

Working with Schools in STEM Public Engagement

Guidelines for research centres

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Contents

Acknowledgements	3
Purpose of the guidelines	4
Getting started	5
What are the key elements for adopting a strategic approach?	8
How do you make things happen?	12
Reviewing achievements	18
Sources of support and advice	19

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Purpose of the guidelines

“We will expect all of our major research groups to engage with the public about their work and will offer them support and training to do so.”

Wellcome Trust Strategic Plan 2010–2020

Efforts to engage the wider public with science, technology, engineering and maths (STEM) have increased significantly in recent years. Many organisations aim their activities at young people to generate interest in STEM subjects and careers in STEM-related occupations. An obvious route to this audience is establishing ongoing relationships with schools.

These guidelines arise from a study of current practice in 11 Wellcome Trust-funded research centres.¹ Across the centres there is a great deal of good activity occurring with schools, and the overall commitment to this work is high.

The purpose of these guidelines is to support the research centres, and other organisations, in improving the quality, quantity and range of activities they provide. In particular, these guidelines aim to encourage a more strategic approach to public engagement work with schools so that it is an integral and important part of the research centres’ overall plans and activities.

Although these guidelines focus on taking a strategic approach to developing relationships with schools, the principles apply equally to establishing public engagement more widely as an integral part of the activities of research centres. Indeed, centres may wish to develop an overall strategy for their public engagement work, within which establishing relationships with schools is a major element.

Structure of the guidelines

The guidelines:

- pose a series of questions that centres should consider in developing a more strategic approach to their work with schools
- provide some practical advice on implementing programmes and activities
- through a series of short case studies, illustrate ways in which some of the challenges might be addressed.

The guidelines are set out in five sections:

- ‘Getting started’ (page 5), which sets out the model on which these guidelines are based, presents the questions that will be addressed and shows how the different sections relate to each other.
- ‘What are the key elements for adopting a strategic approach?’ (page 8)
- ‘How do you make things happen?’ (page 12), which looks at the practicalities of establishing relationships with schools and the provision of different types of activities.
- ‘Reviewing achievements’ (page 18), which considers issues of monitoring, evaluation and impact.
- ‘Sources of support and advice’ (page 19), which provides a list of sources of advice and support, principally for the UK.

It is essential to note that every organisation operates in its own set of circumstances, which influence its decisions and actions. Consequently, the guidelines do not provide a one-size-fits-all prescription; rather, by addressing questions and presenting case studies, they offer suggestions about how work with schools might be improved.

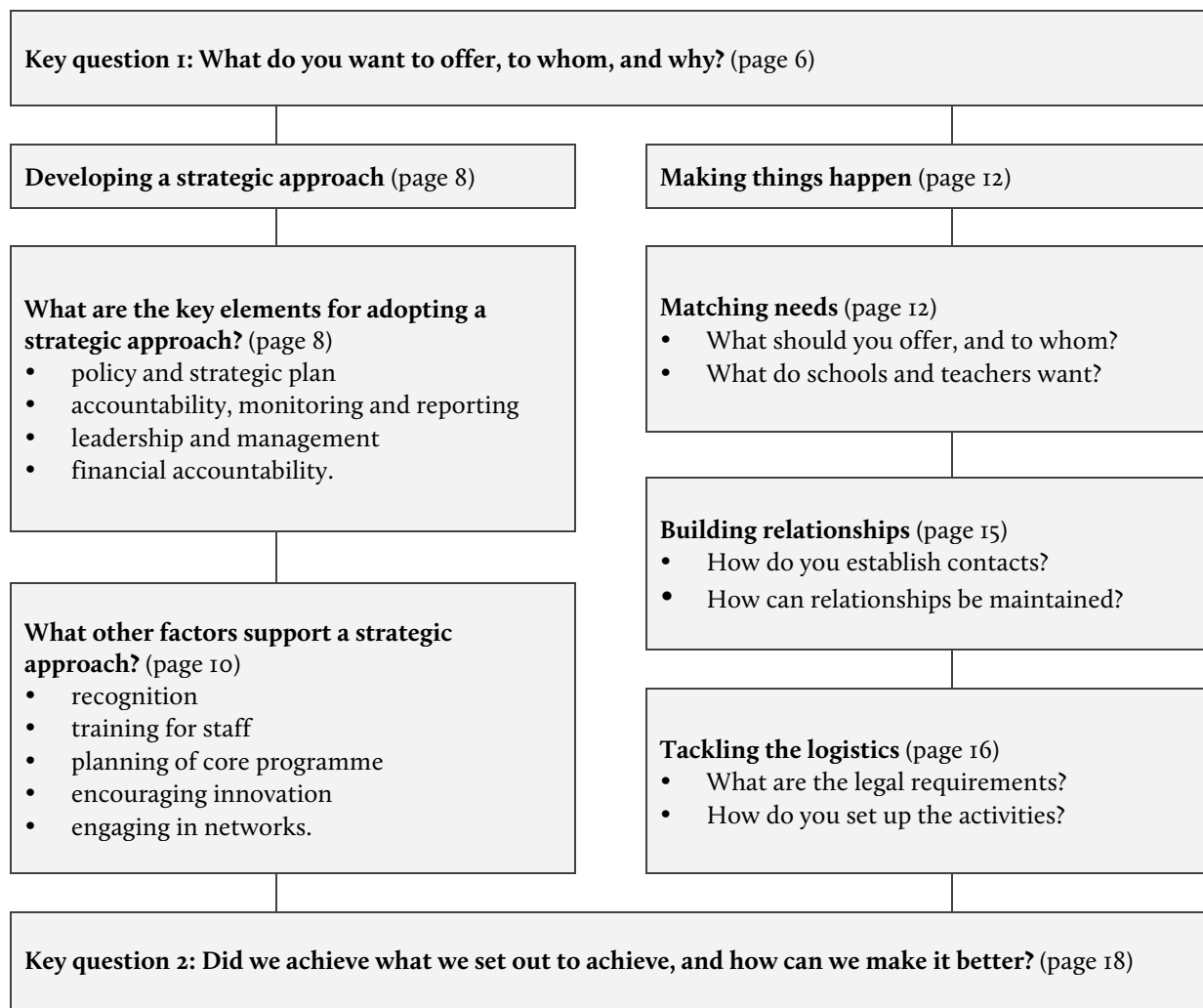
¹ Bell D. Working with Schools in STEM Public Engagement: A report for the Wellcome Trust examining approaches taken by Wellcome Trust-funded research centres.

