection to maintain and strengthen quality in their CEIAG provision (part of their wider provision of EWB). Go to <http://www.cegnet.co.uk>
- Challenging stereotyping and promoting fairness, inclusion and diversity are key issues for STEM-EWB activity. The STEM Careers Equality and Diversity online toolkit for schools offers important advice, resources and links. Go to <http://www.stem-e-and-d-toolkit.co.uk/>
- It is important to regularly evaluate aspects of STEM-EWB provision for their impact on equality and diversity. You can use the STEM-EWB equalities impact assessment recording sheet in Annex E.

Annex A: Learning outcome frameworks for economic wellbeing and financial capability at KS3

1. Learning outcomes at KS3 & KS4 from the Careers Education Framework (DCSF, 2010)

1. Empowers young people to plan and manage their own futures		
	By the age of 14 pupils:	By the age of 16 pupils:
1.1	develop the skills they need to locate information about their options in learning and work and use these skills with support and independently	are able to investigate opportunities for learning and work on their own <small>bristol-meeting-march-2009)</small>
1.2	develop the skills they need to recognise impartial careers information when investigating their options in learning and work.	are able to interpret information and to identify partiality and bias
1.3	know how to set challenging, realistic learning goals with targets and action points to support their achievement	make challenging but realistic plans for their future learning and work
1.4	recognise what influences their ability to reach their goals, seek help with any barriers to progress and show self-reliance and determination when implementing their plans	recognise barriers to the achievement of their plans and understand how these can be overcome
1.5	recognise how personal, educational, social and economic circumstances influence their plans about careers, learning and work	are able to review and adapt their plans in the light of changing personal, educational, social and economic circumstances
1.6	feed back that they have the skills to plan and manage their KS4 choices	feed back that they have the skills that they need to plan and manage their careers

2. Responds to the needs of each learner

By the age of 14 pupils:

- 2.1** describe their motivation, strengths and learning/work preferences
-
- 2.2** know how to access and use sources of information, advice and guidance (IAG) from within the school, Connexions and other specialist services to help them with their KS4 options choices and longer term goals
-
- 2.3** identify the skills and qualifications they need to pursue their preferred KS4 pathway
-
- 2.4** construct an individual learning plan to record their progress, experiences and achievements and set broad learning goals for the 14–19 phase
-
- 2.5** identify and articulate recommendations for improving the support they received to prepare for KS4 options and future opportunities in learning and work
-
- 2.6** feed back that they have received the support they needed to prepare for KS4 options and future opportunities in learning and work

By the age of 16 pupils:

- understand what motivates them, their strengths and their learning/work preferences
-
- know how to access personalised information, advice and guidance (including from specialist agencies) at times, and in formats, that reflect their needs
-
- understand the skills and qualifications that they need to pursue their ambitions
-
- have an individual learning plan (ILP) that they keep under review and update as they approach each transition
-
- influence the design and delivery of careers education/information and advice services
-
- feed back that they have received personalised support that they have needed to make informed choices

3. Provides comprehensive information and advice

By the age of 14 pupils:

- 3.1** access and use the main information sources on learning opportunities 14 to 19 and beyond
-
- 3.2** identify the full range of 14–19 opportunities available to them in their school and through the 14–19 partnership
-
- 3.3** identify the opportunities for progressing to further learning from each of the pathways available at KS4, including to Apprenticeships and higher education
-
- 3.4** recognise the value of different forms of work, including self employment, to individuals and society and identify the opportunities and rewards from each of the pathways available 14–19

By the age of 16 pupils:

- understand the opportunities afforded by, and are provided with easy access to:
- the Connexions service
 - Connexions Direct
 - the local 14–19 prospectus
 - Apprenticeships Vacancies On-Line
 - other information sources used locally
 - the transition support team (for young people with special educational needs and disabilities)
 - Business Link
 - UCAS and Unistats
-
- understand the full range of learning opportunities open to them within the school and elsewhere (including at local colleges and with work based learning providers)
-
- understand the opportunities for progression to further learning afforded by each course/pathway, including to higher education
-
- understand the work opportunities and rewards afforded by each course/pathway

3.5	identify sectors where opportunities exist to be self-employed	understand the opportunities afforded by self-employment
3.6	recognise the value of different forms of voluntary work and community activities to individuals and society	know how to access information about community and voluntary opportunities
3.7	are aware of the principles of personal budgeting, money management, rates of pay and work allowances	understand, and are able to claim, the financial support that they are eligible to receive to support their learning
3.8	describe what the labour market is and how individuals can be affected by the changing supply and demand for labour	understand the concept of labour markets
3.9	are aware of local labour market opportunities for young people	are aware of opportunities within local, regional and national labour markets
3.10	are aware of the laws and by-laws relating to young people's hours of work and part-time jobs	know how to access information about community and voluntary opportunities
3.11	feed back that they have had the information and advice they have needed to make their 14-16 choices	feed back that they have had the information and advice that they have needed to make informed choices

4. Provides comprehensive information and advice

	By the age of 14 pupils:	By the age of 16 pupils:
4.1	identify how an individual's perceptions and expectations of themselves can change in the light of contact with people from different learning and work settings	have been positively challenged to consider opportunities that they might not otherwise have considered (e.g. by experiential learning or 'taster' sessions and through visits to employers, work based training providers, universities, etc.)
4.2	identify ways of staying positive about who they are, what they can achieve and how other people see them	set challenging but realistic learning and work goals
4.3	recognise how work and economic independence affect personal wellbeing	understand the benefits of economic independence
4.4	identify ways of finding work that will be rewarding	have positive expectations of work
4.5	identify and recognise the benefits of 14-19 pathways that suit their preferred learning styles	understand the benefits of remaining in learning (including in further education, Apprenticeships, other jobs with training and higher education)
4.6	identify the range of information sources on 14-19 choices and distinguish between formal and informal sources	recognise when advice provided from informal sources has been shaped by the life experiences of the advice giver and may be inaccurate or incomplete
4.7	feed back that they are excited by, and committed to, 14-19 learning	feed back that they are excited by, and committed to further learning

5. Actively promotes equality of opportunity and challenges stereotypes

By the age of 14 pupils:

- 5.1** recognise and challenge the stereotypes that limit choices and opportunities for them and other people
- 5.2** investigate how stereotypical decision-making by men and women can affect their earnings
- 5.3** investigate locally-available courses that are open to students from their school
- 5.4** recognise and know how to access learning options in and beyond the school that are not traditionally associated with their gender, ethnicity, faith, learning or physical ability, cultural or socio-economic background
- 5.5** discuss the benefits and challenges of choosing non-traditional opportunities and identify basic techniques for tackling the challenges
- 5.6** feed back that they can recognise and make the case for rejecting learning and work stereotypes

By the age of 16 pupils:

- are able to recognise and challenge stereotypical views of opportunities in learning and work
- understand that stereotypical decision-making can have financial implications
- consider learning and work options that are not generally associated with their school
- consider learning and work options that are not traditionally associated with their gender, ethnicity, faith, learning or physical ability, cultural or socio-economic background
- make successful transitions when they choose non-traditional opportunities
- feed back that they recognise, and reject, learning and work stereotypes

6. Helps young people to progress

By the age of 14 pupils:

