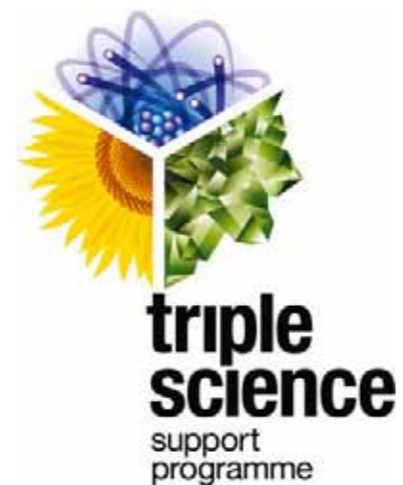


Many schools that are preparing to introduce Triple Science GCSEs may find it helpful to collaborate. This publication looks at some of the issues, the benefits of collaboration, partnership models, and hints and guidance on setting up a successful partnership.



triple science GCSEs: **collaborative approaches**

**updated
spring 2009**

**GCSEs in biology, chemistry
and physics**

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Preface

The Department for Children, Schools and Families (DCSF) has contracted with the Learning and Skills Network to support awareness and take-up of Triple Science GCSEs through the Triple Science Support Programme.

The programme aims to support the following policy objectives:

- to enable young people with level 6 or above in science at Key stage 3 that would benefit to study Triple Science GCSEs from September 2008
- to help specialist science, mathematics and computing, technology and engineering colleges offer Triple Science to all those students that would benefit.

The Triple Science Support Programme comprises the following:

- the programme website: www.triplescience.org.uk
- the Triple Science community including a new section on e-learning
- a programme newsletter three times a year
- publications on: collaboration and partnership; raising attainment in Triple Science; curriculum modelling, timetabling and Triple Science; and three subject-specific resources on the separate sciences
- case studies that expand on the publication themes
- Triple Science networks of support for practitioners
- Triple Science collaborative projects
- an offer of small workshops or bespoke consultancy for up to 400 schools (around the topics above)
- a marketing campaign around Triple Science for schools.

This programme has been funded by the DCSF. All publications, networks and newsletters will be delivered without charge to maintained secondary schools. The training and consultancy will be available to schools that either do not currently offer Triple Science GCSEs or are planning a substantial increase in the numbers in September 2009.

If you wish to register an interest in the programme, please contact the LSN helpline on 0845 071 0800 or e-mail triplescience@LSNeducation.org.uk

Alan Goulbourne

Executive Manager
Triple Science Support Programme
Learning and Skills Network



Executive summary

Policy context

1

To increase the supply of engineers and scientists, the Government has set out an ambitious plan to encourage more students to take science at A-level and in higher education.

An increase in the numbers of young people taking GCSEs in biology, chemistry and physics (Triple Science) has been identified as one of the ways to make this happen. It is part of a wider strategy based on the *Science and Innovation Investment Framework 2004–2014*.

2

Plans relating to Triple Science GCSEs for all schools include:

- a non-statutory entitlement to enable all young people with Key stage 3 science attainment of level 6 and above that would benefit, to study Triple Science GCSEs from September 2008 in all schools.

For specialist colleges:

- specialist science colleges will offer Triple Science to all those students with Key stage 3 science attainment of level 6 and above that would benefit, from 2008
- specialist engineering colleges will offer Triple Science to all those students with Key stage 3 science attainment of level 6 and above that would benefit, from 2009

- specialist technology colleges will offer Triple Science to all those students with Key stage 3 science attainment of level 6 and above that would benefit, from 2009
- and specialist mathematics and computing colleges will offer Triple Science to all those students with Key stage 3 science attainment of level 6 and above that would benefit, from 2010.

The intention is that specialist colleges will offer the entitlement at least from the beginning of the school's next re-designation cycle.

3

Triple Science is a combination of three GCSEs in biology, chemistry and physics. It provides the fullest coverage of these three subjects at Key stage 4 and, taken together, the subjects cover the statutory programme of study for science. They are available within the suites of awarding body specifications introduced for first teaching in 2006. However, core and additional GCSEs in science will remain a meaningful route to A-level sciences for many young people in maintained schools.

4

The introduction of Triple Science GCSEs should be seen within the context of other changes, some of which will have more direct impact on science provision than others, but all of which will affect the school curriculum as a whole. These include:

- the new curriculum for Key stage 3 and the growing practice of covering aspects of this in two years
- the introduction of the Diploma for 14–19 year-olds, for first teaching (in five lines of learning) in 2008 and as a student entitlement across all 17 lines of learning from 2013.

Why Triple Science GCSEs?

5

Schools that have offered Triple Science GCSEs for a number of years report the following benefits:

- the course adds diversity to the curriculum
- it satisfies parental demand
- it is an excellent preparation for A-level
- there is a 'halo' effect that improves the standard of science in the school
- the science staff enjoy teaching the course.

6

At the strategic level, the economic future of the country is dependent on a good supply of highly educated scientists. The Government has made a commitment to encourage all schools to offer Triple Science to students who could benefit with the objective of eventually increasing the numbers of science, technology, engineering and mathematics (STEM) graduates in the UK.

7

At the student level, Triple Science provides more opportunities to enjoy a greater breadth of knowledge and understanding of science and is one way of personalising the curriculum for young people that would benefit from more science.

Why a Triple Science Support Programme?

8

The Triple Science Support Programme has been put in place to help schools, managers and teachers plan, prepare and implement the Triple Science GCSEs. At the systemic level, the support programme should create momentum for change that leads to the entitlement becoming a reality in maintained schools in England.

This publication focuses on one of the themes of the programme – facilitating collaborative approaches to delivery.

Key features of collaboration

9

Most successful partnerships have some common characteristics such as commitment from senior managers from all partnership members, strong local leadership, a common vision with clear aims and objectives, good planning, management and organisation, effective team work, excellent communication strategies, ability to solve problems and find creative solutions, and effective strategies for managing change.

10

Schools looking to shift the culture from competition to collaboration need to ensure that strategic and operational partnerships add value for all concerned. They need to deal with emerging difficulties and use effective change management strategies to manage conflict and power relationships.

The many benefits of collaborative working include a strategic approach to planning the curriculum, greater range of provision and choice for students, effective use of resources, economies of scale, improved teaching and learning, and coherent staff development opportunities.

11

There are a range of different approaches to working collaboratively in the education communities, from informal arrangements between curriculum teams and heads of science in local schools to highly sophisticated collaborative delivery where partnerships have contractual arrangements with a range of providers. Some of these more formal partnerships involve staffing, funding, transport and development of new systems across several organisations. Different approaches have also been identified for urban, suburban and rural environments.

12

When a school is considering some form of collaborative delivery for Triple Science, initial research will establish its current strengths, weaknesses and aspirations, as well as any existing partnership arrangements, not only with other schools but with affiliated professional organisations, higher education institutions (HEIs) and employers, which could form the basis of future development.

13

Where a more formal partnership is being constituted a strategic planning group should be set up with senior management representation and authority to make decisions on, for example, aims, objectives and desired outcomes, student entitlement, models to use, communication strategies, resourcing and funding, health and safety, key legal responsibilities and risk assessment. Contracts and service-level agreements should spell out roles and responsibilities.

14

Each set of policy decisions identified by the strategic planning group should be accompanied by a set of strategies and operational procedures.

Putting in place these agreed procedures and protocols that everyone signs up to will support the transition from strategic to operational management and ensure that the partnership is effective. Teachers and pupils should be given an induction into any relevant protocols and health and safety procedures that are specific to the school they are visiting.

15

There are many professional associations and support organisations, including HE institutions and employers, that are keen to engage with schools, to support and update teachers, offer continuing professional development (CPD) and provide students with an insight into science in research and the world of work.

Section 1

Introduction and policy context

Who is the publication for?

This publication is aimed at school managers and teachers of science who are investigating ways of providing the Triple Science entitlement by working in partnership with others. It focuses on the benefits of collaborative working and the management and operational arrangements needed to make it work. Although the main driver for collaboration is to expand the science curriculum to include the Triple Science GCSEs, this will involve changes to the delivery of the whole science curriculum.

It provides practical advice and examples of good practice drawn from a range of sources such as our science partners, Science Learning Centres (SLC), the Institute of Biology (IoB), the Institute of Physics (IoP), the Royal Society of Chemistry (RSC) and other national bodies, which include Association for Science Education (ASE) and Secondary National Strategies, as well as some examples of schools currently delivering Triple Science.

It also draws on the lessons learned from partnership and collaborative delivery models developed through programmes funded by the Department for Children, Schools and Family (DCSF, part-successor to the Department for Education and Skills, DfES), such as the Increased Flexibility for 14–16 Year Olds Programme (IFP) and 14–19 Pathfinders.

There are many excellent case studies highlighting the strengths and weaknesses of different partnership arrangements available on the websites of the Qualifications and Curriculum Authority (QCA), the DCSF, Teachernet, Innovation Unit and Vocational Learning Support Programme (see Appendix 5 for web addresses).

They explore some of the issues and barriers experienced by many of the partnerships, different geographical arrangements, different models of collaborative delivery, transport arrangements, information, advice and guidance, curriculum models, assessment arrangements and work-based learning.

The key common strand to all these initiatives is their recognition that successful 14–19 education and training can be offered through effective collaboration between schools, colleges and other partners planning and delivering learning opportunities, sharing resources, expertise and specialisms.

Background

The Government believes that the future economic success of the United Kingdom depends on a good supply of skilled scientists and engineers. It aims to secure this supply by creating an education and training environment that delivers the best in science teaching and learning at every stage.

Key priorities for the Government

One of the Government's key priorities for action is to increase provision of the three separate science GCSEs. It is committed to ensuring the following.

- To enable young people with level 6 or above in science at Key stage 3 that would benefit to study Triple Science GCSEs from September 2008.
- To help specialist science schools offer Triple Science to all those students that would benefit.
- All schools are encouraged to make Triple Science available to all students who could benefit.

Since September 2007, all students have had a statutory entitlement to study the Key stage 4 programme of study.

Science at Key stage 4

GCSE Science (sometimes called core or single science) is the qualification that covers the statutory programme of study (PoS) for science at Key stage 4.

Most students take, and should continue to take, the equivalent of at least two GCSEs in science. Choices available include Additional Science, Additional Applied Science and Applied Science (double award, DA). These remain a viable route to A-level study in science.

Triple Science (TS) is a combination of three GCSEs in biology, chemistry and physics. It provides the fullest coverage of these three subjects at Key stage 4 and, taken together, the subjects cover the PoS for science. The courses cover an extensive range of subject matter and therefore prepare students well for progression to A-level.

The introduction of the new entitlement to Triple Science for students achieving level 6 or above at the end of Key stage 3 means that all schools are encouraged to make arrangements to meet it. The Triple Science Support Programme (TSSP) aims to provide resources, materials and training that will help schools not currently offering Triple Science to see the possibilities that exist, and make the appropriate decisions and curriculum arrangements for their own circumstances and their own students.

For details of the TSSP see *Preface* (page V).

Summary of science statutory requirement, statutory entitlement and non-statutory entitlement

Statutory requirement (GCSE) – all Key stage 4 students:

- one science GCSE (covering the Key stage 4 programme of study).

Statutory entitlement – all Key stage 4 students:

- two science GCSEs – schools will need to offer access to at least:
 - GCSE Science + GCSE Additional Science
 - or
 - GCSE Physics, GCSE Chemistry and GCSE Biology.

Non-statutory entitlement – Key stage 4 students who have reached level 6 in science at Key stage 3:

- three GCSEs: GCSE Physics, GCSE Chemistry and GCSE Biology.

This can be achieved through:

- GCSE Science units + GCSE Additional Science units + TS extension units.

Section 2

Why collaborate?

One of the Government's key aims for the 14–19 phase is for students to have greater freedom to choose programmes of study that meet their needs, capabilities and aspirations. Already many schools and colleges are working collaboratively to provide a wider curriculum choice at Key stage 4.