Getting started

Getting started (or, more precisely, knowing where to start) when working with schools can be difficult. The first step is to think about where you are, then where you want to go and how you might get there. There are many options, so being able to see the bigger picture can help guide the process.

Figure 1 provides a model for these guidelines. There are two key questions linked by two interrelated strands of activity, which together should lead to more effective programmes.

Figure 1.



Key question 1: What do you want to offer, to whom, and why?

There are many things that can be done when working with schools and nearly as many reasons for doing them. Time spent giving some thought to this question will help to clarify:

- the purpose of working with schools, in terms of overall objectives and specific activities
- the audience the work is aimed at, whether that is all types of school or a defined subset
- the scope of the programme and type of activities that are offered (see page 8).

This question applies at all levels: developing a strategic approach to working with schools, setting up programmes and designing specific activities. Exploring the answers should not be done in isolation, however. Time spent in consultation with teachers (both primary and secondary), colleagues and other stakeholders is well spent and helps to develop a balance between a user-led approach and the capacity of the centre.

This section considers the question at the strategic level, which sets the context for the more specific activity planning that will be dealt with in the section 'How do you make things happen?' (page 12).

Why do you want to work with schools?

Your reasons might be:

aspirational

- to inspire young people about science in general and your discipline in particular
- to encourage young people to consider becoming scientists
- to provide young people with role models and examples of what scientists do
- to give opportunities for researchers to share their enthusiasm for their subject by engaging with different audiences
- to revitalise teachers' enthusiasm for their subject, update their knowledge and understanding, and raise their level of expertise.

promotional

- to raise the profile of the centre and the work that it does
- to provide access to a substantial and diverse audience
- to encourage recruitment to biological sciences degree programmes.

learning driven

- to teach young people about science.

Which schools do you want to work with?

There are several major differentiators to consider:

- The characteristics of students, including age, social and cultural backgrounds, gender, and ability.
- Status of the schools – are they state-funded (e.g. in England these might be maintained, academies or free schools), independent or private? Are they selective or non-selective?
- Location of the schools – are they local, regional or national? Are they inner city or rural?
- The characteristics of teachers – this might include the level of teacher subject expertise in primary schools, for example, and the level of support that might be required in the preparation or follow-up for an activity.
- Capacity of the centre. This may determine the number and type of relationships with schools that can be supported – would you prefer an in-depth relationship with a few schools or links with many schools?

What types of programme or activities do you want to offer?

This will depend on your responses to the other two questions, and particularly on:

- the expertise and interests of your researchers
- the facilities and resources available
- what the schools want and need for their students.

A good way to start considering this question would be auditing the activities the centre is already undertaking and their success. This provides a starting point that will highlight what is currently available and potentially identify opportunities for development. It could also involve decisions to stop doing some

things and replace them with other activities that provide greater benefits. Conducting such an audit also provides a baseline against which future progress can be evaluated (see page 18).

The section 'How do you make things happen?' (page 12) provides more detail on what might be included in programmes and/or activities, but at the strategic level it might be worth putting in place a teachers' panel that you can use to test out ideas and gain feedback through face-to-face meetings or an online community.

What are the key elements for adopting a strategic approach?