- 6.1** recognise the relevance to their future progression of the knowledge and skills they are developing at school and how these will benefit their career and working life
- 6.2** are aware of the progress (in terms of learning and work) that they can make if they continue with the study of particular subjects
- 6.3** understand the importance of investing in their own learning to keep their options open
- 6.4** are aware of how to create a good impression when making applications and being interviewed
- 6.5** are able to follow the arrangements for applying for KS4 options
- 6.6** are aware of how developing subject, functional and personal, learning and thinking skills will help them plan and manage their career and prepare them for enterprise, self-employment, employability and independent living

By the age of 16 pupils:

- understand the relevance to their future lives of each part of the curriculum
- understand the progression opportunities (in terms of learning and work) afforded by each part of the curriculum
- understand the importance of Key Stage 4 and post-16 subject choices on long term work and career options
- can follow applications procedures and prepare for interviews
- understand that they are guaranteed an offer of a place in learning after Year 11 and Year 12, and know how to access this offer
- understand and demonstrate the main qualities, attitudes and skills needed to enter, and succeed in working life and independent living

6.7	understand and use the options choice process	understand the Common Application Process and are able to use it as required when applying for post-16 provision
6.8	are able to make a carefully considered decision and follow it through so that they are able to make progress	progress smoothly into further education/training or employment after leaving school
6.9	feed back, after the options process, that they are satisfied with the curriculum decisions that they have made	feed back, after leaving school, that they are satisfied with the decisions that they have made

2. Career, work-related learning and enterprise framework 11–19 (QCA, 2008)

Economic wellbeing 11–19: career, work-related learning and enterprise		
Elements of provision for all learners	Suggested minimum provision at each key stage	Through this provision learners can:
<p>1. Recognise, develop and apply their skills for enterprise and employability.</p>	<p>Learners have the opportunity to develop and apply their skills in two work-related activities.</p> <p>Learners have one discussion about the skills they have developed</p>	<ul style="list-style-type: none"> • understand and demonstrate the main qualities, attitudes and skills needed to enter and thrive in the working world; • evaluate the usefulness of a range of skills for gaining and sustaining employment and self-employment; • manage their continuing career development, including transitions; • take risks and learn from mistakes; • apply their functional skills and personal, learning and thinking skills.
<p>2. Relate their own abilities, attributes and achievements to career intentions, and make informed choices based on an understanding of available options.</p>	<p>Learners undertake activities to develop their skills for career management, including a guidance interview focusing on career progression.</p>	<ul style="list-style-type: none"> • demonstrate an understanding of the concept of 'career'; • recognise and respond appropriately to the main influences in career choice; • identify, select and use a range of information sources to research, clarify and review career options and choices, including financial support for post-16 and higher education; • assess their needs, interests, values, skills, abilities and attitudes in relation to options in learning, work and enterprise, and use this process to make creative and realistic choices for progression; • access and use an interview with a career guidance specialist to progress their plans; • make, review and adapt their individual learning plan for transition into, through and beyond the 14–19 phase; • complete application procedures for their next steps, including a CV, personal statement and preparation for interview.

<p>3. Develop awareness of the extent and diversity of opportunities in learning and work.</p>	<p>Learners undertake two tasks that investigate opportunities in learning and work, and the changing patterns of employment.</p>	<ul style="list-style-type: none"> • understand the range of opportunities in learning and work (local, national, European and global), and the changing patterns of employment; • understand the significance of the changes happening in the world of work and relate them to their career plans; • explain the chief characteristics of employment, self-employment and voluntary work; • recognise and challenge stereotypical views of opportunities in learning and work.
<p>4. Use their experiences of work to extend their understanding of careers and work</p>	<p>Learners have two experiences of work. 14–19 learners have the equivalent of half a day of preparation and half a day of debriefing and follow-up of their work experience.</p>	<ul style="list-style-type: none"> • identify what they have learned about work from their experiences; • understand what motivates people to work; • identify the qualities and skills needed for enterprise and employability; • understand the importance of lifelong learning to employability and progression; • apply learning gained from their experiences of work to their curriculum and to their career planning.
<p>5. Learn from contact with people who work.</p>	<p>Learners have contact with two people from different occupational sectors.</p>	<ul style="list-style-type: none"> • understand the career motivations and pathways taken by individuals; • understand the importance to employers of skills, attitudes and qualifications; • appreciate the benefit of further learning and personal development.
<p>6. Learn about how and why businesses operate.</p>	<p>Learners undertake two curriculum activities that develop their understanding of work and enterprise.</p>	<ul style="list-style-type: none"> • outline the main types of business and what motivates them; • understand how different businesses are organised and structured; • give examples of rights and responsibilities at work, work roles and identities, and attitudes and values in relation to work and enterprise; • demonstrate a basic knowledge and understanding of a range of economic and business concepts and terms, including the connections between markets, competition, price and profit.
<p>7. Learn about working practices and environments.</p>	<p>Learners have two opportunities to use work practices or environments as contexts for learning.</p>	<ul style="list-style-type: none"> • understand how and why working practices and environments differ; • understand the main hazards associated with particular types of workplace and how these hazards are minimised; • relate knowledge about work to their learning and career development.
<p>8. Undertake tasks and activities set in work contexts.</p>	<p>Learners have two opportunities to use work as a context for learning within the curriculum and record evidence of their learning.</p>	<ul style="list-style-type: none"> • understand the relevance of curriculum subjects to the world of work and to their own career development; • demonstrate an understanding of economic and business terms; • analyse how examples of learning within the curriculum can be applied to work contexts; • evaluate their experiences and learning to inform future progress and career plan.

<p>9. Engage with ideas, challenges and applications from the business world.</p>	<p>Learners undertake one business challenge, problem-solving or enterprise activity.</p>	<ul style="list-style-type: none"> • know and understand important enterprise concepts; • demonstrate enterprise skills, including decision making, leadership, risk management and presentation; • demonstrate enterprise attitudes, including a willingness to take on new challenges, self-reliance, open-mindedness, respect for evidence, pragmatism and commitment to making a difference; • demonstrate enterprising qualities, including adaptability, perseverance, determination, flexibility, creativity, ability to improvise, confidence, initiative, self-confidence, autonomy and the drive to make things happen.
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3. Guidance on financial capability in the secondary curriculum: key stage 3 and 4 (DCSF, 2008)