Most schools and post-16 organisations are partners in consortia developing and planning the delivery of diplomas. There is a wealth of information and excellent case studies on the 14–19 curriculum and 14–19 partnerships on www.dcsf.gov.uk/14-19

The range of new GCSEs in the sciences provides students with greater flexibility in the science curriculum allowing them to combine science GCSEs to match their interests, capabilities and aspirations (QCA 2005).

To meet the national entitlement for students who have achieved level 6 at Key stage 3, schools will need to build their capacity to deliver the Triple Science GCSEs in physics, chemistry and biology. For many schools this will involve working collaboratively with other schools, further education (FE) colleges and HE institutions – particularly where schools face shortages of specialist teachers, facilities or equipment. Collaborative ways of working, particularly to deliver Triple Science GCSEs, may be a new departure and for many schools a radical one, requiring a great deal of flexibility from students, teaching staff and institutions.

What are the benefits of collaborating?

Partnerships can bring together like-minded people with the same agenda to ensure better and more flexible provision. They encourage innovation and a sharing of resources as well as teaching approaches and strategies.

Individual members of the partnership have their own strengths, expertise and resources: what is perceived as a barrier for one partner may be resolved by another. Working together for a common purpose often generates creative solutions to overcoming barriers individual partners have experienced in their own organisations.

Increased collaboration could really help schools to meet the student entitlement at 14 to 16, encourage coherent curriculum planning, provide wider choice and smooth the transition between pre- and post-16 learning.

At a strategic level

Effective collaboration and partnership can:

- improve strategic relationships and planning
- avoid overlap and duplication
- provide economies of scale
- optimise the use of expensive equipment and resources
- bring together complementary skills
- increase the portfolio of provision across a local area
- create opportunities for employers and higher education to work collaboratively with a wider group of schools and students.

At curriculum delivery level

Effective collaboration and partnership can:

- promote opportunities for sharing of expertise and good practice
- create opportunities for joint CPD – building on the strengths and specialisms of partners
- overcome teacher isolation
- create appropriate and efficient group sizes by combining groups.

For students

Effective collaboration and partnership can:

- provide a wider choice of learning opportunities and qualifications
- improve progression opportunities
- improve transition
- access the specialist subject support and the academic, vocational and pastoral strengths of partner schools and colleges.

Benefits to other stakeholders

There are many stakeholders who have an interest in or brief for improving the numbers of students studying physics, chemistry and biology. For them working in collaboration with other partners would offer real benefits:

- for school and college cluster groups – sharing resources and teaching to deliver an enhanced curriculum
- for sixth forms – a potential supply of new students progressing from GCSEs
- for teachers and curriculum managers in a school – the sharing of resources and approaches to bring about real improvements in teaching and learning
- for national bodies charged with providing guidance, support and workforce development so that schools can increase their capacity to deliver – Secondary National Strategies (SNS), the Specialist Schools and Academies Trust (SSAT), SLC, ASE, IoP, IoB, RSC – provides a platform or network within which they can deliver their brief

- for HE institutions – the potential for a steady supply of new high-quality undergraduates
- for employers seeking a skilled workforce – a potential supply of employees who come with skills and knowledge that are relevant to requirements for science in the 21st century. Many large science employers are also keen to be involved with teachers and students to fulfil their corporate social policy and public engagement policy
- nationally – meeting the economic imperative – see the *Science and innovation investment framework 2004–2014*.

What are the issues facing schools?

Students' attitudes to science are strongly affected by learning and teaching methods, curriculum choice, assessment and the quality of teaching they experience.

School planning and management will be affected by expanding the curriculum offer to include Triple Science GCSEs in physics, chemistry and biology, at the same time as offering the full provision of science GCSEs and other science qualifications at Key stage 4.

Workforce development

Research from ASE (ASE 2006) suggests that the main factor determining attitudes towards school science is the quality of the education experience provided by the teacher. Thus, part of the explanation for student attitudes towards science may be a shortage of well-qualified science teachers capable of providing a positive experience – although this does vary between schools, regions and disciplines. Extending the science curriculum at Key stage 4 will increase the need for more general and specialist science teachers.

Forty-four per cent (44%) of specialists in science departments have qualifications in biology, 25% have qualifications in chemistry, only 19% have qualifications in physics and the rest are generalists.

The level of specialist qualification of the teacher has been found to be the second most effective predictor of pupil performance in physics, after pupil characteristics.

Planning to deliver the full science curriculum entitlement provides an opportunity to refocus on the teaching and learning of science, particularly as the theme How Science Works is common to all GCSE sciences, whether it be single science or Triple Science.

Analysis of the additional content required to bridge the gap between science GCSEs and Triple Science GCSEs will begin to identify skills shortages. Other gaps in teacher skills and knowledge may appear as the assessment for science GCSEs is extended to accommodate separately assessed physics, chemistry and biology.

Qualifications are only part of the picture in effective teaching and learning. An enthusiastic non-specialist with a confident delivery, which comes about with a thorough understanding of the topic, can often provide a far more worthwhile learning experience for pupils than an unimaginative but well-qualified subject specialist.

Some challenges that face curriculum managers are:

- how to improve the pedagogical skills of staff – the best ways of teaching science content and concepts to different groups of students
- the development of the pedagogical skills of staff teaching in an unfamiliar discipline area, eg biology graduate teaching physics
- how to expand the number of teachers of science to cope with increased demands of Triple Science.

Setting up local collaboration and partnerships, particularly where there are few specialists in a particular discipline, can provide opportunities to share and exchange continuing professional development and capitalise on networking opportunities provided by support organisations.

Teaching and learning approaches

The new programme of study (QCA 2005) will encourage a wider variety of teaching styles. There will be an increase in group work, discussions of ethical scientific issues based on contemporary applications, and applications of science. Ways of communicating scientific ideas will be more varied and accessible, reflected in the inclusion of 'Communications skills' in the How Science Works section of the programme of study.

Assessment approaches – including work-related topics

From 2006 all GCSE specifications must have a minimum of 25% internal assessment and 25% external assessment.

Examples of internal assessment (depending on the awarding body) include:

- work-related topics
- 'can do' tasks
- investigations
- assessment of presentations.

Examples of external assessments include:

- objective tests
- short-answer questions
- open-book assessments.

The benefits of specialists teaching each science are as important for single science and Double Science GCSEs but in those the aggregation process used to award the final grade(s) masks any weakness in one of the individual sciences. For Triple Science, these weaknesses would be more apparent.

Delivery models

One of the challenges facing schools will be designing the timetable to accommodate the extra time required to deliver the Triple Science GCSEs, ensuring that students have an enhanced experience in science as well as access to a wide curriculum choice in other GCSE subjects. To provide the total GCSE science packages along with additional opportunities for supplementary GCSE science subjects, such as astronomy, or accelerated provision (AS units in Year 11), will require some imaginative timetabling and collaborative approaches.

Many of the new science GCSEs are modular so curriculum planners should be able to analyse units and combinations to identify the TS extension units, topics and content that need to be delivered to provide the full range of science GCSEs.

Different models can be developed for extending the science curriculum, for example core and options, use of twilight sessions, starting in Year 9, delivering GCSEs in parallel or in series, collaborative delivery with other schools. These will involve developing more flexible timetable arrangements to allow schools to choose a delivery model that best suits their circumstances.

Detailed examples of different models are available in the Triple Science Support Programme publication *Triple Science GCSEs: curriculum planning and design*, available to download from www.triplescience.org.uk

Information, advice and guidance

Students, parents and careers advisers are among the groups that need to be aware of the new opportunities to study for different science qualifications. School sixth form staff should also be aware of the Triple Science curriculum and the impact on progression to A-level.

ASE research on attitudes towards school science (ASE 2006) shows that students become less positive from the ages of 11 to 16. The evidence from focus groups shows that children are interested in science but less interested than in other subjects.

It follows therefore that a carefully thought-out promotional strategy will be needed to ensure recruitment of the right target group to the Triple Science GCSEs and raise awareness with other stakeholders.

Twenty First Century Science has suggested that the student profile for Triple Science could be:

- able to learn science at an accelerated pace
- enjoys understanding scientific concepts and ideas
- enjoys reading about science beyond the course
- has a science-related leisure interest
- able to work independently
- likely to study science at AS or A-level.

For full details, see the OCR website www.21stcenturyscience.org

Through impartial information, advice and guidance students should be made aware of the implications of taking Triple Science for their other options and future career aspirations, as well as for preparation for A-level science.

Demands on resources

There will be greater demands on specialist equipment and laboratory space, as the timetable is expanded to cater for the full range of science GCSE provision and the introduction of many new topics.

Practical work is a distinctive feature of science education. External stakeholders often regard it as critical to improved student attitudes to science and the uptake of more advanced science courses. Research evidence (ASE 2006) also consistently shows that students like practical activity in class, often contrasting it with 'writing', which is unpopular.

Collaborating with other local schools and colleges, particularly specialist schools and technology colleges, to share teaching opportunities and equipment may provide a solution to increased demand. Employers and HE institutions may provide access to facilities that are not always available to schools and may be particularly relevant to the new topics in the Triple Science curriculum. Working with HE institutions and employers will also help contextualise school science, helping learners to see the relevance of science.

Changing the culture

In some areas where there has been a history of competition, or some schools are perceived as 'stronger' than others, there are likely to be considerable tensions and barriers to developing partnerships and collaborative ways of working. There will also be the temptation for schools to offer inducements or poach enthusiastic and skilled science teachers where there is a shortage. It may take a 'leap of faith' to move forward to working collaboratively.

Key points to address:

- workforce development – supply of teachers trained to deliver in the specialist subject areas
- different approaches to teaching and learning that are more engaging and relevant
- different approaches to assessment
- curriculum models and timetable arrangements – planning to deliver the student entitlement by 2008 and providing the full curriculum choice
- information, advice and guidance for students choosing their options as well as for parents
- recruitment – viability of small groups, capacity to deliver for high demand
- demand on resources, laboratories and specialist teaching equipment
- access to 'out-of-classroom' experiences, including higher education and employer links, to enhance the learning experience
- greater use of e-learning, video-conferencing and web technology
- changing culture from competition to collaboration.

Section 3

Partnership working

General characteristics of successful partnerships

At the heart of collaborative working there is usually the desire to raise standards, promote inclusion, find new ways of approaching teaching and learning, and build capacity. Working collaboratively often involves change.

Most successful partnerships have some common characteristics such as:

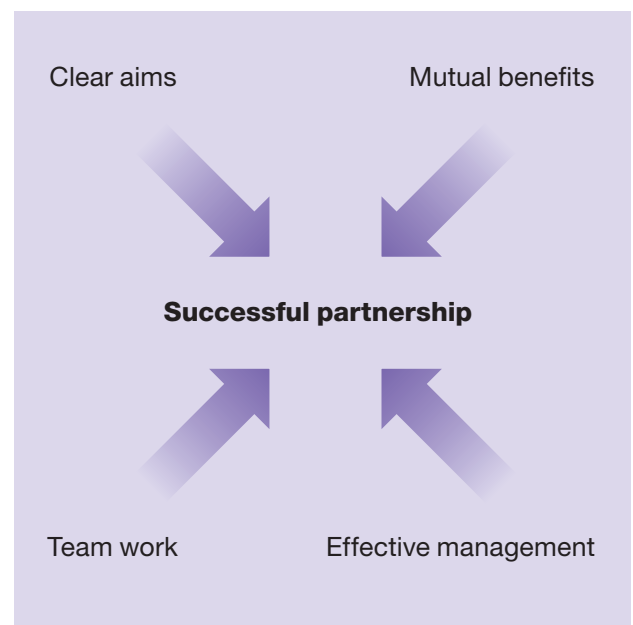
- commitment from senior managers from all partnership organisations/members
- strong local leadership, particularly at the outset to encourage project development
- agreeing a common vision with clear aims and objectives
- good planning, management and organisation
- effective team work
- excellent communication strategies
- ability to solve problems and find creative solutions
- effective strategies for managing change.