This section deals with questions that should be addressed at an organisational level. The answers endeavour to provide the context in which programmes and activities for working with schools are set. A strategic approach should establish work with schools as an integral part of the centre's overall mission, research and public engagement activity by:

- clarifying objectives and success criteria
- supporting the sustainability of the work, which may include relationships with schools that are developed and strengthened over time
- raising the profile of the activities and providing clear lines of accountability.

Establishing a strategic approach requires a combination of processes to help embed the activities across the organisation and support a cycle of planning, monitoring and review.

A policy and strategic plan

Developing a policy and strategic plan is a crucial opportunity to establish work with schools as part of the mission of the centre. It does not need to be a long document or take up a great deal of time, but it should provide a statement of the overall purpose of the work, the high-level objectives, the main focus of the activities and some criteria for success. In short, it should provide a summary of the responses to the two key questions 'What do you want to offer, to whom, and why?' and 'Did we achieve what we set out to achieve, and how can we make it better?'

Case study 1

Developing a policy for working with schools

For most centres, engaging with schools is something that develops organically, but there comes a point when developing a policy or strategy document is necessary. This was the case for Diamond Light Source, the UK's synchrotron facility.

Making links with schools was always one of the objectives of the centre, and visits from schools were established as part of the wider public engagement programme. These have been successful; however, as the demands on the overall facility have developed, so have those on the public engagement activities. External demands have also encouraged the facility to take time to determine its own priorities, to help allocate limited resources to projects. It was therefore decided that a strategy supported across the whole facility was required.

A group was established with a membership that reflected a wide range of interests and included the Head of Engineering, Principal Beamline Scientists, the Life Science Coordinator and the Head of Communications. The group consulted across the departments and drew up a draft policy document.

The key elements of the strategy identified the definition of 'engagement' for Diamond. This was vital because each organisation will have a definition that meets its own unique needs. The strategy then set out three key goals for engaging the public and several commitments, through which the goals will be met. These included a commitment to staff training and development, in addition to providing opportunities for the public and schools.

In particular, the section on school links included the following statement:

Diamond will engage with the education sector, offering a range of appropriate opportunities both on site and off site. Resource will be focussed on developing curriculum relevant content, working with teachers from a range of key stages and also with awarding bodies, science learning centres and other providers of training. We will work with universities to engage undergraduates with synchrotron science. We will seek to engage with teachers and students on a nationwide basis using online tools and resources suitable for their needs.

The strategy, which has widespread support, is now being implemented and will be reviewed annually.

The most important aspect is the process by which the policy and strategic plan are developed: it should be widely 'owned' as part of what the centre does, rather than being the work of a few enthusiasts. It should, therefore, be seen as an amplification of one of the overall strategic objectives of the centre and not as a separate area of activity.

It is also desirable to consult teachers and other stakeholders as part of the process. Discussions with those who have used the centre should provide some insights into what schools would find most useful. Some of the people who are consulted could provide the core of a teachers' panel and provide ongoing feedback and ideas for future developments.

Arrangements for accountability, monitoring and reporting progress

In many respects, these arrangements could be similar to those for any major research project. A major benefit of setting up mechanisms for accountability, monitoring and reporting is having a formal process by which work with schools is discussed in the context of other aspects of the centre's work. It also provides a way in which additional advice and guidance can be provided for the coordinator of school-focused activities.

Case study 2

A centre-wide committee for public engagement

In ensuring that public engagement and work with schools was embedded as part of the wider operations of the centre, The Wellcome Trust Centre for Cell-Matrix Research, Manchester, established a centre-wide committee five years ago. It meets on regular basis (approximately six times a year) and has a membership comprising one principal investigator, three postdoctoral researchers and two PhD students.

By setting the group up in this way, the Centre endeavours to ensure that:

- public engagement and school activities are seen as a key part of the Centre's work
- all levels of staff have a voice
- all aspects of the Centre's scientific research are involved (by selecting a committee representative of the Centre's breadth of research)
- the coordinator has support and progress is monitored
- there is succession planning and continuity, so ideas and programming do not all rest with one individual.

Having a committee also serves to get more individuals involved; working with colleagues encourages others to partake. Developing reusable resources also enables continuity and gives the people responsible for developing the resources a sense of ownership over certain aspects of the public engagement programme.

Leadership and management

Work with schools requires support and encouragement throughout the organisation, in particular from the director. Two key elements are especially important:

- a coordinator specifically for work with schools or as a major part of a public engagement role, which has a significant impact on the level of activity and the way in which it is perceived
- administrative support and agreed procedures, which add to the efficiency of running activities and help to minimise the demands on individual researchers and others who contribute to the programme.

Financial accountability

- A dedicated budget for work with schools is a clear signal that it is a recognised area of activity. Much can be done with relatively small budgets, but being able to plan funded activity helps build sustainability.
- Identifying sources of additional funding can enable further development. This might be done via internal centre mechanisms but will probably require external sources.

What other factors support a strategic approach?