	<p>Learning outcomes at key stage 3 – pupils will:</p>	<p>Learning outcomes at key stage 4 – pupils will:</p>
<p>Exploring career and personal finance</p>	<p>understand</p> <ul style="list-style-type: none"> • how wages/salaries are calculated (hourly, weekly, annually, bonuses, overtime) • about different types of allowances and benefits available to me when I start independent life <p>be able to</p> <ul style="list-style-type: none"> • estimate and calculate take home pay for different occupations and circumstances <p>have explored attitudes to</p> <ul style="list-style-type: none"> • priorities, needs and wants for the near future and later in life 	<p>understand</p> <ul style="list-style-type: none"> • how wages and salaries are calculated • how deductions such as tax, national insurance and pension contributions affect take home pay and what they are used for <p>be able to</p> <ul style="list-style-type: none"> • identify financial qualities, attitudes and skills for employability • calculate young people’s earnings and benefits including Education Maintenance Allowance and student finance/loans <p>have explored attitudes to</p> <ul style="list-style-type: none"> • financial implications of career and other personal life choices/priorities
<p>Exploring capability and personal finance</p>	<p>understand</p> <ul style="list-style-type: none"> • different ways to pay for goods and services and different forms of credit or debit arrangement • how holiday currency is arranged and how to calculate conversion rates • ways of choosing, opening and using different forms of bank account <p>be able to</p> <ul style="list-style-type: none"> • plan budgets for current weekly finances as a consumer • use different ways of recording spending and savings • choose financial products in different circumstances. <p>have explored attitudes to</p> <ul style="list-style-type: none"> • how ineffective use of money can result in wasted resources 	<p>understand</p> <ul style="list-style-type: none"> • implications of credit and debt (loans, overdrafts, mortgages), how costs accumulate over time <p>be able to</p> <ul style="list-style-type: none"> • compare the advantages and disadvantages of different forms of payment • balance income and expenditure – weekly and longer term budgeting • interpret bills and personal finance statements, extracting key information • calculate compound interest including the significance of AER and APR • find, use and evaluate financial advice and information from Internet, product advertising, financial advisors, Citizens Advice Bureaux • use their knowledge of the market to work out the best deal in products and services • use understanding to calculate exchange rates <p>have explored attitudes to</p> <ul style="list-style-type: none"> • social, emotional and cultural factors influencing financial decisions • sacrificing current spending for long-term benefits (e.g. investments, pensions, further and higher education)

Exploring risk and personal finance

understand

- how risk can be positive as well as negative and what basic financial decisions contain risks
- how personal interest rates are calculated and how they vary according to the level of risk and length of commitment
- that financial decisions are more about circumstances and personal choices than right answers
- when typically insurance might be needed or not needed
- how the stock market works, including positive and negative risks associated with it

be able to

- find accurate information about choosing savings accounts and other financial products (minimising risk)
- consider the likelihood or otherwise of key national or international events affecting personal money

have explored attitudes to

- issues associated with gambling and how to avoid problems with it

Exploring economic understanding and personal finance

understand

- the role of business in generating wealth – and what happens to it
- how local services are paid for
- the main forms of taxation
- the role of charities and choices about giving to them
- some effects of turbulence in the financial markets

be able to

- find and access advice about money

have explored attitudes to

- environmental and ethical issues related to consumer choices

understand

- how insurance works and the types of insurance relevant to young people
- how and why interest rates vary over time, according to the level of risk associated with them (including length of commitment) and how this can affect people
- the differences between secured and unsecured loans and purchase agreements
- the differences in risk and return between saving and investment products
- the financial skills needed and risks involved in setting up and running a business

be able to

- make a basic risk/reward assessment in relation to saving and borrowing (and quantify the risk on the basis of past data)
- develop a sense of financial risk and recognise and learn from mistakes in financial decisions

have explored attitudes to

- the risks and rewards related to gambling

understand

- that private sector financial institutions make money through charging a higher rate of interest to borrowers than savers and by selling other financial services
- how companies and other organisations are financed
- how and why foreign exchange rates fluctuate
- the main areas of national and local government finance and spending
- rights and responsibilities re: financial products

be able to

- identify services and support available to a person setting up their own business

have explored attitudes to

- local, national and global decisions that affect finances and impact on personal lives
- personal spending in relation to fair trade, ethical trading, ethical investment

Annex B. Resources

Annex B offers further suggestions for resources to help deliver STEM–EWB activities at key stage 3. They have been grouped according to themes such as student accreditation schemes, clubs and design–and–make/enrichment activities. It is not intended to be exhaustive. They have been selected for their relevance to the STEM–EWB agenda and inclusion in the guide does not necessarily constitute a recommendation. Please contact stemcareers@shu.ac.uk if you are aware of other useful resources that could be included in this guide.

STEM Directories

The most comprehensive collection of resources can be found in the STEM Online Directories. They provide information about the schemes and programmes provided by organisations from across the UK that aim to enhance and enrich the STEM curriculum. You can choose the criteria to use to search the database including by subject (e.g. applied science, biology, chemistry, etc.) and by keyword (e.g. careers, work–related, enterprise).

Search the STEM Directories here <http://www.stemdirectories.org.uk>

STEM Subject Choice and Careers AP8 resources



Follow a simple registration process and download STEM Subject Choice and Careers resources from the Digital Storecupboard. You can also subscribe to the schools newsletter. keyword <http://digitalstorecupboard.tintisha-web.co.uk/home>



Future Morph

Age

KS3, KS4 and Post 16

About

Future Morph is a Science Council website which shows students some of the careers open to them from studying STEM subjects beyond the age of 16. It has advice, interactive games, competitions, features and case studies. Parents, teachers and careers staff have their own sections.

Delivery

Put this resource on the school's VLE.

Links to the activities/resources

Future Morph
<http://www.futuremorph.org/>



Maths Careers

Age

KS3, KS4 and Post 16

About

'Maths Careers' has a wealth of ideas to support STEM-EWB topic work which will appeal to the interests of both boys and girls. Topics are arranged under themes such as the environment, health and society, business and money, science and engineering and sport. It also offers career profiles and information about studying mathematics at university. This site is maintained by the Institute of Mathematics and its Applications, supported by the London Mathematical Society and the Royal Statistical Society.

Delivery

This site provides ideas for subject and thematic learning. The link can be placed in the maths and careers rooms on the school VLE.

Links to the activities/resources

Maths Careers website
<http://www.mathscareers.org.uk/>



STEM Careers Ambassadors Briefing Pack and Guidance for organisations delivering STEM careers ambassador training

Age

KS3, KS4 and Post 16

About

This briefing pack is designed to equip individuals working in STEM-related jobs to become role models and ambassadors to develop young people's interest in STEM subject choice and careers. It includes sections on becoming an effective role model, challenging stereotyping, planning activities and understanding CEIAG in schools. The Guidance booklet is for organisations delivering STEM careers ambassador training. The booklets are designed to be used in conjunction with 'Role Models and Work Experience' which can be viewed on the Teachers TV website.

Delivery

Through the curriculum and extra-curricular/enrichment activities

Links to the activities/resources

STEM Careers Ambassadors Briefing Pack and Guidance
 (Download from the Digital Storecupboard)
 'Role Models and Work Experience'
<http://www.teachers.tv/video/36674>

	A Quick Guide for STEM Work Experience Placements
Age	KS4 and Post 16
About	This guide is designed to help teachers, learners, employers and anyone involved in work experience develop strategies for creating good quality STEM-related placements for young people age 14–19.
Delivery	Suspended timetable/enrichment activity
Links to the activities/resources	A Quick Guide for STEM Work Experience Placements http://www.digitalstorecupboard.tintisha-web.co.uk/work-experience-placements-pack



STEM Choices: A Resource Pack for Careers Education and Information, Advice and Guidance Practitioners (2009)

- Downloadable from the Digital Storecupboard or Futuremorph
<http://www.digitalstorecupboard.tintisha-web.co.uk/careers-education-and-information-advice-and-guidance-practitioners-pack>