As with any successful team the composition of the group will influence how effectively it works. When setting up a partnership it is important to ensure the right balance of skills and knowledge and that there are group members with the skills to lead and motivate as well as to manage tensions.

The representatives of the different organisations in the partnership also need to have the autonomy to make decisions on behalf of the organisation.

In the early days of a partnership's life it is important to clarify the mutual vision, targets, roles and responsibilities and to establish what each partner hopes to achieve for their own organisation as well as for the partnership. It takes time for partners to establish trust and develop into a mature partnership with sharing of good practice, effective communication arrangements and working systems and procedures.

Figure 1
Characteristics of successful partnerships



Managing change

Effectively managing changes and preparing the teams of people who will be involved in implementing the partnership arrangements needs careful planning. The most effective initiatives are those that include a 'bottom up' as well as a 'top down' approach and involve listening to people's views and building on their experience, investing adequate resources such as meeting time and consultation time.

There are many management tools available for managing change and identifying and reducing the effect of barriers, including:

- problem-solving techniques
- process mapping
- forcefield analysis
- strengths/weakness/opportunities/threats (SWOT) analysis.

Examples of these can be found at www.tda.gov.uk/remodelling/managingchange/tools.aspx/

Ultimately, for collaboration to be successful it must make each individual more successful. For partnerships to work each member of the partnership needs to benefit.

Key points to address:

(LSN 2006/2)

- ensuring that strategic and operational partnerships add value for all concerned
- developing and implementing workable arrangements to achieve objectives
- working cross-sector where organisations may have different cultures and priorities
- meeting challenging targets effectively
- dealing with emerging difficulties and managing conflict
- managing power relationships, particularly where there are imbalances
- dissolving partnerships when they come to a natural end or have outlived their usefulness.

Examples of partnership models for delivering the science curriculum

There are a range of different approaches to working in partnership or working collaboratively in the education communities, from informal arrangements between curriculum teams and heads of science in local schools to highly sophisticated collaborative delivery where partnerships have contractual arrangements with a range of providers. Some of these more formal partnerships take the form of 'hard' federations and involve staffing, funding, transport and development of new systems across several organisations. Different approaches have been identified for urban, suburban and rural environments.

Local school (or college) cluster

This involves sharing delivery of the curriculum by sharing teaching, use of peripatetic teachers, sharing students, sharing resources/equipment, organising joint visits, mentoring, buddying, and joint planning and delivery of staff development.

A school partnership in Slough, which consists of a grammar school and two 11–16 schools, has been set up for KS5 teaching. All three schools are within walking distance of each other, so that travel times and delays are minimal. Of the five science staff, one is a physicist and the rest are biologists. Through the consortia students have access to a wider range of AS science units thus extending the KS5 science curriculum. This model could be expanded to provide a wider KS4 science curriculum.

See Case study 1.

Local and regional networks

Networks provide opportunities for teachers and managers to meet to discuss common issues of management, teaching and learning. They enable members to collaborate on resource development, common projects or to share staff development opportunities. Some networks have developed through support from national bodies such as SLC, IoP, IoB, and RSC (see Appendix 5 for web addresses) whereas others have evolved organically in response to local need. The flexible models of networks funded and managed by national bodies allow local schools to work with each other as well as HE institutions.

See Case study 2.

E-learning, virtual learning environments (VLEs), interactive web-enabled provision, video-conferencing and the use of IT in collaboration

Some communities have developed the use of technology to enable sharing resources within and across institutions, managing learning, assessment and monitoring and tracking student performance. These approaches are particularly relevant to rural communities where travel is difficult.

The use of electronic local area prospectuses has opened up access for students and parents to information on the courses available and progression routes.

See Case studies 6 and 7.

Partnerships with higher education and employers

Many HE institutions and employers are keen to engage with schools – to support and update teachers, offer CPD and provide students with an insight into science in research and the world of work.

Many science teachers in schools have links and affiliations with local and regional contacts in science related industries and research.

There are also many national arrangements that teachers can tap into such as:

- STEMNET helps schools and colleges access science, technology engineering and mathematics activities and experiences. It links businesses and other organisations that employ STEM-educated people with schools and colleges for young people to get a clear idea of the diverse and exciting range of careers open to them. See www.stemnet.org.uk
- SETPOINT contract holders offer information on national, regional and local initiatives that are available to schools in all areas of STEM education and can direct schools towards appropriate programmes that enhance science teaching and learning.

Research Councils UK

The Research Councils fund a variety of activities, resources and grant schemes. These are developed for teachers and others delivering science, technology, engineering and maths in schools. See www.RCUK.ac.uk/SIS

Some examples of these activities are:

- Working with the research councils, ASE have put all their e-resources onto www.schoolscience.co.uk. The site provides an enormous range of materials to enhance the science curriculum, showing teachers and students how what they have learnt in the classroom relates to the real world.
- Science and Technology Facilities Council (STFC) has laboratories at Daresbury in Cheshire, Rutherford Appleton (RAL) in Oxfordshire and the UK Astronomy Technology Centre at the Royal Observatory in Edinburgh. The laboratories offer schools a fantastic opportunity to interact with real scientists and real large-scale scientific experimental facilities. All the UK facilities have programmes of school visits, open days, special events and work experience and provide strong programmes of learning support and teacher CPD. See www.scitech.ac.uk

See Case study 10.

Working with scientists

There are several schemes that enable teachers and students to work directly with scientists, for example Researchers in Residence and the Science and Engineering Ambassadors scheme.

Working directly with ‘real scientists’, whether in school or in their place of work, gives students a picture of what scientists actually do and shows them as people with personalities and interests.

Students begin to see that science is a social activity in which communication is vital and which can involve travel to exotic places! They also experience the enthusiasm of practising scientists for their work and this is very often infectious.

See Case studies 11, 12 and 13.

Federations

The DCSF defines ‘hard’ federations, which have formal and binding commitments in two different ways:

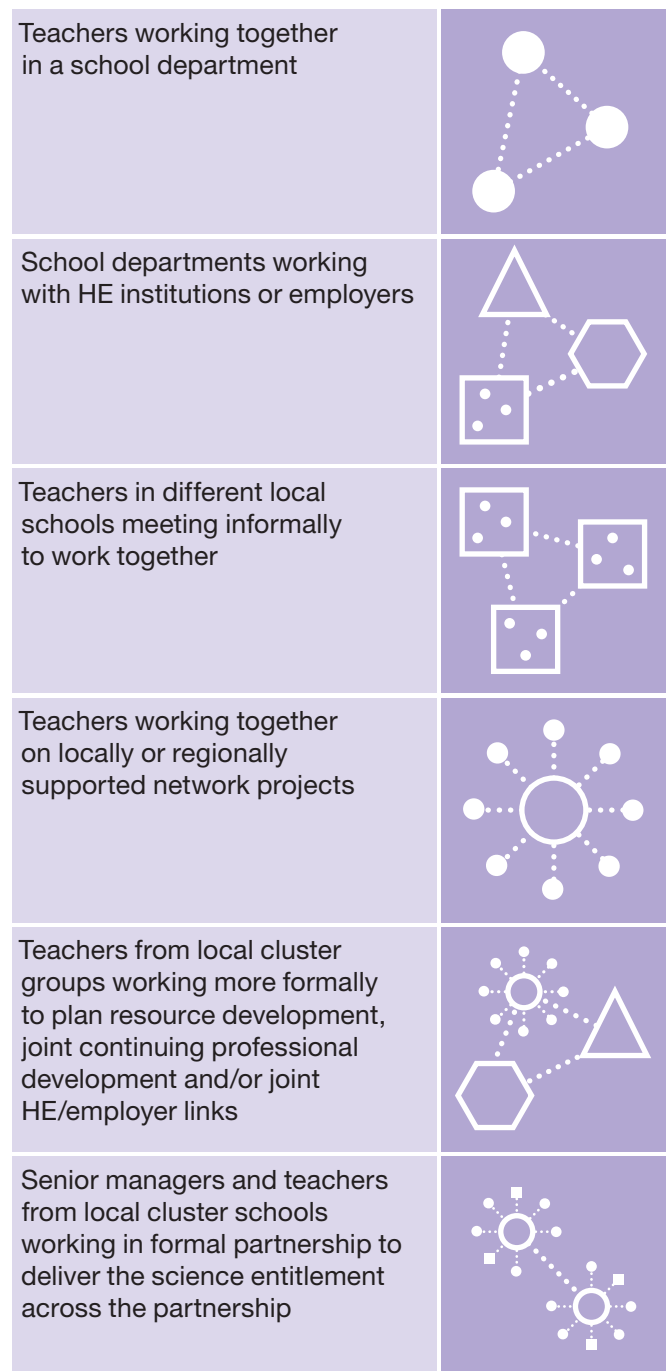
- the definition as invoked in the 2002 Education Act, which allows for the creation of a single governing body or a joint governing body committee across two or more schools from September 2003 onwards
- a group of schools with a formal (ie written) agreement to work together to raise standards, promote inclusion, find new ways of approaching teaching and learning and build capacity between schools in a coherent manner. This will be brought about in part through structural changes in leadership and management, in many instances through making use of the joint governance arrangements invoked in the 2002 Education Act.

Details of regulations, definitions and examples of good practice in developing federations are available at www.standards.dfes.gov.uk/federations/ and www.innovation-unit.co.uk/collaboration/ Schools need to take a measured and staged approach to cooperation and collaboration to ensure its long-term impact and success.

Summary: the collaboration continuum

Most schools are already involved in some sort of collaborative activity and it is useful to identify where you are now and take small incremental steps to extend your involvement with other partners.

Figure 2
Collaboration models



A specialist science college working in partnership

Case study 1

Swavesey Village College (SVC) is a Specialist Science College and offers a full range of science provision: single, double, applied and triple award GCSEs as well as BTEC First Certificate and Diplomas. The offer includes accelerated provision in Year 9 and AS qualifications in Year 11.

The science team from this 11–16 school works with a range of partners to increase levels of achievement, motivation and progression to post-16 sciences for all students at SVC and partner schools. The relationships that have developed include contributing to in-set for local primary school science teams, working strategically on joint development and CPD projects with other secondary and post-16 schools, as well as links with Cambridge University outreach teams. SVC has also forged strong links with a range of local business partners such as UCB Ltd, Bayer Crop Science, Nokia, ARM, MCI Services, St John's College, Cambridge and Anglian Water and Addenbrookes Hospital, who contribute to enriching and enhancing the science curriculum.

SVC is currently working on a Triple Science collaborative delivery project with Manor Community College and City of Ely Community College. The organisations involved have different experiences and needs in the delivery of Triple Science. The group is investigating a number of different curriculum models for the delivery of triple science:

- in dual award time
- over three years – starting in Year 9
- developing extension units online to allow access to Triple Science for small group numbers of students.

The group is involving industry partners such as Addenbrookes Hospital and Mott MacDonald as well as tapping into the expertise from Lead Practitioners Network groups, and the Cambridge Science Adviser. They are also liaising with Hills Rd Sixth Form College to investigate feedback from current A-level students on how their GCSE experience has prepared them for A-level.

Through this collaborative activity, developing curriculum models, the sharing of good practice and close involvement of industry partners the group anticipates there will be an increase in the uptake of both Triple Science GCSEs and A-level sciences as well as improved results.

A locally formed network

Case study 2

The Cambridge Biology Teachers Group involves 11–16, 11–18 and 16+ colleges in the Cambridge region plus various research institutes, companies, HE institutions and biology-based organisations. Eighteen schools and colleges in Cambridge and the surrounding area are involved in the network and new colleges are being recruited extending into Hertfordshire and Essex. Other partners include GlaxoSmithKline, the Wellcome Trust Sanger Institute, the Babraham Institute, the Gurdon Institute and MRC research institutes along with the University of Cambridge, Faculty of Education and the University Zoology Museum. Partnership facilitators include SETPoint Cambridgeshire, STEMNET East of England and The Britten Partnership.