While a strategy or policy sets out the high-level objectives and processes, it needs to be supported by other components that contribute to improving the quality and value of work with schools.

Recognition for the work being undertaken

This may be done through formal mechanisms, such as appraisal of staff, but other vehicles can be effective and might include awards for contributions, celebratory events, reports in newsletters and on the centre website, and a dedicated section in the centre's annual report or prospectus.

Training for staff

Many researchers are daunted by the prospect of having to explain their research to wider audiences, whether through oral presentations or in writing. Developing mechanisms to support individuals not only raises the quality of the activities and events but also helps to improve the communication skills of the researchers involved. Indeed, the training associated with public engagement or school links activities can be a strong selling point for individuals getting involved. The training might include formal short courses, coaching and mentoring. The STEM Ambassador programme provides training for its ambassadors, as well as arranging DBS checks, and further support can be found on the NCPE website.

Case study 3

A training programme for public engagement and school links

Support for staff involved in school activities and wider science communication is offered through a two-day training course held at the Wellcome Trust Centre for Molecular Parasitology at the University of Glasgow. The programme, which aims to improve communication skills in addition to providing specific information relating to school-focused activities, was developed by two public engagement coordinators with many years' experience in public engagement. The course is open to all PhD students, postdoctorates and technicians. The aim of the course is to train students and staff to maximise the potential of any public engagement activities. At the end of the two-day course, attendees are encouraged to sign up as a STEM Ambassador.

The course comprises eight units:

- Public Engagement – What is it and why bother?
- Public Engagement – Getting involved
- Public Engagement – Audience
- Public Engagement – Schemes available
- Public Engagement – Additional info
- Public Engagement – Telling a story
- Public Engagement – Press and social media
- Public Engagement – Practical exercises

Course materials can be accessed at

www.gla.ac.uk/researchinstitutes/iii/wtcmp/newsfeatures/headline_218505_en.html.

Course participants are encouraged to get involved in public engagement activities such as the Wellcome Trust Centre for Molecular Parasitology Schools Science Club project; more details can be seen at www.gla.ac.uk/researchinstitutes/iii/wtcmp/schoolsscienceclub.

Planning a core programme of activities

Establishing a core programme provides everyone with ample notice of the commitments of the centre, the individuals involved and contacts for further information. It should not rule out additional activities that arise during the year, but it will help to sustain activities, maximise the use of resources and minimise duplicated effort in meeting commitments.

Encouraging innovation and new ideas

There should always be opportunities for developing new and innovative ways of presenting the work of the centre and its researchers. This can be done using one of several mechanisms, such as convening informal brainstorming groups, researchers working with teachers or others on a particular idea and supporting individual interests, possibly with a small grant.

Engaging and networking with others in the field

Learning from others who are involved in similar endeavours is one of the best ways of getting ideas and/or improving existing activities. Establishing both individual and organisational networks is particularly valuable, and working with other centres with similar interests can be beneficial.

How do you make things happen?

Matching needs

What should you offer, and to whom?

The size and scope of what is offered for schools is ultimately determined by time, resources, the willingness of individuals and geography. The breadth of activities that can be offered is vast, but the majority of them fall into the six groups outlined below.

1. Talks and presentations in schools are comparatively easy to set up: usually, they only involve one or two individuals, who go to the school at a prearranged date and time. However, they still require planning, preparation and skilled engagers to ensure that the presentation is pitched at the right level for the pupils being addressed, the type of school and the size of the group.

More complex arrangements might involve a series of presentations in a school, possibly as part of a larger project, providing more sustained involvement.

Case study 4 School-based activities

Two researchers at the Wellcome Trust Centre for Cell Biology in Edinburgh have taken the school visit several steps beyond giving a talk. As part of a wider project, supported with some external funding, they worked with primary school children using art and dance to explore their understanding of cell division.

As part of a project called *Happi-genetics*, they devised a series of workshops that start with a brief introduction to cells, chromosomes and cell division by one of their scientists. The children are divided in three groups and rotate around three stations:

- (1) Scientists show the children how to use different kinds of microscopes and magnifying lenses and guide them in their discovery of the world of cells and microscopic organisms.
- (2) The children are led by scientists to perform a dance following the movements of chromosomes during cell division. The choreography involves the use of ropes and props to simulate the cellular cytoskeleton used by the chromosomes to move to opposite sides of the cell.
- (3) Artists encourage the children to build models of chromosomes and cells, drawing inspiration from the images and movies shown.

Further details can be found at edincell.bio.ed.ac.uk/node/25 and edincell.bio.ed.ac.uk/node/27.

An important aspect of this programme is the way in which the researchers have developed a partnership with an artist to explore interdisciplinary approaches to engaging young children with science. Although it may be logistically more difficult to do this in secondary schools because of timetable restrictions, it is certainly possible and to be encouraged.