Contents

1. Introduction

The importance of STEM and the contribution of careers education and IAG

2. CEIAG professionals' guide

- Current and future trends
- The international perspective

3. Learning routes and pathways

Keeping future options open by choosing a STEM learning route

4. Equality and diversity

Promoting STEM learning routes and careers in a positive way to encourage under-represented groups to see the benefits of STEM options

5. Where's the money?

Illustrating the earning potential of STEM careers

6. Making presentations

Using key facts to show the impact of STEM in dealing with today's challenges; group work ideas

7. Industry focus

Spotlight on key STEM industries, including case studies

8. Organising STEM Events

Stimulating activities, with links to organisations who deliver inspiring projects

9. Where to find more information

Sources of references and websites, including Sector Skills Councils, and finding out about your local area

10 STEM supply and demand research

A review of supply and demand issues relating to STEM subject choice, and research into the STEM labour market

Supplements:**Industry focus 2:**

The UK Nuclear Power Industry (2009)

Careers and labour market information – case studies – degree courses – websites and links to classroom resources

Industry focus 3:

The UK Renewable Energy Industry (2009)

Careers and labour market information – case studies – degree courses – websites and links to classroom resources

Industry focus 4:

The UK Maritime Industry (2010)

Careers and labour market information – case studies – degree courses – websites and links to classroom resources

**Science and Maths: See where they can take you****Age**

KS3, KS4 and Post 16

About

Students explore the careers they can do by studying science and maths.

Delivery

Place in science, maths and careers areas of school VLE

Links to the activities/resources

Science and Maths sees where they can take you
<http://www.futuremorph.org/scienceandmaths.cfm>



ScienceUpd8

Age

KS3 & KS4

About

The ScienceUpd8 website offers an extensive collection of contemporary topic ideas and plans many of which have a link to young people's economic wellbeing, e.g. Bears in trouble shows science skills put to use in a career when students take on the role of a trainee documentary producer. ScienceUpd8 is a joint project from the ASE and the Centre for Science Education, Sheffield Hallam University

Delivery

Activities can be delivered in-school.

Links to the activities/resources

ScienceUpd8 website
<http://www.upd8.org.uk/>
 Bears in trouble topic
<http://www.upd8.org.uk/activity/311/Bears-in-trouble.html>



STEM Subject Choice and Careers Teachers.TV programmes

Age

KS3 & KS4, Staff

About

This series of programmes for Teachers.TV were made as part of the STEM Subject Choice and Careers project (Action Programme 8) for the DCSF. They can contribute to CPD activities for STEM and EWB staff in schools. Many of the programmes have accompanying support materials for use with students which can be downloaded from the Teachers.TV website. Some additional resources are included below.

Delivery

These programmes illustrate the range of STEM-EWB approaches, e.g. in-school activities, clubs, events.

Links to the activities/resources

This series looks at the kind of skills needed to work in STEM professions, examines the careers available and includes advice from research scientists, engineers and project managers.
<http://www.teachers.tv/series/stem-subject-choice-and-careers>

Cont ...

Links to the activities/resources (continued)**The nine programmes in the series are:****Science**

Science teacher Nichola Offer uses a range of techniques to help her students think about careers in STEM (Science, Technology, Engineering and Maths) professions.

Nichola focuses on IVF and invites the school nurse, Rachael Bines, into the lesson to talk to her Year 8 class at the Thomas Deacon Academy, Peterborough, about her work and to provide professional support.

The students perform a role play which gets them thinking about the number of professions involved in IVF and raises some interesting questions.

The second part of the lesson challenges students to focus on one particular profession by searching various STEM careers websites, with the students creating a poster display of their findings.

<http://www.teachers.tv/video/31980>

Maths

Teacher Daniel Gadd links maths lessons to the use of maths in the world of work, helping students understand how their learning relates to the real world.

The class at the Graham School, Scarborough, focuses on how logistic managers use network diagrams to aid efficiency in deliveries and when laying cables.

Daniel relates the topic firstly to paper rounds, and the students develop the idea further, working on a cabling exercise to calculate the minimum amount of cable needed to link a series of towns. Daniel challenges his students to model one of the ideas they are working on.

The students also research how different people use maths in their careers, culminating in a presentation to their peers at the end of the lesson.

<http://www.teachers.tv/video/31981>

Engineering

Maths teacher Eva Cowlshaw and science teacher Amy Lucas introduce Year 9 students at CTC Kingshurst Academy, Birmingham, to engineering careers using the context of structural engineering in theme park rides.

In the maths lesson the students look at rigid structures and learn how they are important in engineering, and have the chance to investigate their own choice of rigid structures.

In science, the students model an ejector seat ride using a variety of apparatus. Their investigation looks at the different forces involved in the ride and how to monitor its speed.

For the final part of the day the students take on the roles of interviewers and candidates in mock interviews for a structural engineering job.

<http://www.teachers.tv/video/31982>

Choosing Careers

Lorette Parker, head of careers at Collingwood College, Surrey, invites eight professionals to the school to talk about their careers in STEM-related professions.

Amongst the group are research scientists, engineers and project managers. Lorette hopes they will help motivate the students to consider STEM professions as a possible career path.

Cont ...

Links to the activities/resources (continued)

In small groups, the students interview the visitors, getting as much information as they can. They are expected to meet and greet the visitors in the same way they would act in a real job interview.

The experience proves to be an eye-opener for the students and many are surprised about the opportunities available in STEM professions.

<http://www.teachers.tv/video/31983>

Equality and Diversity

Two secondary schools in Blackburn explore STEM careers by encouraging their students to take a hands-on approach to learning.

Witton Park High School takes a workshop for Year 8 girls which aims to show the students alternatives to gender stereotyped jobs. The girls are asked to consider traditional jobs along with high paid STEM related jobs. They also take part in a team building activity.

Meanwhile at Pleckgate High School, where teachers are trying to engage all students with STEM, an interactive mobile laboratory, staffed by practising scientists and engineers visits the school.

Small groups of students take part in the onboard experiments which are designed to be accessible to all learners and introduce them to new aspects of STEM.

<http://www.teachers.tv/video/36358>

STEM Subject Choice and Careers - Role Models and Work Placements

A group of STEM ambassadors visit Bradfield School in Sheffield to share their stories with a group of Year 9 girls.

As a lesson starter the pupils take part in an exercise aimed at combating some of the stereotypical images of STEM related careers. The ambassadors then take questions from the pupils about the sort of careers that are available to pupils who take up STEM subjects.

Meanwhile another group of learners are followed as they take part in a work placement run by the Connaught Partnership. Here the video examines the processes and procedures needed to ensure a successful work placement.

Apprentices at an aerospace manufacturer in Bolton discuss the benefits of experience in the workplace and a learner in Sheffield talks about the value of her work placement at a firm of architects.

<http://www.teachers.tv/video/36674>

Information, advice and guidance

At Collingwood College in Camberley, Science Teacher Angalika Newton is eager to introduce careers in science to her students.

Angalika works with Head of Careers Lorette Parker to plan a lesson to introduce the kinds of jobs that science can lead to.

They are looking at introducing a range of techniques into the classroom which will equip the students with the information they need to make informed choices. These include bringing outside visitors into the school, peer-to-peer and one-to-one learning conversations and consolidating their ideas in the form of a careers map.

This programme is part of a series looking at the careers available in STEM professions.

<http://www.teachers.tv/video/36360>

Cont ...