The group meets twice a term. Half of the meetings are hosted by one of the colleges and a specific issue is discussed, for example the introduction of the new GCSEs in science, including Triple Science, sharing resources, the transition from GCSE to post-16 courses, vocational 16+ courses. The other meetings have been hosted by the Wellcome Trust Sanger Institute, Babraham Institute, the Gurdon Institute, the University Zoology Museum and the Darwin Correspondence Project and have included continuing professional development in new areas of biology.

The network aims to:

- foster a spirit of cooperation between biology providers
- share ideas, information and resources
- address common problems and challenges
- offer mutual support
- help biology teachers new to the profession
- discuss issues such as the introduction of the new science GCSE and the transition to 16+ courses
- arrange talks as part of CPD
- arrange teacher visits to research institutes and companies
- hold practical workshops
- facilitate joint activities between colleges and research institutes
- provide guidance on the types of courses available at the different institutions
- organise events and conferences.

There are many benefits for the different members. Since its inception in 2005 the group has grown in size and remit, and has created a strong network. It enables the research institutes, companies and HE institutions to access interested teachers. The regular meetings have inspired many friendships which are spawning many new initiatives.

Key to the success of the group is that it is local, no one has to travel great distances to meetings so attendance is high. A recent new dimension has been the recruitment of newly qualified teachers (NQTs) who can immediately be integrated into the local biology community and feel the benefits of a supportive network.

As a result of the success of the group, new biology teachers' groups are being formed in North Hertfordshire, North Essex and Bedfordshire and Luton and there are exciting possibilities of collaboration between these groups.

The website www.cambridgebiologists.org was set up to facilitate the work of the group and provides details of some of the local providers. It also has a forum for sharing ideas, promoting events, making requests for help and offers of help and floating institutions.

Nationally supported local networks

Case study 3

TSSP has been supporting 40 Triple Science networks throughout the nine English regions. Networks have been given the support of a consultant to help them formulate their action plans, based around the themes of the programme. The networks have been producing resources, schemes of work and CPD packages for delivering various components of physics, chemistry and biology GCSEs.

Network leaders are encouraged to use the Learning Community (open to all teachers) on www.triplescience.org.uk to exchange ideas and share resources.

All the resources produced from these networks as well as top tips for running Triple Science networks and case studies of different approaches to setting up networks are freely available to all Triple Science teachers by registering on the Learning Community (<http://community.triplescience.org.uk>).

A local network involving an independent school and four comprehensive schools

Case study 4

Collaborative development of resources and CPD to support non-specialist physics teachers

Surrey Physics TSSP network was established by several members of the Institute of Physics network in the south east to support Triple Science development through a TSSP project. The members were drawn from one independent school, Charterhouse, and four state comprehensive schools, Kings College, Guildford, Raneleigh School, Bracknell, Broadwater School, Godalming, Park Community School, Portsmouth and the Teacher Training Department at Reading University.

The focus of the network project was to produce interesting materials for physics teaching that are challenging but accessible to both teachers and pupils. The network members wanted to provide resources that would attract non-specialist physics teachers and enable them to access areas of the P3 curriculum where they may not feel confident. The topics chosen were:

- Bubbles – teaching about forces and motion
- Torches – teaching about how generators and capacitors work.

The resources, which included video clips of demonstration lessons, were produced by experienced physics teachers who were familiar with the difficulties of making these topics accessible to students. The resources included discussion on how to use the materials to develop skills in pedagogy.

The materials produced were tested with non-specialist physics teachers in science departments of the schools involved, as well as with PGCE students at a consortium of south west London teacher training institutes.

The project materials – which are all available on <http://community.triplescience.org.uk> – have been shared with the wider membership of the Surrey IoP network and there are already plans to use the ‘Bubbles’ topic to develop the materials for use in maths classes.

The network is broadening its membership for this year’s Triple Science collaborative partnership project and developing further resources for non-specialist physics teachers, along with a range of master classes and CPD activities.

Visit www.triplescience.org.uk to see the full Surrey Physics TSSP network case study.

A local network building on Diploma development and higher education partnership

Case study 5

Bradfield School – building a culture of collaboration through Diploma development

Bradfield School is an 11–16 school and specialist engineering college in a rural location in the north of Sheffield. The school has been offering Triple Science for more than six years. Since September 2008 the school has been offering the Diploma in engineering, for which it is the lead institution for a consortium of four schools. In the first instance students from one of the partner schools are attending classes on Wednesdays at Bradfield School. Sheffield Local Authority has played a major role in coordinating Diploma provision, and has coordinated links with local industry (BAe and Cadbury) across the Local Authority.

While the science department has been largely self-sufficient in delivering Triple Science, it has formed links with The University of Sheffield and made use of their RSC-funded ‘lab for schools’ to support teaching and learning in chemistry topic areas where staff have identified gaps in expertise. Staff at the university provide help with the teaching of these topics and access to specialised equipment for demonstration purposes.

In both engineering and science departments it is recognised that new technologies, the use of online resources and virtual learning environments (VLEs) hold rich potential for collaboration. The school and some of its partners are already part of the VLE platform (called FROG) where resources and materials can be posted for shared access. The school is also actively developing the use of video-conferencing. These facilities will give remote access to teaching and learning opportunities for groups of students from different schools and provide links with industry contacts.

While there is no direct link between the science curriculum delivery and the engineering Diploma, discussions are developing within the school about overall STEM provision. Setting up the Diploma has given the school valuable experience in partnership working, highlighting the importance of focusing at the early stages on creating the right climate and environment. The experience gained in unpicking some of the issues around developing a curriculum in partnership with other organisations, particularly the timetable arrangements to facilitate the movement of staff and pupils, will prove very valuable when developing partnership arrangements for other areas of the curriculum.

Visit www.triplescience.org.uk to see the full Bradfield School case study.

Using technology to support collaboration

Case study 6

Lewisham 14–19 federated partnership has developed technology strategies to support its collaborative delivery. The partnership has a sophisticated joint management information system (MIS), which is used by managers, teachers and students to support the delivery of the KS4 and KS5 curriculum. Within the partnership five schools use the system to support the delivery of the 14–19 curriculum, including the OCR Twenty First Century Science suite of qualifications.

The joint MIS enables all the partners to access information from their own and other institutions as appropriate. It can also provide regional information for the local authority (LA) and the Learning and Skills Council (LSC) as appropriate.

The learning platform, which supports virtual teaching, includes the use of video clips and video-conferencing along with:

- an electronic library
- schemes of work
- curriculum content

and integrates with the MIS system to produce electronic individual annual learning plans (using Fast Tomato software).

Features of the learning platform include:

- students save all their work electronically in their portfolio area
- teachers and students can see which learning activities have been completed by each student, or groups of students, and to what level
- simple tests can be marked electronically
- the production of regular reports, for self-assessment or target-setting, can be automated
- teachers can develop or adapt resources to create their own curriculum material
- collaboration areas to enable work with other students
- home or course work can be submitted and marked electronically
- a 'digital backpack' in development that will contain all essential information to support the student.

Many of these features are found individually on most learning platforms but system integration is needed to produce the whole range and Lewisham's system is well on the way to producing this integration.

Case study 7

The Kingswood Partnership is a 14–19 Pathfinder in the Bristol area comprising six secondary schools and an FE college. It is committed to raising levels of achievement and the participation of all young people in the Kingswood area by offering a broad, inclusive 14–19 curriculum framework.

An important component in achieving the vision is ‘Kingswood Online’, an e-learning platform linking 7000 students in schools, 30,000 in the college, (18,000 full-time), approximately 14,000 parents/guardians and 460 staff across the seven sites. Kingswood Online provides online learning and resources, linked data-management systems and online unified guidance, including individual learning plans (ILPs) for all students.

The Kingswood Partnership has contributed to success rates (after a journey) rising from 33% to 65%. Empowering students is key, and success has been achieved by giving students access to the technology they are accustomed to at home.

Using technology to support collaboration

Case study 8

Developing e-learning and a 'virtual school' – effective collaboration between a school, an external provider and STEM undergraduate students

Villiers High School is a large, mixed 11–16 comprehensive in Southall, Ealing, serving an ethnically diverse area. From September 2009, the school will be offering post-16 provision, including the International Baccalaureate (subject to authorisation) in partnership with three other schools. There is potential to build on these relationships for further collaboration in the science curriculum.

The school has invested significantly in ICT, including sets of laptop computers and a wireless network that supports ubiquitous access. This allows individual online access for students anywhere and anytime in the school and enables effective functioning of the 'virtual school'.

The school has first offered Triple Science in 2007/8 to a group of students (22 from a total GCSE entry of over 350) achieving a high success rate. At this time the school had some staffing shortages (no specialist physics teacher). The extension classes for these 22 students took place on Saturday mornings.

The head teacher has led the school in a parallel development – a pilot 'virtual school' with five other schools. This pilot offered alternative teaching and learning opportunities in science, mathematics and English for Key stage 3 pupils.

The school has also formed a partnership with Exscitec, an organisation offering STEM-based problem-solving activities for schools. Exscitec has involved undergraduate students from Imperial College in the partnership activities at Villiers High School.

The key elements of the collaboration have combined the Exscitec provision, the involvement of undergraduate students with high levels of subject knowledge, a range of technical and creative skills and the 'virtual school', resulting in:

- the development of a range of creative resources, including animations and quizzes relevant to the science curriculum – enriching and enhancing the science materials in the 'virtual school'
- the use of undergraduates as e-mentors for the students, who could e-mail questions relating to the activities on the 'virtual school'
- the contribution of undergraduates as role models for GCSE science students – as well as providing valuable information on science careers and progression opportunities.

The creation of the 'virtual school' shows the potential of e-learning and online provision in alleviating shortages of staff or gaps in staff expertise in delivering Triple Science.

Along with a review of the curriculum delivery, timetable and options, and building on the experience of delivering Triple Science in 2007/8, the collaboration with Exscitec and Imperial College undergraduates, development of the 'virtual school' and partnerships formed for the International Baccalaureate, the school is in a position to assess how best these developments can support the delivery of Triple Science.

Visit www.triplescience.org.uk to see the full Villiers High School case study.

Working with higher education

Case study 9

University of Bristol, School of Chemistry – supporting TSSP network

The 2008 network project, managed by Tim Harrison of Bristol University's Bristol ChemLabS, involved six schools – Winchcombe, Ridgeway, Colston's Girls, Katharine Lady Berkeley, Downside and Malmesbury. Bristol ChemLabS is the project name of the UK's Centre for Excellence in Teaching and Learning in practical chemistry. One of the main aims of the ChemLabS is to transform the student experience of practical chemistry and to set a new standard for laboratory-based science.

The School of Chemistry at Bristol University arranged aspirational visits for students and teachers in the network. These aspirational days gave the students a flavour of what it is like to be a chemistry student at Bristol for a day.

The Year 10 students worked on a series of organic chemistry practicals designed in conjunction with their school science staff to augment current work in their science and chemistry lessons. The afternoon sessions of talks and lectures ranged from 'life as a student', to postgraduate research on extremophile chemistry and a demonstration on some aspects of atmospheric chemistry.

Other activities included extracting caffeine from tea leaves and a performance of the highly topical *A pollutant's tale* by Tim Harrison.

The feedback from teachers and students highlights the importance of widening Year 9 and 10 science students' horizons beyond the school science labs. All the students were inspired by the lectures and had a great time in the lab, using equipment and trying methods they would never normally get the chance to. The practical work combined some principles that they had used before but with much more sophisticated and wonderfully high-tech equipment.

Bristol ChemLabS are extending their work with the TSSP network to include CPD activities for teachers.

Visit www.triplescience.org.uk to see the full full Bristol ChemLabS case study.

Working with higher education

Case study 10

The University of Cambridge Science Festival involves the University of Cambridge, schools in eastern England, Anglia Ruskin University and local scientific and technical companies.

Its aim is to give pupils an insight into studying science at university with over 100 open access events, from astronomy to zoology. There are talks, practical demonstrations and hands-on activities.

Each year during the Science Festival a number of highly sought-after places are offered to groups of GCSE pupils for 'science master classes'.

Visit www.cambridgescience.org for details.