2. Centre visits by school groups are a frequent occurrence in several centres and often require the involvement of several researchers for varying lengths of time. The visit may be a one-off event or part of a set programme of talks, tours and discussions with scientists. Planning is crucial; in addition to the content of the visit, there are logistical issues such as arrangements for parking, cloakrooms and so on.

3. The use of equipment and facilities by school groups for practical activities, either at the centres or in the schools, can be arranged. Centres may also become involved with providing support for individual students, for example through the Nuffield Bursary scheme. Less formally, students undertaking Advanced Higher Projects in Scotland or Extended Project Qualifications in England could be supported by centres through mentoring by researchers and the availability of resources.

Case study 5

Sharing school-focused activities with a wider audience

Magnificent Microbes is a project that involves researchers from the Wellcome Trust Centre for Gene Regulation and Expression as part of the College of Life Sciences in Dundee. This project, which was designed for students aged 10 to 14, involved the researchers in a development day with a group of 25 children to inform a larger event held at Sensation, the Dundee Science Centre. The feedback from these children was very important in refining the activities for the main event, which runs over two days. Day 1 involved more than 200 schoolchildren in a range of hands-on activities and presentations on the wonders of microbes. Day 2 was open to the general public and attracted parents and young people from around the region.

This example aims to maximise the reach and impact of the activity in several ways – primarily through researchers from the Wellcome Trust Centre working with others from the wider College of Life Sciences within which it sits, and by taking the activities designed with input from children to a wider audience.

4. Resources of different types to support learning can be developed for teachers and pupils. These may include a range of paper-based, digital and online materials providing background information, high-quality photographs, and simulations, as well as accessible reading materials such as cartoons (e.g. describing life cycles or biological processes and procedures). A particularly interesting area for development is to provide schools access to contemporary experimental data they could analyse.

Case study 6

Development of safe protocols

As part of its work with schools, the Wellcome Trust- and Cancer Research UK-funded Gurdon Centre in Cambridge recognised that some of the activities researchers wished to include in science open days had health and safety implications; therefore, they developed some experimental protocols that reflect some of the techniques that are used in their research. They lack the accuracy required for research but can be safely and effectively carried out by children.

One such technique is the use of stains to examine different cell types: this is a classic procedure that can be reproduced at public events if the chemicals used are not toxic in any way. A protocol developed by the researchers is replacing methylene blue, which is commonly used to observe cell structures in the laboratory, with food dye. This not only reduces risk but is also cheaper than using expensive stains.

5. Ongoing interactions between researchers and pupils can enhance relationships with schools significantly; for example, scientists responding to questions from teachers and pupils via email or social media enables follow-up questions after visits and talks. Alternatively, such interactions can be established as stand-alone activities along the lines of *I'm A Scientist, Get Me Out of Here!*

6. CPD activities for teachers are invaluable for several reasons. They can revitalise the teachers' enthusiasm for their subject, update their subject knowledge and make them more knowledgeable about the work of the centre. Teacher feedback from courses or open events is also valuable in planning future activities.

Case study 7

CPD support for teachers

Public engagement has been a core element of the Wellcome Trust Sanger Institute's strategy since its involvement in the Human Genome Project in the 1990s. One of the major strands of the public engagement strategy includes working with school students, teachers, science education specialists and the Institute's researchers to provide a sound foundation in genetics for students, develop engaging resources on contemporary genetics and genomics, and facilitate dialogue between young people, teachers and researchers.

The public engagement team develops resources on genetics and genomics that can be used by teachers in the classroom. These include animations, short films and activities that bring genomics to life. These resources are freely available online through www.yourgenome.org and the National STEM Centre's e-library. Activities relate to topics in the National Curriculum and illustrate research being undertaken at the Institute. Many of them encourage inquiry-based science education approaches so students learn through scientific inquiry and develop an understanding of the scientific process.

To ensure scientific accuracy, the resources are developed in partnership with scientists at all stages of the development process. Teachers also play a pivotal part in testing the resources and providing critical input on content and learning goals. Science education researchers evaluate resources for their usability and robustness in the classroom.

To update teacher content knowledge on genetics and genomics, the public engagement team provide dedicated professional development sessions for teachers. These sessions are often run in collaboration with the National Science Learning Centre and regional Science Learning Centres. The sessions include a series of talks from our researchers on their latest discoveries and a tour of the Institute's research facilities to demonstrate the technologies used to study genomes. Teachers are introduced to the classroom resources and encouraged to use them in their schools and share them with their colleagues. These sessions enable the Institute to forge links with teachers and inspire them about the exciting research developments and applications of genomics, which they can then pass on to their students.

Clearly, these groups of activities are not mutually exclusive, so it is worth thinking about ways in which they could be integrated to provide even better experiences for both the young people and the researchers involved. For example, at a simple level, giving a talk in a school might be enhanced if students are encouraged to email follow-up questions to the researcher over a defined period of time. This helps to build the relationship and provides feedback on which aspects of the talk provoked particular interest or curiosity.