Links to the activities/resources (continued)

Economic Wellbeing

Riddlesdown High school in South London is taking steps to encourage pupils to study science, maths and technology.

We see students at the school participate in a role play as members of a residents' association. During the activity they discuss a proposal to build a pharmaceutical plant in their neighbourhood.

The pupils weigh up the pros and cons of the proposal, considering the economic benefits that the plans could bring to the community, against potentially negative issues such as environmental disruption.

The residents' association committee simulation is available as a download on the Teachers.TV website.

Later, staff discuss the challenges of teaching the value of STEM subjects as they often feel ill-equipped to educate pupils about opportunities in science-related careers.
<http://www.teachers.tv/video/36359>

STEM Careers Interviews

A series of interviews on the importance of STEM skills. Those interviewed include: Government Affairs Manager Dr Virginia-Acha; Education Editor Helen Joyce; President of Royal Institute of British Architects, Sunand Prasad; Executive Producer Carlton Reeve; and Strategic Recruitment Planner Glyn Dean.

The interviewees discuss which STEM skills they use in their careers, and how studying STEM subjects has helped develop these skills. Teachers can use the video clips to discuss with students what STEM skills they will need for the future.
<http://www.teachers.tv/videos/38114>



STEMNET

Age

KS3 & KS4

About

The Science, Technology, Engineering and Mathematics Network promotes opportunities to help young people to increase their choices and achieve their potential through STEM learning and careers. STEMNET runs three programmes: STEM Ambassadors (q.v.), After School Science and Engineering Clubs (ASSEC) and brokerage of STEM enhancement and enrichment. Details can be found on the STEMNET website together with case studies of the impact of STEMNET programmes on young people's economic wellbeing. An evaluation of the ASSEC programme was carried out for the DCSF in 2008. Among the findings, clubs were shown to have a positive impact on staff understanding of STEM careers and girls were more likely to show an interest in becoming a scientist rather than an engineer. However, there was mixed evidence about whether pupils' understanding of STEM careers has increased as a result of attending the clubs.

STEM Career Role Models is a TeachersTV series in which students meet some inspirational professionals. There are six videos in this series:

- Sheila Kanani: Planetary Scientist <http://www.teachers.tv/videos/38076>
- Faye Cashman: Spacecraft Engineer <http://www.teachers.tv/videos/38079>
- Charlotte Bailey: Trainee Plant Analyst <http://www.teachers.tv/videos/38107>
- Chris Styles: Applications Engineer <http://www.teachers.tv/videos/38108>
- Graham Gannon: Entrepreneur <http://www.teachers.tv/videos/38191>
- Leo Garcia: Medical Physicist <http://www.teachers.tv/videos/38208>

Delivery

STEMNET programmes can be run in and after school.

Links to the activities/resources

STEMNET
<http://www.stemnet.org.uk/home.cfm>
After-School Science and Engineering Clubs: Evaluation
<http://www.education.gov.uk/research/data/uploadfiles/DCSF-RW071.pdf>



STEM Challenges

Age

KS3

About

The STEM Challenges are ten STEM–EWB activities that have been inspired by London 2012. Each one is a competition and will focus on a different aspect of the preparations or the event itself, e.g. the first Challenge focused on the design and siting of a new national handball arena. The challenges will include case studies and career profiles to help illustrate and bring to life each context. The resources can be downloaded from the website for you to use even after each competition has closed. The STEM Challenges are being managed by STEMNET in association with LOCOG and the DCSF.

Delivery

They have been designed so that you can carry them out in a club environment (e.g. a STEM Club) or during lessons.

Links to the activities/resources

<http://www.stemchallenges.net/>



STEM Ambassadors

Age

KS3 & KS4

About

STEM Ambassadors are volunteers at all levels and stages in their careers and employed across a broad spectrum of STEM disciplines who are ready to work with young people and schools to encourage a greater interest and activity in science, technology, engineering and maths and the career opportunities they offer.

They can help with supporting teacher delivery of STEM–EWB programmes by:

- participating in regular lessons as well as special events
- bringing in specialist equipment or expertise to your classrooms
- providing up-to-date knowledge of contemporary science, technology and research processes
- supporting extra-curricular activities such as after-school clubs, awards and competitions
- mentoring students and supporting their project work.

To contact STEMNET about the STEM Ambassadors programme, go to:

<http://www.stemnet.org.uk/contact>

The STEM Ambassadors' programme is a STEMNET programme.

Delivery

STEM Ambassadors get involved in a wide range of activities including projects, judging competitions, e-mentoring, supporting clubs, mock job interviews and careers fairs.

Links to the activities/resources




STEM Ambassadors

<http://www.stemnet.org.uk/content/ambassadors>

STEMNET


<http://www.stemnet.org.uk/home.cfm>


STEM-EWB accreditation schemes for students

 <p>Age</p> <p>About</p> <p>Delivery</p> <p>Links to the activities/resources</p>	<h3>ASDAN Certificate of Personal Effectiveness</h3> <hr/> <p>KS3, KS4 and Post 16</p> <hr/> <p>ASDAN has created a version of its Certificate of Personal Effectiveness (CoPE) which can be achieved through Science, Technology, Engineering and Mathematics (STEM) associated activities.</p> <hr/> <p>The certificate requires a mixed mode of delivery.</p> <hr/> <p>ASDAN Certificate of Personal Effectiveness http://www.asdan.org.uk/cope.php?cont=level3</p>
 <p>Age</p> <p>About</p> <p>Delivery</p> <p>Links to the activities/resources</p>	<h3>BTEC Certificate in STEM Leadership Skills (Level 1 and Level 2)</h3> <hr/> <p>KS3, KS4 and Post 16</p> <hr/> <p>The Centre for Science Education at Sheffield Hallam University has worked with Edexcel to develop a series of STEM leadership units that can be combined with optional units in the WorkSkills Framework to build a BTEC Certificate at Level 1 or 2. A key aim of the qualification is to increase learners' motivation to study STEM subjects and to equip them to apply these skills in the workplace. Optional units are available in planning and running an enterprise activity.</p> <hr/> <p>Designed to be delivered through the curriculum and enrichment activities from age 11.</p> <hr/> <p>Stem Leaders Qualification http://www.personalcapabilities.co.uk/slq</p>
 <p>Age</p> <p>About</p> <p>Delivery</p> <p>Links to the activities/resources</p>	<h3>CREST Awards</h3> <hr/> <p>KS3, KS4 and Post 16</p> <hr/> <p>The British Science Association Creativity in Science and Technology Award Scheme is a nationally recognised accreditation scheme for project work in science and technology. Through a mentoring system, the scheme facilitates links between schools and industry or higher education. It enables students of all abilities to explore real scientific, engineering and technological problems for themselves and promotes work-related learning. Awards are available at three levels (bronze, silver, gold).</p> <hr/> <p>BP has pioneered STEM-based work experience during which students undertake project work leading to a CREST silver award. Pupils who complete the Jaguar Cars Maths in Motion Challenge are eligible for a CREST bronze award.</p> <hr/> <p>CREST Awards http://www.britishscienceassociation.org/crest CREST Awards through STEM-based work experience (BP case study) http://www.stemsussex.co.uk/files/CREST-Case_Study_02.pdf Jaguar Careers Maths in Motion Challenge http://www.mathschallenge.co.uk/</p>