There are a number of similar events around the country, for example the Cheltenham Science Festival which attracts thousands of children (and adults) each year. On a smaller scale, the Bath Science Festival attracts considerable interest from primary schools in and around Bath.

Working with higher education

Case study 11

Researchers in Residence facilitates a partnership between researchers from HE institutions, research institutes and teachers and students from secondary schools. The scheme also works in partnership with other organisations in related fields, such as the UK GRAD scheme, the BA CREST Awards scheme, Science and Engineering Ambassadors scheme, Science Learning Centres and the Royal Society.

Researchers in Residence aims to enrich the classroom experience of secondary-school students by placing a cutting-edge researcher in the school to:

- engage pupils with contemporary research to stimulate their interest and motivation in the social, physical, life and earth sciences and humanities, and by doing so motivate them to take up careers in those areas, especially where there are identified national shortages
- provide early-stage researchers with the opportunity to develop and use effective science communication and develop teamwork skills by working with school pupils.

The Researchers in Residence scheme recruits and trains researchers from all over the UK and then matches them with an appropriate 'host teacher'. Together the researcher and the host teacher decide on a programme of activities that the researcher carries out in the school with the school students.

Some of the activities include:

- talks about the latest research in a field, the ethics of research, life at university or even the process of research
- interactive activities such as practical work, discussion activities or education games
- a piece of project work or an investigation.

Residencies last between 14 and 24 hours and there is no cost to the school.

The scheme makes science more relevant and exciting, raises motivation among students, connects with a cutting-edge researcher who is both knowledgeable and passionate about their subject, provides a positive role model to challenge stereotypes, fosters links with a university or research institute and offers an opportunity for continuing professional development.

For the researchers it offers a rewarding and exciting experience, helping people connect with their research, developing their crucial communication, team work and interpersonal skills, enhancing their CV, and giving them the chance to engage with, and learn from, educationalists.

The scheme is funded by the UK's Research Councils or the Wellcome Trust and managed overall by the University of Edinburgh with nine Researchers in Residence regional coordinators in the UK, who facilitate and support the residencies.

Make contact at
researchersinresidence@ed.ac.uk or
www.researchersinresidence.ac.uk

Working with national organisations

Case study 12

The Science and Engineering Ambassadors (SEAs) scheme is the flagship programme of the Science, Technology, Engineering and Mathematics Network (STEMNET). The ambassadors are individuals from a wide variety of STEM backgrounds, from all across the UK, who offer their time, enthusiasm and expertise to help schools inspire young people. Their jobs range from marine biologists to aeronautical engineering apprentices, medical physicists to industrial chemists, electrical engineers to lab technicians. They get involved in activities such as:

- supporting school science and engineering clubs
- helping with school STEM competitions, events and awards
- assisting in extra-curricular STEM experiences
- offering mentoring, careers guidance and positive role models
- helping to provide work-based placements for teachers and students.

Employer collaboration

Case study 13

Many employers, particularly in large organisations, have a community liaison function; in research institutes there is often a requirement for some type of engagement with the public.

The most effective collaboration occurs when teachers establish a relationship with the employer or research institute and work on an activity package or professional development unit that does not conform to the usual visit or a talk.

The Wellcome Trust Sanger Institute works with schools to stimulate interest and encourage informed debate about the nature and implications of genetic and genomic science.

Students and/or teachers tour the largest genome centre in Europe and interact with contemporary researchers.

Subjects can include genomics and health (cancer, pathogens), understanding biology (proteomics, evolution) and the implications and impact of this research.

The Institute provides resources and activities for 14+ students and teachers including: onsite visits with cooperative and computer-based experiences, and student/teacher-focused on- and off-line resources. Professional development is offered through Science Learning Centres and resources. There are also opportunities for video-conferencing through the JANET Videoconferencing Service (JVCS) network. They are currently developing the 'Inside DNA: a genomic revolution' exhibition in partnership with At-Bristol science centre and Ecsite-uk (consortium of museums and science centres), which will travel the UK from November 2007.

The Institute has been recently commended for working with Hills Road Sixth Form College, offering tailored genomics and ethics-related updates and experiences for students completing an Open University unit on Human Genetics and Health.

The Institute encourages teachers to talk to them directly about visiting or developing their own knowledge of genetics/genomics. They are keen to embark on partnerships to develop resources and experiences that could be piloted with individual schools and then developed into resources/activities packages for other institutions, on or offsite.

For more information visit www.sanger.ac.uk/Teams/Team104/ or www.yourgenome.org

Section 4

Getting started

If you or your school are considering working in partnership with other schools, colleges or other organisations you need to think about your strengths and weaknesses, aspirations for the science curriculum and potential partners.

It is essential that you have:

- a clear and positive decision about the partnership at a strategic level, with full senior management and governance support
- a clear vision of why the partnership is being developed in the school development plan
- a high level of senior management commitment throughout the development, implementation and the embedding of the partnership and its activities, evidenced by the allocation of staff time and resource.

Partnerships are most effective when the vision and strategy are understood by all levels of the schools and colleges, and where teaching staff are involved in the early stages of planning.

Before approaching potential partners, carry out some initial research. This will save time in the long run and help in the planning stages.

Creating a team

Set up a small working group that could include members of the science team and a senior manager to carry out a needs analysis and establish the school's short- and long-term aims and objectives. Senior managers are likely to be involved at a strategic level with local 14–19 strategic groups and have good contacts and information on existing local collaboration.

Have a clear picture of your strengths and weaknesses and why you want to set up a partnership.

Do you want to:

- deliver an inspiring science curriculum?
- increase the provision offered and other learning opportunities?
- increase the uptake of physics, chemistry and biology GCSEs?
- develop staff skills and knowledge?
- improve access to resources and facilities?
- ensure progression for students?
- build up good relationships with other local schools and stakeholders?

What are your views on:

- good classroom teaching and learning?
- the amount of time needed to deliver the curriculum?
- progression opportunities?
- access to CPD?
- access to practical facilities?

How do you manage:

- out-of-school activities?
- industry research visits?
- visits from HE representatives?

Task for school science working group

Identify the components of the aspiration curriculum. Brainstorm ideas and rate your strengths and weaknesses. Use this to form the basis of what you have to offer a partnership and what you are looking for, what you can deliver in house and what you will need help with. Establish your list of criteria.

Figure 3
SWOT analysis

Strengths	Weaknesses
Opportunities	Threats

Your SWOT analysis should cover:

- current curriculum offer
- staff skills, expertise and capacity
- laboratories
- equipment and resources.

Learner voice – involving the students

When students are really engaged in shaping and leading their own learning and education it can result in benefits for students, teachers and the whole institution. It therefore follows that in planning changes to the science curriculum the students' voice should be heard and should influence decisions.

Identify the students who are thinking about option choices as well as those currently studying science GCSEs. Seek their views, using questionnaires, interviews or focus groups, on the strengths and weaknesses of the current provision, suggestions for changes and their aspirations and progression aims.

Which schools and colleges should be involved?

(LSN 2005/3)

Find out about what other schools and colleges have to offer through LA advisers, strategic 14–19 groups, local area prospectuses and school governors.

Further information can be found from school and college prospectuses, websites, Ofsted reports and LA science advisers.

There may be opportunities to work with sixth form colleges, FE colleges or specialist schools. Where there is sixth form provision there may be specialist physics, chemistry and biology teachers willing to provide support for CPD and with access to specialist resources and equipment. Specialist science schools have a remit to support other local schools with science curriculum and staff development.

Some post-16 consortia may already have been set up to offer area-wide provision of post-16 science subjects.

Identify the strengths and weaknesses of any existing collaborative arrangements

It is useful to collect information about:

- the range of provision to match the needs of your pupils
- achievement rates
- involvement with other school links or partners
- links with employers
- links with higher education
- resources and facilities
- local and national reputation.

What other partners can be involved?

LA advisers may help to broker partnership arrangements. Are there any contacts with local employers and HE institutions?

There are many organisations with local or regional branches that can offer support and guidance or regional networks. These include:

- Triple Science Support Programme
- Science Learning Centres
- Secondary National Strategies
- Association for Science Education
- Institute of Biology
- Institute of Physics
- Royal Society of Chemistry
- STEMNET
- Setpoint
- subject leaders' groups
- Specialist Schools and Academies Trust
- awarding bodies.

See Appendix 5 for details.

Tapping into information from these support organisations can also provide information about local arrangements.

Next steps for the science working group

- Identify the local schools and consortia that currently deliver physics, chemistry and biology provision.
- Find out what partnerships your school is already involved in. What are their strengths and weaknesses?
- Investigate other sources of support that are available, eg from local authorities, national organisations.
- Consider your own strengths and weaknesses and those of your potential partners. Match these to your criteria for partnerships. Select partners that will allow you to tap into resources or support previously unavailable to you.
- Think of the characteristics of a good partnership working – developing trust, team-working, and benefits to all members. How will you build this into your plans?
- Explore potential tensions that may arise in partnership working.
- Carry out a cost–benefit analysis of working in partnership.

Section 5

Setting up a partnership: strategic planning, leadership and management

If you or your school are considering working in partnership with other schools, colleges or other organisations once you are started you need to think about:

- strategic planning, leadership and management
- identifying appropriate and relevant partners
- partnership agreements and contracts.

For any partnership or working relationship, the characteristics identified in Section 3 – aims, team-working, trust and benefits – are relevant no matter the scale of activity. Maintaining some continuity as you introduce change can bring about improvement. You may want to take an incremental approach to partnership working, building on current small-scale collaborative activities rather than embarking on a large-scale formal partnership.

Although some of the topics in this section (DfES 2000) will be more relevant to formal partnership arrangements, such as service-level agreements and transport arrangements, most of the processes will apply to a greater or lesser extent.

Try the audits

At an early planning meeting with partners, try out the audits in Appendix 1. Electronic copies are available at www.triplescience.org.uk

Partnership strategic planning group

The purpose of this group will be to establish the strategic direction of the partnership. It should cover:

- aims, objectives and desired outcomes
- student entitlement
- scope of collaborative activities
- process of the development
- models to use
- roles and responsibilities
- communication strategies
- arrangements for managing and resourcing the partnership
- health, safety, staff and student welfare issues and key legal responsibilities
- risk assessment
- contracts and service-level agreements
- behaviour management policy
- timetabling harmonisation
- funding for transport arrangements.

A partnership strategic planning group could involve head teachers and senior managers as well as the curriculum heads likely to be involved in the delivery. It should be responsible for making strategic decisions, governance, leadership and legal and financial control.

It will also be responsible for creating a development plan and protocols for working practices. These will ensure that all members of the partnership have a common understanding of expectations, systems, roles and responsibilities.

Aims, objectives and desired outcomes

The fundamental drivers for collaboration must be the curriculum entitlement that all partners must offer their students. Schools working in collaboration are more likely to increase their capacity to offer the whole range of science qualifications and entitlement to all their students (see Audits 1 and 2).

Collaborations must build on the strengths of the individual partners. Long-term aims for the partnership should be considered.

Scope of collaborative activities

(See Audits 3 and 6)

The activities are likely to involve some or all of:

- workforce development – involvement in joint CPD, capitalising on staff expertise, mentoring, team teaching, staff exchanges and peer mentoring
- sharing equipment
- joint delivery of the curriculum:
 - sharing staff – where teachers move from one school to another to deliver parts of the curriculum
 - students moving from one institution to another to learn all or part of the curriculum
 - sharing visits and employer and HE engagement opportunities
- use of VLEs, managed learning environments (MLEs) and other uses of IT such as electronic portfolios.

Process of the development

The strategic group will set up a series of planning and development meetings with staff from each of the schools and organisations in the partnership. This is likely to include visits to each institution.

The key milestones in the implementation plan will reflect the stages of the academic cycle for students and inform the process:

- autumn Year 9 – options briefing evenings for parents and students
- spring/summer Year 9 – students chose their options
- Years 10 and 11 – students complete their programmes of study
- spring/summer Year 11 – students consider progression to post-16.