Activities should reflect what schools want

Schools' and teachers' reasons for engaging with centres are many and varied, so it is advisable to consult with teachers. Links with the National Curriculum are important, if only because teachers have to justify the activity to their head of department or the school senior management team, but other reasons are often the driving force.

For students, these reasons include:

- challenging their views of science
- extending their experience of particular topics
- bringing science alive in a way that is not possible in school
- meeting 'real scientists' and young researchers, and helping them realise scientists are real people
- widening their horizons by allowing them to see scientists in their own environment and get a feel for what working as a scientist might be like.

For teachers, these reasons include:

- rekindling their enthusiasm for their subject
- updating their knowledge and expertise

- building networks of contacts.

In working with schools, teachers would like the centres to do the following:

- help with logistical issues; for instance, by producing a menu of preset programmes for schools and pre-written risk assessments, and by ensuring effective communications regarding activity arrangements
- include pre- and post-visit activities for students online
- run courses for teachers at the centres.

How do you link your work to what is in the curriculum?

It may be obvious, but it is worth reiterating that it is not the responsibility of centres to teach the curriculum. Centre engagement with schools will, however, enhance the learning experiences of young people. Curriculum requirements within the UK vary in detail from country to country and with the associated examination specifications. (Sources of information are listed on pages 19–20.) Despite the variation in detail, they have major topics in common that are in line with the centres' work, including:

- cell structure and function
- cell division (mitosis and meiosis)
- genetics and genomics
- infections and diseases
- use of drugs.

Of particular value to schools is the way in which centres can expose pupils to topical science, the cutting edge of research, the processes of science and how scientists work. This would involve some consideration of the decisions that scientists have to make, including ethical issues – for example, when using particular tissues or animals in their research.

Careful preparation is the key to success for any activity, so some familiarity with the curriculum is useful; however, given the areas of research in the centres, links can be readily made. The most important element in successful engagement is the enthusiasm of the researchers for their work and their comfort communicating that to young people.

Building relationships

How do you establish contacts?

Reaching out to schools can be made effective by defining the types of schools to be approached and using careful planning. Once links with schools have been made, they often grow because teachers are very good at sharing contacts with colleagues.

- Personal contacts are the most common way of making links with schools. Simply drawing up a list of schools known to centre staff will often produce a useful starting point for making contacts.
- Responding to schools' requests to do talks or host visits is also a common way to establish links.

However, in adopting a more strategic approach to this work, centres will need to consider other mechanisms for initiating contact with schools, especially for particular types of school.

- Direct approaches to schools can include mailshots with leaflets, either advertising a particular event or outlining what the centre offers. A more targeted approach would be to send a letter to the head teacher and a copy to the head of science or biology. Ideally, these should be sent to a named person. It is often possible to use contacts – for example, within the University admissions office or outreach units – to get to the right people in a school.
- Indirect approaches through intermediaries would almost exclusively have been via the local authority science adviser in the past. Although the strength of local authorities has been reduced, it is still worth finding out what the local authority might be able to offer in the way of support. For example, some areas still hold Heads of Science meetings, which provide opportunities for contacting groups of schools.
- In England, the increasingly popular academies and free schools offer opportunities for establishing links through their parent organisations or the networks of partner schools.
- Other networks – such as STEMNET, The Association for Science Education, the British Science Association and the Science Learning Centres (see page 19 for contact details) – have regional structures and can provide links with teachers and schools.

How can relationships be maintained?

The level at which relationships need to be maintained depends in part on the type of relationship that is wanted and the amount of time and effort that can be put into them. Establishing sustainable relationships takes time – probably two to five years – so it is important to make links with more than one individual in a school, so contact can be maintained if the original link moves on. Ways of strengthening the relationships include:

Establishing a contact database

This is a key administrative task, which will save time and effort if it is set up well. Ideally, details of all schools that have any interaction with a centre should be recorded and a note should be made of the type (enquiry, speaker, visit, etc.) and date of the engagement, the age of the students, and the name of the teacher involved. This information can then be used for a wide range of purposes, subject to DPA regulations.

Publishing electronic updates for schools

These can be distributed by email or social media and provide schools and teachers with information about work going on at the centre and forthcoming events. Even if it is not possible to prepare specific updates for schools, sending other material that might be of interest reminds them of what the centre is doing.

Highlighting school-focused activities on the centre website

A separate website for schools may be neither feasible nor desirable for centres, but clear signposting and links to or from other websites that teachers visit can increase the profile of the centre, as can improving access to resources and information for schools and teachers.

Holding teachers' events or offering CPD sessions

These events can be held independently or in partnership with other organisations, such as a regional science learning centre.

Promoting involvement of researchers with schools

This is most easily done through existing schemes such as STEM Ambassadors, run by STEMNET, or activities such as *I'm A Scientist, Get Me Out of Here!*

Engaging with school senior management teams

The development of particularly close relationships will almost certainly require the involvement of the school senior management team – perhaps through an invitation to visit the centre to explore possible partnership links.