	Primary, Secondary and Advanced Leaders Award
Age	Secondary (11–16) and Advanced (17–19)
About	The free Leaders Award has been created to give pupils the opportunity to discover more about possible career paths and to become a leader for STEM activities in their school. Students interview one person who works in the STEM field. Special Leaders Awards with prizes are also sponsored by organisations such as RAeS, BLOODHOUND SSC, IChemE, WISE and IMechE.
Delivery	Students can interview visitors to the school
Links to the activities/resources	Leaders Award http://www.leadersaward.com/ Special Leaders Awards http://www.leadersaward.com/index.php?option=com_content&view=article&id=70

Clubs

	Café Sci
	
Age	KS3, KS4 and Post 16
About	Café Sci in schools is based on the Café Scientifique movement. Cafés are debating forums. They last around 50 minutes: a guest scientist speaks for 10–15 minutes, followed by questions and conversation with the participating students. The format allows participants to discuss their views and concerns about scientific issues relevant to everyday life, including economic wellbeing.
Delivery	Cafés are held during lunchtimes or immediately after school
Links to the activities/resources	Café Sci http://www.juniorcafesci.org.uk/

	The Salters' Institute
	
Age	KS3 & KS4
About	The Salters' Institute promotes the setting up of Chemistry Clubs in schools for 11–14 year olds in order to encourage more pupils to continue the study of chemistry. The clubs make contact with local industry and pupils take part in university-based regional events. The website has an online handbook for teachers wishing to set up a club. The Salters' Institute also runs one-day Festivals of Chemistry for Y7/8 pupils involving practical challenges and demonstrations.
Delivery	Extra-curricular
Links to the activities/resources	Salters' Chemistry Clubs http://www.salters.co.uk/club/ Salters' Festivals of Chemistry http://www.salters.co.uk/festivals/index.html



Young Engineers

Age

KS3, KS4 and Post 16

About

Young Engineers aims to inspire young people to consider a career in engineering. They run a wide variety of competitions as well as a national club network.

Delivery

These enrichment activities are delivered mainly after-school.

Links to the activities/resources

Young Engineers
<http://www.youngeng.org/home.asp>

Design-and-make/enrichment activities



Ashfield Music Festival – a physics, enterprise and careers activity

Age

KS3 & KS4

About

Developed by the Career Development Organisation for the Institute of Physics. Role play for teams of six competing against each other to win the contract to build the stage for a forthcoming music festival with the help of experts from business.

Delivery

One-day, off-timetable activity

Links to the activities/resources

http://www.iop.org/education/teacher/extra_resources/ashfield/page_39512.html



Clyde Waterfront Education

Age

KS3, KS4

About

ClydeWaterfront is a long-term urban renewal project to regenerate 13 miles of the River Clyde from Glasgow city centre to Dumbarton. The project partners have developed a number of fully-developed lesson activities that could be adapted to support the STEM-EWB curriculum in England. Schools could also link with local regeneration projects to develop their own activities.

Delivery

These activities are suitable for STEM-EWB activity days.

Links to the activities/resources

Bridge building

Young people work in teams as architect companies with the task of designing a new bridge to cross the Clyde. The activity involves work on structures, enterprise and employability.
<http://www.clydewaterfronteducation.com/structuresbridgebuilding.aspx>

Design an eco-friendly car

Young people work in teams to meet a spec to design a hybrid/modern environmentally-friendly car that possibly reduces harmful gas emissions. The activity involves meeting certain criteria within a set budget (e.g. which materials to use and design parameters for the car), applying understanding of percentages, calculating SDT (speed, distance time) and finance (profit and loss) in a project, enterprise and employability skills; team work; engagement with businesses (e.g. visiting workplaces), finding out about different jobs (e.g. inputs from careers advisers).
<http://www.clydewaterfronteducation.com/designanecofriendlycar.aspx>

Links to the activities/resources (continued)

Produce a running shoe (textile design)

Young people create an original trainer textile print to promote the Glasgow 10k race or the Commonwealth Games. They market it to sports experts for judging and potential sponsorship. The activity involves textile design and print-making process, how to create repeat pattern designs; budgeting (profit and loss, labour costs, costs of materials, deciding on price), enterprise and employability skills; engagement with employers/business, talking to people about their jobs in design and business.

<http://www.clydewaterfronteducation.com/producearunningshoedesign.aspx>

Homes for the future

Young people investigate climate change in order to recognise the importance of building new homes with consideration for environmental impact. Young people engage with local property developers and architects to research methods of building which are environmentally sound. They form architecture companies and design a home using solar energy/environmentally friendly materials. This activity involves understanding climate change, energy, construction and building services, talking to architects and property developers.

<http://www.clydewaterfronteducation.com/homesforthefuture.aspx>



East Midlands STEM Partnership

Age

KS3, KS4 and Post 16

About

The East Midlands STEM Partnership has resources and links on its website and news about local and national STEM_EWB events including schools lectures, celebration weeks (e.g. Science and Engineering Week), competitions and challenges.

Delivery

Many of the events are suited to extension and enrichment days

Links to the activities/resources

East Midlands STEM Partnership
East Midlands <http://www.emstempartnership.org.uk/>



Engaging Places

Age

KS1–KS4 and Post 16

About

The Engaging Places team of the Commission for Architecture and the Built Environment (CABE) and English Heritage maintain a website with hundreds of ideas for activities and events for supporting learning through buildings and places across the curriculum, e.g. Green Day. Many of the resources under science, maths and design and technology have links to EWB.

Delivery

They can be run within the normal timetable and through enrichment days.

Links to the activities/resources

Engaging Places
<http://www.engagingplaces.org.uk/home>



The Smallpeice Trust

Age

KS3, KS4 and Post 16

About

The Smallpeice Trust runs design-and-make projects in school that provide a short introduction into creative thinking, problem-solving and teamwork; and 4-day residential courses at universities for students interested in engineering. There are courses for Y9, Y10 and Y11-12. Courses are accredited by the Royal Academy of Engineering Best Programme.

<http://www.raeng.org.uk/education/best.htm>

Delivery

These activities are delivered through enrichment days.

Links to the activities/resources

The Smallpeice Trust
<http://www.smallpeicetrust.org.uk/>

Information and case studies



At work with science

Age

KS3, KS4 and Post 16

About

At Work with Science – The work-related learning modules on this ABPI website show how science is used in the pharmaceutical industry. The various modules range from job application skills, to team working and enterprise activities together with a virtual visit to a chemical plant.

Delivery

Through the curriculum

Links to the activities/resources

<http://www.atworkwithscience.com>

UNDATION JAMES DYSON

Age

KS3 & KS4

About

The James Dyson Foundation website offers downloads and resources to enthuse young people about design engineering. Young people can find out about the design process, look at engineer profiles, investigate design heroes from the past and print out engineering posters.

Delivery

Suitable for in-school activities.

Links to the activities/resources

James Dyson Foundation
<http://www.jamesdysonfoundation.com/default.asp>



Jobs4u

Age

KS3, KS4 and Post 16

About

Jobs4u is a careers database with up-to-date information on a wide range of STEM-related and other jobs including descriptions of the work, entry requirements, prospects, salaries and case studies. Students can search by job title (e.g. cosmetic scientist) as well as by job family (e.g.: engineering).