Models to use

Identifying capacity and establishing the current offer across the partner institutions will highlight gaps in provision and establish priorities for partnership delivery. The model that is chosen will depend on flexibility and synchronisation in the timetables as well as staff, resources and geographical location of the partners (see Audits 4 and 5).

There are many examples of curriculum models, along with strengths and weaknesses of each approach to be found in the TSSP publication *Curriculum planning and design* (see Appendix 6).

Try looking at the distribution of provision over the week and consider:

- introducing longer lessons
- using longer days
- introducing flexible days
- using the extended school day
- altering or suspending the timetable for specific periods.

The numbers of students enrolled for a particular subject may influence the direct teaching time allocated and the type of activities. For example, a small group of students gaining individual attention in a classroom may need a different approach from a large group. There may be an overlap in skills development where students on a fast-track GCSE maths programme are also studying physics GCSE.

Strategic decisions

The strategic planning group will have the responsibility for making decisions on 'who, what, where and how' based on the initial needs analysis, while operational teams will have responsibility for implementing decisions.

Who is involved?

- Which students and how many?
- Which teachers and curriculum heads?
- Which support staff?

What is the curriculum?

- Which subjects? Physics? Chemistry? Biology? Enrichment and extension for gifted and talented?
- Which units?
- Which awarding body?

When will it be delivered?

Consider:

- timetable planning, structure and flexibility
- can visits to other schools be occasional or full-day, conference-style arrangements or are they every week, fortnight?
- session plans, schemes of work, lesson plans
- flexibility for educational visits, guest speakers, work with employers and other specialists.

Where?

- Will students travel or will teachers travel?
- Are there alternatives to students travelling, such as use of VLEs?
- What are the transport arrangements – especially in rural communities?
- Will support staff accompany students?
- Has travel time been built in?

How will students be supported?

Consider:

- information, advice and guidance
- induction
- pastoral arrangements
- monitoring and progression
- access to learning resources at school and home.

Roles and responsibilities

Once the decision has been made to form a partnership, a range of staff from each organisation should be involved in plans from an early stage. This helps to develop ownership, build relationships and provide managers and teachers with the opportunity to influence decisions from an early stage.

It is important to identify a person from each institution to coordinate activities. This role is key to the successful implementation of any collaboration. The coordinator should have authority to act and have strong line management links to senior managers. Once operational plans are under way it is likely that the operational team will include heads of department, teachers, careers coordinators and heads of year.

Roles and responsibilities may be included in the 'service-level' or 'partnership' agreement and should cover responsibility for meeting legal, health and safety and insurance requirements, as well as curriculum and pastoral requirements. The partners should establish common standards and approaches to meeting legal requirements. The student's host organisation retains a duty of care but assigns some responsibility to the institution where students are travelling for their lessons. In any partnership activity there should be a lead partner so that responsibility can be assigned in the event of an accident and subsequent insurance claim.

Communication strategies

Effective communication strategies for all aspects of the partnership are key to encouraging ownership, 'buy in' and successful implementation. They include:

- common times for meetings of the strategic group and operational groups
- clear lines of communication with senior management, including line management
- communication protocols for effectively run meetings, such as agreed format for minutes, agendas and action points
- reporting and feedback between institutions re strategic partnership and operational management
- exchange of MIS and data transfer arrangements
- use of IT, e-mail, VLEs and video-conferencing for strategic group, operational management and e-learning.

Arrangements for managing and resourcing the partnership

Costs

(LSN 2006/2)

Partnerships vary in size and complexity, which makes it difficult to generalise about costs. However, the kinds of expenses likely to be incurred in a collaboration which involves more than one organisation delivering a joint curriculum are:

- management and communication
- administration
- consultation – student/parent voice
- HE, employer engagement and work experience coordination
- staff development
- transport
- e-learning
- information, advice and guidance.

Some other costs of collaboration, which vary greatly according to the nature of the collaboration and other local circumstances, include:

- partnership development costs
- outlay for development of materials
- overheads relating to curriculum planning, including joint timetabling, and curriculum design and development
- outlay for development.

Establishing robust funding principles is crucial to successful collaboration and must be resolved as soon as the model for collaboration is agreed. Collaborations should consider:

- developing several funding streams to sustain their initiatives
- transferring costs to the individual partners as soon as possible.

Health and safety and key legal requirements

Partnerships must set out their policies and harmonise their arrangements to ensure they meet their responsibilities of duty of care on health, safety and welfare and other key legal requirements such as insurance, staff vetting, attendance reporting, accident or serious incident reporting and transport. It is vital that strategic and operational responsibility is allocated. See Appendices 2–4.

Providing opportunities for disabled pupils

The Disability Discrimination Act 1995, as amended by the Special Educational Needs and Disability Act 2001, requires education institutions to take reasonable steps to ensure that a disabled pupil is not placed at a substantial disadvantage in comparison to pupils who are not disabled.

Risk analysis

When developing the plan a risk assessment should be carried out. ‘What if?’ scenarios and actual and potential risks should be evaluated in terms of the likelihood of them occurring, the impact they would have and control measures to reduce or eliminate the identified risks. School staff should be familiar with *Managing health and safety on educational visits* (DfES 1998) (see www.teachernet.gov.uk/wholeschool/healthandsafety/visits/) and confer with their school educational visits coordinator. Risk assessment can cover financial risks as well as the risk of the partnership not reaching its targets, individual members not being able to deliver or risks occurring due to disagreements and conflicts.

Contracts and service-level agreements

Service-level agreements will ensure that services that meet quality standards can be supplied to the partnership, particularly where funding is transferring from one organisation to another

Constraints and barriers

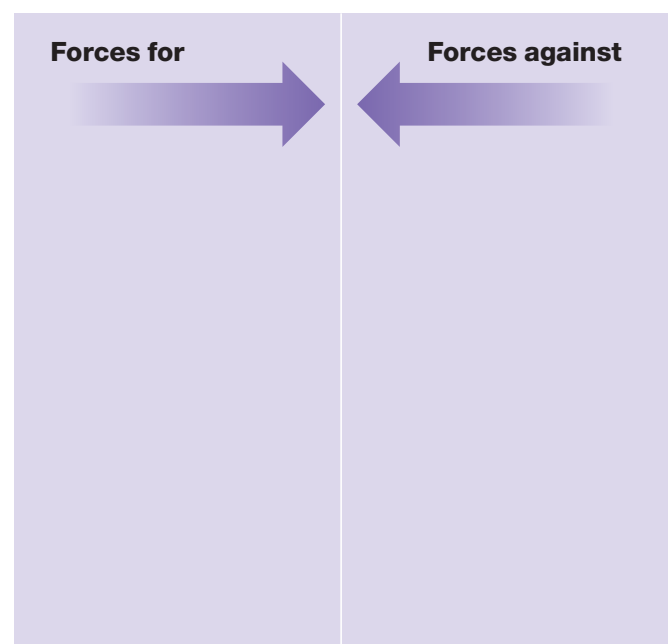
An important part of change management involves identifying potential constraints and barriers and taking steps to minimise these.

Using forcefield analysis to analyse the barriers

List the positive factors that favour your project plan, eg wider curriculum offer, improved staff expertise and factors that are against it, eg time constraints, cost of collaboration, staff morale, competition.

Develop creative solutions to increase the positive factors and tip the balance against the barriers.

Figure 4
Forcefield analysis



Summary: action points

Setting up a formal partnership – strategic plan

	What is the action	Who is responsible?	How is it communicated?
Setting up the partnership group			
Aims – what do we want to achieve?			
Entitlement			
Scope – what will it cover?			
What process will we use – steps in the plan?			
Which models?			
How will we resource it?			
What is our policy on health, safety, pupil welfare and other legal issues?			
How are we going to communicate the arrangements, particularly health and safety and pupil welfare responsibilities, to all the partners including parents and pupils?			
What are the risks?			
What contracts do we need in place?			

An electronic version of this document, which may be customised to meet the partnership needs, is available at www.triplescience.org.uk/search/Resource-30918.aspx

Section 6

Operational management: from strategy to implementation

Developing staff

Local collaborative groups and networks provide an ideal vehicle for sharing and exchanging staff development opportunities and for having a critical number of people involved in the training. Individual schools may have small numbers, with staff working in isolation.

Different members of the collaborative/network may have affiliations with different professional bodies, external organisations and awarding bodies with access to different sources of materials to support potential training topics such as:

- new specifications
- new assessment approaches
- new teaching and learning approaches
- new content and topics
- developing new resources
- working with employers
- working with higher education
- working collaboratively with other schools
- responsibilities and duty of care when working in partnership.

Planning joint staff training activities should address the following:

- needs analysis – including a timeline to agree when specific tasks will be completed
- establishing the time on the curriculum
- planning the programme
- arranging dissemination events
- embedding the plans in individual school plans
- coordinating the activity
- funding the programme.

Staff development models could include:

- accredited programmes
- online programmes
- peer mentoring.

Procedures, protocols and responsibilities

Each partner school should have a site coordinator responsible for managing and communicating the partnership arrangements on a day-to-day basis. The coordinators should have been involved in developing the operational procedures and should be line-managed by a senior manager from the strategic partnership group.

Each set of policy decisions identified in Section 5, *Setting up a partnership*, should be accompanied by a set of strategies and operational procedures.

Putting in place these agreed procedures and protocols, which everyone signs up to, will support the transition from strategic to operational management and ensure that the partnership is effective.

These protocols should also spell out the responsibilities of students, parents and the school staff for:

- learning agreements and target-setting
- feedback on progress
- parental agreements.

Partner organisations will need to plan student induction to ensure that students and their parents are clear about arrangements and expectations, and to ensure that students are inducted into the relevant health and safety procedures.

Duty of care

Through the process of setting up and communicating protocols the partner schools/college will ensure that they have discharged their responsibilities towards pupils in terms of **curriculum entitlement** as well as **duty of care** through:

- health and safety
- attendance and reporting procedures
- travel arrangements
- insurance
- vetting
- work-related learning and the law.

Health and safety

There is a clear duty on partnership organisations to review their health and safety policies, ensure compatibility, and create clear joint procedures and responsibilities that are agreed by all members of the partnership. Teachers and pupils should be given an induction into any relevant health and safety procedures that are specific to the school they are visiting.

See Appendix 2.

Attendance and reporting procedures

While pupils are away from their 'home' school on other premises the legal requirement to check their attendance and keep records remains the responsibility of the school where they are on the roll.

It is vital that each school takes responsibility for informing the partner key contact immediately an absence from school is known. Clear procedures and contact names are important so that:

- school teaching staff are informed of any reported absence
- pupils feel secure and opportunities for 'taking advantage' are minimised
- legal responsibilities are met for the recording of attendance of those under the minimum school-leaving age
- schools have made reasonable efforts to collate contact details to locate any pupil who has not arrived at a visiting school or college.

See Appendix 3.

Reporting progress

Schools in a partnership may need to agree on sharing baseline data such as attainment in National Curriculum tests taken during Year 9, forecasts of attainment and teacher assessments in related subjects such as mathematics.

The agreed reporting structure between partnership schools should be developed to coincide with the reporting structure for:

- parent report evenings
- decisions by students about next steps and progression
- school and college development planning.

Reports should take into account:

- students' progress against individual learning plans
- behaviour and conduct
- assessment grades
- attendance.

Travel arrangements

Where the curriculum model chosen involves students attending more than one school or college arrangements for travel and transport need to be considered.

The local geography will dictate the details and will vary from inner-city areas with good public transport links to more widely dispersed conurbations and scattered rural areas.

Progression towards independent travel is a valuable skill for adult life and where this is promoted schools should make this clear in communications to parents and pupils and have alternative arrangements for pupils with special educational needs. Furthermore, the school should consider providing alternatives where the journey involves potentially greater risks than the pupils' normal journeys to and from their school.

A number of local authorities and 14–19 partnerships have already developed transport arrangements that help them support more flexible 14–19 curriculum delivery.