Tackling the logistics

What are the legal requirements?

There are not as many legal requirements as are often claimed, although there may be local guidelines that need to be followed. Broadly, there are two areas that need to be addressed.

Health and safety matters

The key issue here is the need for appropriate risk assessments to be completed. From a school perspective, a pre-prepared risk assessment for a visit to a centre, for example, is always welcome. For activities in school, the teacher should be able to provide information on health and safety issues, but further advice can be obtained from specialist organisations such as CLEAPSS and SSERC (see page 19 for details).

Disclosure and Barring Service checks

Individuals who regularly interact with young people should obtain a Disclosure and Barring Service (DBS) check. This can take a few months, so it should not be left to the last minute. For some individuals (e.g. people who only give talks and are not left alone with groups of young people), a DBS check is not necessarily required for access to a school, which is at the discretion of the headteacher. It is strongly advised that centres adopt a policy on DBS checks and follow it closely.

How do you set up activities?

- Plan and pay attention to detail: both are crucial, so it is worth establishing a checklist of what needs to be done for particular activities and amending it as you gain experience.
- Try things out beforehand to reduce the chances of them going wrong.

- Establish with teachers what they want – preferably with a discussion and, if it is a new school, a pre-event visit. Their requests will not always be specific, in which case conversations with more experienced colleagues can be a useful guide.
- Find out what the pupils have been doing and try to provide something that is a little different.

Reviewing achievements

Key question 2: Did you achieve what you set out to achieve, and how can you make it better?

As with good research, the quality of evaluation depends on asking the right questions at the right level, gathering the necessary evidence and then making judgements about the lessons learned. This process (with minor variations) should be carried out at all levels to check actual performance against intended objectives, whether they relate to the overall purpose for working with schools or to the individual activities that contribute to a programme. Reviewing achievements and ways in which things can be improved needs to be planned as a coherent process. The mechanisms adopted need to be proportionate to the activity and programme being evaluated. Most importantly, the process should not be seen as a burden or an add-on. Judging the success – or otherwise – of an activity, event or programme depends on the clarity of the criteria against which they are being judged. The inclusion of success criteria in the strategic plan will help with regard to the overall impact of the programme. A review of performance against the criteria will also:

- provide evidence of the benefits and the extent to which the work is valued
- demonstrate value for money
- share learning with others
- identify areas where further improvements can be made
- inform future planning and directions for the activities and programmes.

Individual activities can be assessed through the use of relatively standard *pro forma* questions and the reflections of those involved. These should be collated to draw out any common themes that inform the overall review.

Programmes, depending on the scale, may require external evaluation from time to time – for example, before revising the strategic plan (every three to five years). On an annual basis, however, evidence should be gathered, collated and reviewed in terms of the following:

- The outputs, which are principally data on what happened and/or was produced, including the number of events put on, the number of students involved, the schools involved, and the resources produced. Gathering this information on an ongoing basis provides the information for reports to the appropriate bodies during the year.
- The outcomes, which tend to be more qualitative but provide evidence of how the different participants have benefitted (including improvements in skills, knowledge and attitudes). It is important to ensure these cover not only students and teachers but also researchers and institutions.
- The impact on pupils, teachers and researchers, as well as the centres, is the overall effect the activities have had for the different stakeholders.

Sources of support and advice

Science education

The Association for Science Education

www.ase.org.uk

The Association for Science Education (ASE) is the largest subject association in the UK. As the professional body for all those involved in science education, from preschool to higher education, the ASE provides a national network supported by a dedicated staff team. Members include teachers, technicians and advisers.

STEMNET

www.stemnet.org.uk

STEMNET creates opportunities to inspire young people in science, technology, engineering and mathematics (STEM). This enables young people to develop their creativity, problem-solving and employability skills, widens their choices and supports the UK's future competitiveness. STEMNET receives funding from the Department for Business, Innovation, and Skills, the Department for Education, and The Gatsby Charitable Foundation.

British Science Association

www.britishsociety.org

The British Science Association a nationwide, open-membership organisation that provides opportunities for people of all ages to learn about, discuss and challenge the sciences and their implications.

Myscience.co incorporating the National Science Learning Centre and the National STEM Centre

www.sciencelearningcentres.org.uk/about/myscience.co-limited

Myscience operates the National Science Learning Centre as a centre of excellence for science teachers' continuing professional development, the National STEM Centre (which brings together key national organisations working within the STEM communities) and the regional network of Science Learning Centres.

The Big Bang: UK Young Scientists and Engineers Fair

www.thebigbangfair.co.uk/

The Big Bang works with partner organisations across business and industry, government, and academia. They try to give a flavour of the real scale of engineering and science in the UK by organising a national event (the Big Bang Fair), which happens at a different location in March every year, and a series of regional and local events.