Delivery

In lessons and in students' own time.

Links to the activities/resources

Jobs4u
<http://www.connexions-direct.co.uk/jobs4u>



Next Steps

Age

KS3, KS4 and Post 16

About

For young people to explore jobs in science, do a 'personality quiz', see profiles of scientists (their work, lifestyle and social lives) and profiles of non-scientists who use STEM skills in their jobs, download posters and worksheets; and find out about self-employment (see the Aquapharm case study)

Delivery

In lessons and in students' own time.

Links to the activities/resources

<http://www.planet-science.com/>

Royal Society of Chemistry

Age

KS3, KS4 and Post 16

About

The school's section of the RSC website has careers information, advice and FAQs, links to useful websites, a careers questionnaire to give students ideas of careers that might suit them and interactive games (including Oilstrike in which students try to maximise profits from building their own oil refineries)

Delivery

The games, questionnaire and information can be placed on the school VLE in the chemistry and careers rooms.

Links to the activities/resources

Royal Society of Chemistry careers information for school students
<http://www.rsc.org/Education/SchoolStudents/careers.asp>

Sector Skills Councils

Age

KS4 and Post 16

About

The national network of sector skills councils (SSCs) was set up by the Government to meet the skills needs of employers in particular industry sectors. Many have careers websites with information about career pathways, apprenticeships, qualifications, case studies and labour market trends.

Delivery

Resources for researching careers.

Links to the activities/resources

Cogent is the SSC for chemicals, nuclear, pharmaceuticals, petroleum, oil and gas, and polymers.
<http://www.cogent-careers.com/about>

SummitSkills is the SSC for building services engineering www.summitskills.org.uk

The fashion and textiles sector is part of Skillset. For careers and labour market information, go to: http://www.skillset.org/fashion_and_textiles/

Semta is the Sector Skills Council for Science, engineering and manufacturing technologies.
<http://www.semta.org.uk/>

Energy & Utility Skills is the Sector Skills Council for electricity, gas, waste management and water industries.
<http://www.euskills.co.uk/careers/>

Skills for Health is the Sector Skills Council for the health sector across the UK.
<http://www.skillsforhealth.org.uk/>

ConstructionSkills is the Sector Skills Council for construction.
<http://www.bconstructive.co.uk/>

Skillset the Sector Skills Council (SSC) for Creative Media including broadcast facilities, animation, radio and TV.
<http://www.skillset.org/careers/>

Improve Ltd is the Sector Skills Council for Food and Drink manufacturing and processing.
<http://www.improve-skills.co.uk/>

Proskills UK is the Sector Skills Council for process and manufacturing in the building products, coatings, glass, printing, extractive and mineral processing industries.
<http://www.prospect4u.co.uk/>



WISE – Women into science, engineering and construction

Age

KS3 & KS4

About

The WISE campaign works with industry and education to encourage girls to value and pursue science, engineering and construction courses and to move on into related careers.

Delivery

In lessons and in students' own time.

Links to the activities/resources

WISE – Women into science, engineering and construction
<http://www.wisecampaign.org.uk/>

Personal finance and enterprise



'Learning Money Matters' and 'My Money'

Age

KS3 & KS4

About

'Learning Money Matters' and 'My Money' are PFEG-led initiatives to provide free advice, support and resources to help schools integrate personal finance education across the curriculum, e.g. in mathematics they can calculate the cost of taking different summer holidays. PFEG consultants tailor their support to meet individual school needs. 'Learning Money Matters' is part of the FSA's National Strategy for Financial Capability and 'My Money' is funded by the DCSF.

Delivery

Activities can be delivered through subjects or through events such as My Money Week.

Links to the activities/resources

Learning Money Matters
http://www.pfeg.org/our_work_in_education/learning_money_matters_for_secondary_schools/index.html
 My Money Week
<http://www.mymoneyonline.org/>
 My Money mathematics teacher handbook
<http://www.pfeg.org/document.rm?id=465>



Young Enterprise

Age

KS3, KS4 and Post 16

About

Young Enterprise offer a range of work-related learning and enterprise activities at KS3 that can be given a STEM focus or context including Enterprise in Action (seven sessions) and the Personal Economics programme (5 x 1-hour). They run other activities such as the company programme at KS4.


Delivery

They can be run within the normal timetable. Enterprise in Action can also be run over two days.

Links to the activities/resources

Young Enterprise
<http://www.young-enterprise.org.uk/pub/home.do>

Video libraries




Careersbox

Age KS3, KS4 and Post 16

About *Careersbox* is a free online film collection showing a wide range of STEM and non-STEM related occupations on film. The films can be used to discuss key issues in STEM subject choice and careers such as 'How do people in STEM-related jobs feel about their work?' and 'What STEM skills do people use in jobs that are not obviously STEM-related?'

Delivery Suitable for in-school activities.

Links to the activities/resources Careersbox
<http://www.careersbox.co.uk/>




icould

Age KS3, KS4 and Post 16

About *icould* features film stories of famous and non-famous people (including the story of Dr Aderin Pocock who is a Space Scientist and a Science Communicator)

Delivery Suitable for in-school activities.

Links to the activities/resources icould
<http://icould.com/>




pods4jobs

Age KS3, KS4 and Post 16

About *pods4jobs* features video podcasts made by young people themselves.

Delivery Suitable for in-school activities.

Links to the activities/resources Pods4jobs
<http://www.pods4jobs.com/about.asp>



Not just science

Age KS3, KS4 and Post 16

About Video clips of science and maths topics

Delivery In lessons and in students' own time.

Links to the activities/resources Not just science
<http://www.notjustscience.co.uk/index.php?p=1>

Annex C. Resources

STEM Careers Awareness Timeline Document - Cramlington Learning Village

Year 7			
	Term 1	Term 2	Term3
Science	<p>1. Think like a scientist – the skills needed for forensics at a crime scene</p> <p>2. Matter, particles and modelling</p>	<p>1. Reproduction and all that stuff</p> <p>2. You are what you eat – energy from food</p>	<p>1. Life without a washing machine</p> <p>2. Skills – investigation challenge</p>
Design/ Technology	<p>1. Electronics/ robotics project – family toothbrush holder and timer</p> <p>2. Life without Technology – designers and inventors in society.</p> <p>– Creative writing</p>	<p>1. Structures and design – architects and engineers in society</p> <p>2. Materials and textiles – textile technologists</p>	<p>1. Fairtrade – role of the charity and the products. Cake making (ingredients, choosing flavours, how to advertise)</p> <p>2. 3D drawing – links to jobs/ careers using this skill (?)</p>
Maths	<p>The maths around us including which jobs have the most maths</p>	<p>Imagine a world without maths including the world of work</p>	<p>How algebra is used in business (sole trader, limited companies)</p>
Careers, PSHE and Citizenship	<p>Science@work Fair (Dec) – some Year 7 students</p>		<p>Knex Pig Project with GE PII (June/ July) – some students</p> <p>Boom! Engineering Show in Newcastle (July) – some students</p>
Engineering	n/a	n/a	n/a
Other? (for all KS3)	<p>Year 7/8 Science Club – Monday lunchtimes (starts Nov)</p>	<p>Year 7/8 Green Fingers Club – Mondays (starts April)</p>	<p>Year 7/8 The Aftermath Club – Mondays</p>