Guidance and good practice examples are featured on the DCSF website at www.DCSF.gov.uk/14-19/ which provides information on:

- a range of customised local arrangements between institutions, including public transport and school/college minibuses
- partnership-funded dedicated bus services during the day which link schools and colleges
- extending existing home-to-school transport arrangements with passenger transport authorities to provide transport within the school and college day
- students using new or existing subsidised, concessionary or free travel passes and smart cards on public transport
- individual post-16 students having access to pooled transport
- a range of associated supervisory arrangements to ensure safety, good behaviour and good attendance
- accessing funding streams to finance transport arrangements.

Key points from 14–19 Pathfinders case studies

(Adapted from the DCSF website)

Gateshead:

- urban area, based around an education improvement partnership
- strategic planning, collaboration and annual review of arrangements in the light of curriculum changes
- transport kept to a minimum both in terms of travel time and distance
- use of a combination of transport arrangements to meet pupils' needs
- joint planning between FE college, three secondary schools and Gateshead Local Authority
- block timetabling of provision including common lunchtimes
- nominated institutions leading on particular specialised areas.

Shropshire:

- rural area – institutions dispersed making movement between them difficult
- provision based around five area partnerships
- increasing use of e-learning
- plans to utilise mobile provision.

Suitable and adequate insurance

Schools must check with their LEA (or directly with the insurers if they are an independent school) that suitable and adequate insurance cover is in place for the pupils studying off-site.

The school may wish to take the advice of the DCSF and consider arranging personal accident insurance, which gives compensation for permanent injury with negligence having to be determined (see discussion and details in *Work-related learning and the law* (DfES/0340/2006) and *Insurance: a guide for schools* (DfES/0256/2003) – downloadable from <http://publications.teachernet.gov.uk>)

It is advisable to discuss any concerns with the LA legal adviser, and the college concerned, to ensure that the main risks to young people will be covered. The principal ones are:

- injury to the pupils themselves
- injury to others on the premises
- injury to others not on the premises
- damage to, or loss of, college property
- damage to, or loss of, other property.

Instances giving rise to insurance claims occur infrequently but the risks are higher when pupils are:

- travelling from one site to another, whether independently or in transport provided by school, college or a local company
- out on visits organised by the school or college, including industrial visits.

Vetting arrangements

Again, where partnerships involve external providers, responsibility for vetting arrangements needs to be clearly identified.

See Appendix 4.

Work-related learning and the law

The statutory requirement for work-related learning is that schools include work-related learning in the curriculum for all students at Key stage 4.

Work-related learning is defined as planned activity that uses the context of work to develop knowledge, skills and understanding useful in work, including learning through the experience of work, learning about work and working practices, and learning for work.

For full details of the statutory requirement and case studies visit www.qca.org.uk/14-19/

As the new GCSE science curriculum places emphasis on work-based contexts and industrial processes, it makes sense to offer the work-related learning entitlement in a meaningful way to support the delivery of the curriculum.

Work-related learning opportunities include:

- undertaking tasks and activities set in work contexts
- learning from contact with personnel from different employment sectors
- engaging with ideas, challenges and applications from the business world.

See Case study 14.

Where partnership arrangements involve enhancement of the science curriculum by involving work experience or employer-linked activities the legal implications of work-related activities need to be clearly understood by schools in the partnerships, school–business link practitioners and providers.

Nationally available publications address the legal issues surrounding:

- school–college or school–training provider partnerships
- work experience and extended work experience
- enterprise and employability experience
- workplace visits
- work shadowing and ‘take your son/daughter to work days’
- residential experience
- business mentoring and e-mentoring programmes
- professional development placements.

These work-related activities are distinctive because they are either taught by people from the world of work and/or supported by employers at a place of work.

This means that schools need to be aware of the particular legal responsibilities arising from work-related activities. Schools have a general duty of care, which clearly extends to all the work-related activities listed above but there is also a range of legislation that is relevant to work-related learning programmes.

The other feature of work-related learning that has legal implications is that it is an activity involving partnerships. This adds complications, as it means that in the event of a problem, responsibility for the activity is often divided and there may be lack of clarity about who is legally responsible. This is why for every partnership activity one partner should be designated as taking the lead and making sure that risk assessments are undertaken and any necessary control measures are put in place.

Key points to address:

- staff, students' and parents' induction
- local coordination for partner schools
- procedures and protocols for operational management
- health, safety, duty of care and legal requirements
- responsibilities allocated and communicated to all relevant personnel.

Students investigate projects that demonstrate the application of science

Case study 14

During an industry day organised for 150 Year 10 students the focus was on the application of science in different work contexts. Students sampled different workshops, which were run by members of the science department working with visitors from local companies.

These included: working with a forensic scientist from the police force at a reconstruction of a 'crime scene', exploring the design of a new treatment plant during a visit to a regional water company and investigating the economics of waste disposal and the behaviour of raw materials at a nuclear research facility.

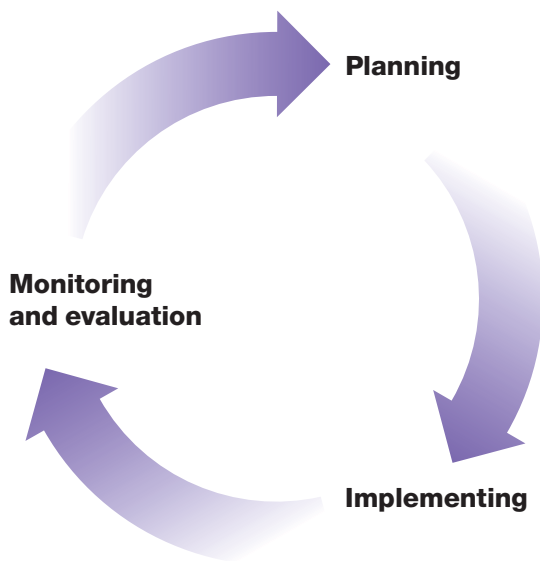
Students investigated how science was used and evaluated the benefits and drawbacks of scientific developments for individuals, businesses, communities and environments. They learned about local industry from working people and undertook scientific, work-related challenges.

Section 7

Evaluating the impact

Monitoring the success of any partnership agreements should be embedded in the planning cycle right from the beginning and should refer back to the aims of the partnership, whether it consists of an informal network arrangement to produce shared teaching and learning resources or a federation of schools working together on joint curriculum delivery.

Figure 5
Quality assurance cycle



Performance measures should relate to the aims of the partnership/collaboration and should link to individual school and partnership self-assessment reports and quality assurance systems.

Some factors to consider when monitoring performance and progress towards delivering the entitlement:

- improved student recruitment
- improved student retention
- improved student attainment
- improved progression
- teacher satisfaction via focus groups and questionnaires
- student satisfaction via focus groups and questionnaires
- a strong partnership team
- economies of scale.

Key points to address:

- What were the aims of the collaboration?
- Who was it intended to benefit?
- What were their needs?
- How was the collaboration implemented? Who? What? Where?
- What were the (six) critical success factors?
- What were the performance measures?
- What did the users say?
- How would we improve for the future?

A quality monitoring framework for a 14–19 partnership

Case study 15

Carlisle College developed a framework for monitoring levels of consistency and quality in the delivery and management of flexible curriculum for school-age pupils, typically in Years 10 and 11, either in the FE college or with other approved providers.

It provides quality criteria against which the various elements of the programme can be scrutinised. These criteria apply both to the home school and to the option provider in equal measures, in recognition of the importance of a partnership approach to pre-16 vocational options.

The framework is divided into criteria under five sections:

- management and coordination
- teaching and learning
- admissions guidance and support
- student entitlement
- professional development.

The criteria that have been included are not extensive but they have been identified as key quality indicators for the various aspects and stages of vocational programmes.

Use of the monitoring framework

The framework is intended to be implemented on a ‘peer-evaluation’ basis by a team of evaluators drawn from the schools, college and other parties involved in the vocational options programme. The methodology and timetable for implementing the framework and for evaluating any outcomes would be agreed in advance by all parties, and any necessary staff development on the use of the framework would take place before any monitoring exercise.

Feedback from the monitoring process would be used by the partnership to strengthen and develop its provision and would feed into any institution-wide quality and review systems.

Evidence for the monitoring team

The monitoring team should look for a range of appropriate evidence to support evaluation of whether or not criteria are being met.

Some of this may be documentary but discussions and so on with lecturers, support staff and, in particular, students are equally important.

Full details of the framework are available at www.vocationallearning.org.uk/regions/

References and bibliography

Note

In June 2007 the Department for Children, Schools and Families (DCSF) became part successor to the Department for Education and Skills (DfES). The DCSF is responsible for improving the focus on all aspects of policy affecting children and young people, as part of the Government's aim to deliver educational excellence. The DfES publications and resources listed opposite can now be found through the DCSF website.

- ASE (2006).
Science education in schools: Issues, evidence and proposals.
Association for Science Education.
- DfES (2000).
Partnerships that work: guidance for schools and colleges providing work-related learning for 14–16 year olds.
Department for Education and Skills.
- DfES (2006).
Evaluation of the Increased Flexibility for 14–16 Year Olds Programme 2006.
Department for Education and Skills.
- DfES (2006).
The Science, Technology, Engineering and Mathematics (STEM) report.
Department for Education and Skills.
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Work-related learning and the law.
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- HM Treasury (2004).
Science and innovation framework 2004–2014.
HM Treasury.
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Science and innovation framework 2004–2014: next steps.
HM Treasury.
- LSN (2004).
Pushing back the boundaries: working with employers and other partners.
Learning and Skills Network.

LSN (2005/1).

Building successful partnerships with business: a guide for teachers of the vocational curriculum.

Learning and Skills Network.

LSN (2005/2).

More than the sum, partnerships for adult learning and skills.

Learning and Skills Network.

LSN (2005/3).

Partnerships that work: guidance for schools and colleges providing work-related learning for 14–16 year olds.

Learning and Skills Network.

LSN (2006/1).

14–19: transition, an aid to partnership working practices.

Learning and Skills Network.

LSN (2006/2).

Developing 14–19 collaboration.

Learning and Skills Network.

LSN (2006/3).

Planning and managing curriculum change.

Learning and Skills Network.

LSN (2006/4).

Strategic planning: a practical handbook for schools, colleges and their partners.

Learning and Skills Network.

QCA (2005).

Science: changes to the curriculum from 2006 for Key stage 4.

Qualifications and Curriculum Authority.

ISBN 1858387647.

Online resources

Training and Development Agency for Schools (TDA): remodelling tools are available at www.tda.gov.uk/remodelling/

OCR: Twenty First Century Science training pack is available at www.21stcenturyscience.org/support/training-materials,1495,NA.html/

Qualifications and Curriculum Authority (QCA): collaboration resources are available at www.qca.org.uk/collaboration/

Appendix 1

Auditing existing arrangements and aspirations

One of the early stages of partnership planning is to establish what arrangements and resources individual members have in place to deliver the science curriculum content. The set of audit documents on pages 53–55 may provide relevant information across the partnership, and help to prioritise areas for common development.

Electronic versions of these documents, which may be customised to meet the partnership needs, are available at www.triplescience.org.uk/search/Resource-30917.aspx

Audit 1
Current provision of Triple Science and other science qualifications at Key stage 4

Audit 2
Curriculum entitlement

Audit 3
Staffing – management, teacher and technician

Audit 4
Laboratories, equipment and facilities

Audit 5
Timetable arrangements

Audit 6
Affiliations, collaborative arrangements, support mechanisms and CPD

Audit 1

Current provision of Triple Science and other science qualifications at Key stage 4

What is your awarding body? How many students currently study each subject?

	School A		School B		School C		School D	
	AB	Student numbers	AB	Student numbers	AB	Student numbers	AB	Student numbers
Physics								
Chemistry								
Biology								
Science GCSE								
Additional science GCSE								

Action points for partnership team

Audit 2

Curriculum entitlement

What are the short-term and long-term entitlement aspirations?
How many students do you anticipate will study each subject?