Curriculum requirements

England - Department for Education

www.education.gov.uk

The Department for Education is responsible for education and children's services. On 31 March 2012, the Qualifications and Curriculum Development Agency closed as part of the Government's wider education reforms, and responsibility for the development of the national curriculum passed to the Department for Education.

The exams administration function is now performed by the Teaching Agency. Please contact them on 0300 100 0100. The National Curriculum assessments function is now performed by the Standards and Testing Agency. Please contact them on 0300 303 3013.

Scotland - Education Scotland

www.educationscotland.gov.uk

Education Scotland is a national body supporting quality and improvement in Scottish education. It works in partnership alongside the full range of bodies and organisations active in the field of Scottish education, from local authorities to further and higher education, third sector and parent groups. One of its key roles is leading and supporting the successful implementation of the curriculum. Together with its partners it has developed the 'Curriculum for Excellence', which aims to achieve a transformation in education in Scotland by providing a coherent, more flexible and enriched curriculum from 3 to 18.

Wales - Department for Education and Skills

wales.gov.uk/topics/educationandskills/schoolshome/curriculuminwales

The Department for Education and Skills provides leadership for education, skills and the Welsh language. It has responsibility for the curriculum in Wales.

Northern Ireland

www.rewardinglearning.org.uk/

The Council for the Curriculum, Examinations and Assessment is a non-departmental public body reporting to the Department of Education in Northern Ireland. It is a unique educational body in the UK, bringing together the three areas of curriculum, examinations and assessment.

Regulatory and awarding bodies

There are four main regulatory bodies in the UK who recognise awarding organisations and their qualifications.

England: OfQual

www.ofqual.gov.uk/

Office of Qualifications and Examinations Regulation (Ofqual) regulates qualifications, examinations and assessments in England and vocational qualifications in Northern Ireland. There are three major awarding bodies in England who develop the specifications for the main secondary examinations:

AQA

web.aqa.org.uk/about-us/

OCR

www.ocr.org.uk/

EDEXCEL

www.edexcel.com/Pages/Home.aspx

Scotland: SQA

www.sqa.org.uk

The Scottish Qualifications Authority (SQA) is the national accreditation and awarding body in Scotland. In their accreditation role, they accredit vocational qualifications that are offered across Scotland (including Scottish Vocational Qualifications) and approve awarding bodies that wish to award them.

Wales: DCELLS

wales.gov.uk/topics/educationandskills/?lang=en

The Department for Children, Education, Lifelong Learning and Skills (DCELLS) is Wales' qualifications regulator.

Northern Ireland: CCEA

www.rewardinglearning.org.uk/

The Council for the Curriculum, Examinations and Assessment (CCEA) is a non-departmental public body reporting to the Department of Education in Northern Ireland. It is a unique educational body in the UK, bringing together the three areas of curriculum, examinations and assessment.

Health and safety

CLEAPPS

www.cleapss.org.uk/about-cleapss

CLEAPSS is now simply a name and not an acronym. It is an advisory service providing support in science and technology for a consortium of local authorities and their schools, including establishments for pupils with special needs.

SSERC

www.science3-18.org/sserc/

The Scottish Schools Education Research Centre (SSERC) is a local authority shared service providing support including health and safety advice, CPD and resources across all 32 Scottish education authorities and the majority of FE colleges and independent schools within Scotland.

Legal requirements

Disclosure and Barring Service checks

www.gov.uk/disclosure-barring-service-check/overview

The Disclosure and Barring Service helps employers in England and Wales make safer recruitment decisions. Several roles, especially those involving children or vulnerable adults, are entitled to a criminal record check. On 1 December 2012, the Criminal Record Bureau merged with the Independent Safeguarding Authority to become the Disclosure and Barring Service.

Public engagement

The Beacons for Public Engagement initiative

www.publicengagement.ac.uk/about/beacons

This is a four-year project designed to create a culture change across the higher education sector. It consists of a network of six beacons: university-based collaborative centres that help support, recognise, reward and build capacity for public engagement work.

The National Co-ordinating Centre for Public Engagement

www.publicengagement.ac.uk/about

NCCPE coordinates, captures and shares learning between the Beacons for Public Engagement and across UK higher education institutions and research institutes.

UK Association for Science and Discovery Centres

sciencecentres.org.uk/about/

The UK Association for Science and Discovery Centres brings together more than 60 major science engagement organisations in the UK with the objective of giving people of all ages and backgrounds the opportunity to explore science and feel a sense of shared ownership over its direction.

Research Councils UK

www.rcuk.ac.uk/per

Research Councils UK is the strategic partnership of the UK's seven Research Councils, which each year invest around £3 billion in research covering the full spectrum of academic disciplines from the medical and biological sciences to astronomy, physics, chemistry and engineering, the social sciences, economics, environmental sciences, and the arts and humanities.

British Interactive Group

www.big.uk.com/

BIG hold very useful workshops and training sessions for researchers and non-researchers.