Year 8			
	Term 1	Term 2	Term3
Science	<p>1. Sickness and health including working in different depts in a hospital</p> <p>2. Alien (wikid upd8) – refers to many job roles</p>	<p>1. A&E (wikid upd8) – on placement in different wards of a hospital including A&E, radiology, cancer, fertility clinic</p> <p>2. Electricity/magnetism – Harry Potter style</p>	<p>1. Structure of the earth – soil, elements, rocks</p>
Design/Technology	<p>1. Roman invention and design challenge – skills required by Romans in different roles</p> <p>2. Design a handheld maze game using CAD/CAM and lasers including packaging</p>	<p>1. Design a radio casing using Art Deco design techniques</p> <p>2. ?</p>	<p>1. Life changing technology – how it changed the world. Creative writing – article for newspaper</p> <p>2. ?</p>
Maths	<p>1. How to get that dream job – aptitude testing, verbal/numerical IQ testing</p> <p>2. The maths in money</p>	<p>1. Maths in WW2 – the role of the different branches of the Armed Forces</p> <p>2. Maths learning through games including bookies and racing</p>	<p>1. The maths in sport and Olympic success</p> <p>2. The maths in saving the planet including designing packaging</p>
Careers, PSHE and Citizenship	<p>Construction and Engineering roadshow – whole year group (Sept)</p>	<p>Year 8 Star Student (some students) careers game with uni students (Feb)</p>	<p>Knex Pig Project with GE PII (June/ July) – some students</p>
Engineering	<p>n/a</p>	<p>n/a</p>	<p>n/a</p>
Other? (for all KS3)	<p>STEM Club – rocket challenges – Tuesdays</p>	<p>Year 7/8/9 Technology Club – Tuesdays (starts April)</p>	<p>Year 7/8 Eco-Schools group</p>

Year 9			
	Term 1	Term 2	Term3
Science	Living things and cells (Biology) Elements (Chemistry) Solar system (Physics) <i>All science topics in Year 9 will be revised and rewritten for September 2011</i>	Inheritance and breeding (B) Mixtures and compounds (C) Seasons/day and night/rock cycle (P)	Ethical decisions/controversies (B) Data handling, composition of air (C) Scientific theories, how scientists work (P)
Design/Technology	1. Packaging and the environment – packaging using 2D/3D/DTP including branding/marketing 2. Design a product using SMART materials	1. Am I a robot – ? 2. What moves me – ?	Innovation challenge – what is possible? desirable? viable? Working through the design process
Maths	1. Dream jobs – aptitude testing/IQs 2. The maths used to keep us healthy – nursing, dietitians	Alien invasion challenge – working with scientists, the intelligence services and government to help the world survive	1. Too good to be true? Slot machine designer 2. Travel to Mars – how? where? what?
Careers, PSHE and Citizenship	Careers Day – fair with employers including STEM companies – whole year group (Nov)		
Engineering	n/a	n/a	n/a
Other? (for all KS3)	Year 9 Science Club – Tuesdays Term 1 (MSD involved)	July – Eco group to participate in opening of Shasun Wetlands Project	

Annex D. The Engaging Employers audit proforma

Employer engagement audit (adapted from Discovering talent, developing skills – The routemap

http://vinspired.com/uploads/admin_assets/datas/88/original/discovering_talent_developing_skills.pdf

Activity	What we do already?	Who benefits?	What we could do?
Work experience/ shadowing and STEM			
Workplace visits			
Provide speakers at careers events			
STEM Ambassadors on activity days			
STEM Ambassadors in the classroom			
Science and engineering clubs			
Online case studies			
Develop EWB materials			
Diploma support			
Apprenticeship taster days			
Teacher placements			
Supply a school governor			
Financial support			

Notes

Who benefits? Any useful engagement must be a win-win for both employers and schools. The key drivers for employers are: to recruit new staff, to improve perceptions of the sector, to develop staff skills and to have a positive community role. The key drivers for schools are to improve learning opportunities and practical outcomes for students.

Annex E. STEM-EWB equalities impact assessment recording sheet

1. Title

2. Summary/description

3. The evidence base

4. What the evidence shows – key facts

5. Challenges and opportunities

6. Equality impact assessment (Choose, adapt and explain one of the statements)

- A. A positive impact is explicitly intended and very likely.
- B. An adverse impact is unlikely, and on the contrary the policy has the clear potential to have a positive impact by reducing and removing barriers and inequalities that currently exist.
- C. An adverse impact is unlikely. On the contrary there is potential to reduce barriers and inequalities that currently exist. There is insufficient evidence, however, for this assessment to be made with as much confidence as is desirable.
- D. Adverse impact is unlikely, but positive impact is also unlikely.
- E. Adverse impact is probable or certain, since certain groups will be disadvantaged, either proportionately or absolutely, or both. Remedial action is therefore necessary.
- F. Adverse impact is probable or certain for certain groups but the policy as a whole can nevertheless be justified (If selected, seek legal advice).

7. Next steps**8. For the record**

Completed by:

Date:

Notes

This proforma is adapted from the DCSF Equality Impact Assessment workbook (2007)

<http://www.dcsf.gov.uk/des/downloads/EQUIAWorkbook.doc>

The information in the workbook will enable schools to conduct a full and rigorous institutional equality impact assessment. This STEM-EWB equality impact assessment proforma is designed to feed into that process.

1. Title – Give the title of the aspect of the STEM-EWB provision with which this assessment is concerned if not the full policy/programme.
2. Summary/description – Write a summary/description of the STEM-EWB policy, programme or activities with which this assessment is concerned.
3. The evidence base – You will be able to draw on many types/sources of evidence both quantitative and qualitative, e.g. surveys, case studies, project evaluations, interviews and focus groups.
4. What the evidence shows – provide a selection of key facts relevant to disability, ethnicity and gender.
5. Challenges and opportunities – Indicate the potential to reduce and remove existing inequalities.
6. Equality impact assessment – Choose adapt and explain one of the statements
7. Next steps – Outline an action plan to address challenges and opportunities you have highlighted
8. For the record – Give the date and who was involved in carrying out the assessment.

Annex F. Glossary

BIS	Department for Business Innovation and Skills (2010–)
CE(IAG)	Careers education, (information, advice and guidance)
CPD	Continuing professional development
CREST	CREativity in Science and Technology Award Scheme
CSE	Centre for Science Education
DCSF	Department for Children, Schools and Families (2007–2010)
DfE	Department for Education (2010–)
DIUS	Department for Innovation, Universities and Skills (2007–2009)
EWB(FC)	Economic wellbeing (and Financial Capability)
HE	Higher Education
KS	Key Stage
PLTS	Personal, Learning and Thinking Skills
PoS	Programme of Study
QCDA	Qualifications and Curriculum Development Agency
STEM	Science, Technology, Engineering and Mathematics
SWOT	Strengths, Weaknesses, Opportunities, Threats
WRL(E)	Work-related learning and enterprise education



A Department for Education initiative to promote subject choice and careers in Science, Technology, Engineering and Maths (STEM) delivered by the Centre for Science Education at Sheffield Hallam University and Babcock

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