	School A		School B		School C		School D	
	Short-term numbers	Long-term numbers	Short-term numbers	Long-term numbers	Short-term numbers	Long-term numbers	Short-term numbers	Long-term numbers
Physics								
Chemistry								
Biology								

Action points for partnership team

Audit 3

Staffing – management, teacher and technician

What is the management structure? What do teachers consider their subject specialism?
How many support staff/technicians are available? Where are the gaps?

	School A		School B		School C		School D	
	Managers/ Heads of department	Support staff/ technicians	Managers/ Heads of department	Support staff/ technicians	Managers/ Heads of department	Support staff/ technicians	Managers/ Heads of department	Support staff/ technicians
Physics								
Chemistry								
Biology								

	School A	School B	School C	School D
	Subject-specialist teachers	Subject-specialist teachers	Subject-specialist teachers	Subject-specialist teachers
Physics				
Chemistry				
Biology				
Other (give details)				

Action points for partnership team

	School A	School B	School C	School D
	E-learning opportunities	E-learning opportunities	E-learning opportunities	E-learning opportunities
Extended school day opportunities (give details)				
Starting GCSE in Year 9 (give details)				

Action points for partnership team

Audit 6

Affiliations, collaborative arrangements, support mechanisms and CPD

What access does your school have to networks, subject-specific organisations, 14–19 collaborative arrangements or local authority (LA) support.

	School A	School B	School C	School D
Science networks				
National subject organisations				
14–19 collaborative arrangements				
LA support networks				

What arrangements are in place for staff development – eg in house, whole school, via team meetings or external training courses (regularly or *ad hoc*)? Give details of when it takes place, and which staff – teaching, support or management.

	School A	School B	School C	School D
Type of support eg in house				
When?				
What staff?				

Action points for partnership team

Appendix 2

Duty of care requirements

The Health and Safety at Work Act 1974 and associated regulations places health and safety responsibilities on employers. This means that the employer of school staff, either the LEA (for community, community special and voluntary controlled schools) or the school's governing body (voluntary-aided, foundation and foundation special schools), is responsible for ensuring the health and safety and welfare of school staff and the health and safety of pupils and visitors, both in school and on school activities. The employer is also responsible for risk assessments of activities and introducing measures to control those risks.

Full details of general health and safety requirements as well as those specific to the science curriculum can be found on www.teachernet.gov.uk but there are key points opposite.

See *Health and safety of pupils on educational visits* (DfES 1998), *Be safe: an introductory guide to health and safety* (LSC 2005) and *Staying safe: a consultation document* (DCSF 2007) for more details.

Key elements of a health and safety policy

- A general statement of policy.
- Delegation of duties as allocated tasks.
- Arrangements made to put in place, monitor and review measures necessary to reach satisfactory health and safety standards.
- Training of staff in health and safety including competence in risk assessment.
- Off-site visits including school-led adventure activities.
- Selecting and controlling contractors.
- First aid and supporting pupils' medical needs.
- School security.
- Occupational health services and work-related stress.
- Consultation arrangements with employees.
- Workplace safety for teachers, pupils and visitors.
- Violence to staff.
- Manual handling.
- Slips and trips.
- Onsite vehicle movements.
- Management of asbestos.
- Control of hazardous substances.
- Maintenance and when necessary examination and test of plant and equipment such as electrical equipment, local exhaust ventilation, pressure systems, gas appliances, lifting equipment and glazing safety.
- Recording and reporting accidents to staff, pupils and visitors – including those reportable under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR).
- Fire safety, including testing of alarms and evacuation procedures.
- Dealing with health and safety emergencies – procedures and contacts.

Key elements of health and safety relating specifically to the science curriculum

The health and safety statement in the National Curriculum applies to a number of subjects including science.

For pupils

When working with tools, equipment and materials in practical activities and in different environments, including those that are unfamiliar, pupils should be taught:

- about hazards, risks and risk control
- to recognise hazards, assess consequent risks and take steps to control the risks to themselves and others
- to use information to assess the immediate and cumulative risks
- to manage their environment to assure the health and safety of others
- to explain the steps they take to control risks.

For teachers

- Complying with the guidelines laid down by employers.
- Adhering to the recommended health and safety practices and procedures including consulting the employer's appropriate model risk assessments.
- Reporting any deficiencies and defects in administering the procedure.

Health and safety requirements for school visits and transport

There is a clear duty on partnership organisations to review their health and safety policies, ensure compatibility and create clear joint procedures and responsibilities which are agreed by all members of the partnership. Teachers and pupils should be given an induction into any relevant health and safety procedures that are specific to the school they are visiting.

Appendix 3

Improving school attendance

(DfES 2006)

Effective attendance practice in schools suggests useful approaches are to:

- demonstrate a strong attendance ethos
- have a clear policy on absence
- have effective, non-bureaucratic systems for monitoring attendance
- use attendance data and other information to improve school and pupil performance
- promote the importance and legal requirements of good attendance to pupils and their parents/carers
- intervene early when individual pupil absence gives cause for concern
- have support systems in place for vulnerable pupils
- reward and celebrate good and improved attendance
- make best use of additional support for pupils and parents with greatest need

and to use effective, non-bureaucratic systems for monitoring attendance which have:

- clear procedures for staff, parents/carers and pupils for accurate recording and reporting
- appropriate training and support for staff using the system
- consistent use by staff of the absence codes for recording absence
- monitoring of the quality of data recorded by staff and procedures to deal with any concerns
- a daily system for checking the attendance of pupils on approved educational activities off-site
- procedures to resolve unexplained absences within a week
- electronic registration systems where appropriate.

Improving school attendance: forward strategy for 2006–07 and beyond (DfES 2006) available to download free from the DCSF website.

Appendix 4

Vetting arrangements

Comprehensive guidance on child protection came into force from 1 January 2007 under the Every Child Matters programme. The guidance, *Safeguarding children and safer recruitment in education*, can be downloaded from www.teachernet.gov.uk/publications/

It addresses the issue of when volunteers working with children would be eligible for and should be given an enhanced Criminal Record Bureau check (paragraph 4.56). This is based on the discretion of the head teacher/principal and depends on factors including the duration, frequency and nature of contact with children, formal and informal information about them, whether they are well known and give cause for concern, and whether they have employment and can provide references.

Appendix 5

Useful organisations

Note

Three new departments were set up by the Prime Minister on 28 June 2007. They replace the Department for Education and Skills (DfES) and the Department of Trade and Industry (DTI). The Department for Children, Schools and Families (DCSF) is responsible for improving the focus on all aspects of policy affecting children and young people, as part of the Government's aim to deliver educational excellence. The DfES publications and resources listed below can now be found through the DCSF website.

Curriculum planning

For details of the secondary curriculum review and the new secondary curriculum, see www.qca.org.uk/qca_11717.aspx/

The QCA 14–19 learning website – www.qca.org.uk/14-19/ – includes discussion and case-study examples of many aspects of curriculum planning.

See www.qca.org.uk/14-19/6th-form-schools/68_239.htm/ for the advantages and disadvantages of organising a Key stage 4 curriculum into different pathways.

For various aspects of collaboration see www.qca.org.uk/14-19/6th-form-schools/68_91.htm/

For guidance on the Personal Development curriculum see www.qca.org.uk/14-19/6th-form-schools/68_1191.htm/

The Secondary National Strategies are available at www.standards.dfes.gov.uk/keystage3/subjects/science/

For guidance on delivering and developing the Diploma see

www.qca.org.uk/qca_10449.aspx

www.qca.org.uk/qca_13909.aspx

www.qca.org.uk/qca_13949.aspx

Collaboration

For details of programmes and initiatives involving collaboration along with case studies, evaluations and helpful checklists of good practice, try:

www.DCSF.gov.uk

www.innovation-unit.co.uk/collaboration/

www.ofsted.org.uk

www.QCA.org.uk

www.vocationallearning.org.uk

Information on the Independent State Schools Partnership projects can be found on www.teachernet.gov.uk/wholeschool/buildingbridges/

Professional associations

For general information relating to the changes to Key stage 4 sciences try looking at the websites of professional associations and subject associations. They may also be able to provide additional support, resources and continuing professional development.

Association for Science Education
www.ase.org.uk

Association for Science Education/
Sheffield Hallam's Centre for Science Learning
www.upd8.org.uk

Association of British
Pharmaceutical Industries
www.abpischools.org.uk

BBC science and nature news
www.bbc.co.uk/sn/

Becta
www.becta.org.uk

British Association for Advancement
of Science
www.the-ba.net

Earth Science Teachers' Association
www.esta-uk.org

Guardian Unlimited
www.guardian.co.uk

Institute of Biology
www.iob.org

Institute of Physics
www.iop.org

Learning and Skills Network
 (vocational learning)
www.vocationallearning.org.uk

National Science Learning Centre (The)
www.sciencelearningcentres.org.uk

New Scientist
www.newscientist.com

Royal Institution of Great Britain
www.rigb.org

Royal Society (The)
www.royalsoc.ac.uk

Royal Society of Chemistry
www.rsc.org

SciDevNet
www.scidev.net

Science and Technology
 in Society (SATIS) from ASE
www.ase.org.uk

Science Learning Centres
www.sciencelearningcentres.org.uk

Secondary National Strategies
[www.standards.dfes.gov.uk/
 keystage3/subjects/science/](http://www.standards.dfes.gov.uk/keystage3/subjects/science/)

SEMTA (useful for applied science)
www.semta.org.uk

Specialist Schools and Academies Trust
www.schoolsnetwork.org.uk

Teachers' TV
www.teachers.tv

Twenty-first Century Science website, run
 by the Nuffield Curriculum Centre and the
 University of York Science Education Group
www.21stcenturyscience.org

Awarding bodies

The awarding bodies' approved specifications and sample assessment materials can be found on their websites, together with information about the guidance and training they will offer to support their specifications.

AQA
www.aqa.org.uk

CCEA
www.ccea.org.uk

Edexcel
www.edexcel.org.uk

OCR
www.ocr.org.uk

WJEC
www.wjec.co.uk

Change-management tools

Find examples at [www.tda.gov.uk/
 remodelling/managingchange/tools.aspx/](http://www.tda.gov.uk/remodelling/managingchange/tools.aspx/)

Teachers' groups

www.cambridgebiologists.org

University of Cambridge Science Festival
www.cambridgescience.org

researchersinresidence@ed.ac.uk
 or

www.researchersinresidence.ac.uk

www.sanger.ac.uk/Teams/Team104/
 or

www.yourgenome.org

Details on regulations, definitions and examples of good practice in developing federations

www.standards.dfes.gov.uk/federations/
 and www.innovation-unit.co.uk/collaboration/

Appendix 6

LSN science publications

Resources for your Triple Science courses: GCSEs in biology, chemistry and physics

This resources guide lists many of the currently available resources, and for each listing there is a short description including suggestions on recommended usage.

Learning and Skills Network, 2008

Free

Tel 0845 071 0800

www.triplescience.org.uk

Triple Science GCSEs: curriculum planning and design

This publication will provide managers and others with practical advice on how to plan, develop and model the Triple Science requirement – taking into account all the critical factors that need to be considered.

Learning and Skills Network, 2008

Free

Tel 0845 071 0800

www.triplescience.org.uk

Triple Science GCSEs: strategies for raising attainment

LSN's raising attainment publication is designed for practitioners. It covers:

- teaching and learning for motivation and understanding
- assessment and use of data
- examination techniques for students
- underpinning school policies and strategies
- advice on examinations and assessment for teachers.

Learning and Skills Network, 2008

Free

Tel 0845 071 0800

www.triplescience.org.uk

Teaching Triple Science: GCSE Biology Teaching Triple Science: GCSE Chemistry Teaching Triple Science: GCSE Physics

LSN has commissioned three subject-specific publications aimed at helping practitioners tackle some of the main issues in delivering the separate sciences. Written by acknowledged experts in these subject areas, the books provide practitioners with up-to-date and useful guidance on:

- the major differences between Double and Triple Science
- teaching and learning modules, particularly focusing on areas known to be delivered less well in schools
- teaching resources and assignments to promote student-centred problem-solving activities.

Learning and Skills Network, 2008

Free

Tel 0845 071 0800

www.triplescience.org.uk