# ISSUES IN PRIMARY SCIENCE TEACHING 2: IN THE SCHOOL

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**Centre for Science Education**
INTRODUCTION

*Issues in primary science teaching 2: In the school* provides a wider perspective on teaching science in the primary school. A key task for the school is the development of a whole school policy for science. The development of such a policy demands careful and creative management of both people and resources and a continued staff training programme to ensure that colleagues implementing the policy are trained and confident in their roles. This is a daunting and difficult task in the present climate when all members of staff are overwhelmed with the responsibilities involved in the implementation of new initiatives.

However, things are not all bleak. The opportunity for teachers to experience new training opportunities is a welcome one, and improvements in the professional status of both individuals and schools must be seen as beneficial.

For the school, longer-term outcomes need to be considered; the system needs to be not only self-sustaining but continually developing. For those working in such a system, implementing new initiatives can represent an exciting and intellectual challenge.

The articles included here provide perspectives on some of these challenges, such as developing a school policy for science, or implementing and managing a school-based INSET programme. For science coordinators, these issues are a necessary part of their job; thus their contribution to making science a part of the children’s everyday world is a crucial one. With so many responsibilities it is sometimes easy for teachers to forget that the primary goal is to develop children’s understanding of science. As the hard work continues, the rewards for the children will be great; primary teachers should take credit for this, and enjoy the satisfaction of a job well done.

Each of the following articles is a discrete entity and examines an issue in depth, but taken together there are areas of overlap between them. You should find, however, that the perspectives of the different authors are complementary, and help to give you a well-rounded view of some important issues in primary science teaching.

Activities are included in the articles. In most cases it will be appropriate to do these in a tutorial session, where discussion with colleagues will provide different viewpoints; occasionally, however, activities will need to be completed at home or at school. They are intended to provide you with an opportunity to consider and discuss the issues put forward in particular articles.
THE MANAGEMENT OF SCIENCE IN THE PRIMARY SCHOOL

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Until quite recently, management was something that teachers did not do—it was never recognized as an important part of the job. Increasingly, however, we are coming to see the need for good management at all levels in the school. This article looks at ways of managing science in the primary school: who manages it and some of the problems and difficulties they may face. Throughout, the roles of the headteacher and science coordinator are emphasized. To be able to manage a situation effectively is both rewarding and satisfying. We hope your work on Science for Primary Teachers will enable you to achieve some, if not all, of the goals set.

INTRODUCTION

For the first time in the history of British education, science has been given a central position in the primary school curriculum. With the publication of Statutory Orders for science, English and mathematics, these three areas are designated the ‘core curriculum’, implying equality of status. No longer can we refer to the three Rs as being ‘the basics’; we must now include science in the list as well.

Primary schools have always accepted that a major part of their role includes the initial stages of teaching children to read, write and become numerate; by the age of 11 most children reach quite a high degree of competency in all three areas. Now, schools are required to place the same emphasis on developing children’s attitudes, skills, and conceptual understanding of the world about them, in that particular way we call ‘scientific’. At the end of their primary school years, children will be expected to have developed the intellectual and practical skills necessary for them to explore and understand the world of science.

The central position of science will be slow to gain acceptance, despite the Statutory Orders. Years of concentrated effort on reading, writing and mathematics have resulted, in some schools, in a very stifling curriculum, which now must change. Headteachers, teachers, governors, parents and children are all part of the system undergoing this scientific revolution, which will need careful management if it is going to succeed.

The management of English and mathematics in schools has achieved a high degree of sophistication over the years, with detailed policies and careful recording of children’s progress reflecting the united effort of the whole staff. Major curriculum development has given rise to a more child-centred way of proceeding: changes of approach are seen, for example, in the inclusion of more practical work, and the more active involvement of parents in the growth of their children’s competencies in reading and mathematics.

This kind of development has not been undertaken in science, which has always been a problematic area for primary schools, not least because of the lack of science education given to primary teachers during training. Another major stumbling-block is the organization and resourcing that is needed in the classroom for open-ended investigations and problem-solving to take place. Many teachers think that this way of working presents a threat to their authority, because they feel that they are no longer in control of the situation, and they do not know the answers to all the questions that may arise.
Management in primary schools depends on effective communication and successful cooperation between headteachers, deputy headteachers, curriculum coordinators, staff (teachers and others), governing body, parents and children. In recent years, the management side of running a primary school has become more stringent, in that the legal requirements are more pressing and the headteacher and governing body more accountable. Taking these trends into consideration, together with the immense variability found in schools, what might good management of science in a primary school be like?

DEFINING ROLES

If an effective science curriculum is to be established in the school, it needs to be defined and agreed upon by all the interested groups. Each group member has an important role to play in implementing the agreed policy, if it is to be successful in the school, and the roles of each group may be quite different.

The headteacher should be:

- conscious of her/his own level of understanding of science, and the need to keep up to date with developments in science teaching
- a keen supporter of science in primary schools as a means of harnessing children's desire to know and learn, and thereby providing a context for the other core areas
- willing to lobby for the appointment of a coordinator for science
- supportive of the science coordinator
- willing to allot money, time and space specifically to science
- understanding of the need for INSET support for the whole staff.

The headteacher's role is to promote the development of an effective policy for science in the school, and oversee the yearly programme. Methods of record-keeping should be evolved, to help with continuity and progression at class level, as well as methods of assessing and recording an individual child's progress, and reporting to parents, governors and the local authority.

Headteachers need to be aware of the special problems concerning the provision of equal opportunities in science; they must make sure that the staff promote the school's policy, not only as this relates to different sexes and cultures, but also with respect to children having special educational needs. The headteacher, perhaps through the science coordinator, should also bring to the notice of the staff local authority guidelines, courses and other opportunities to develop science in the school.

The coordinator should:

- be prepared to attend courses to build up personal knowledge and understanding in science, and appreciate the particular characteristics of science in primary schools
- have a good working understanding of the knowledge needed to deliver the national curriculum for science at primary level
- be coordinator for science only, and not be burdened with responsibilities for other areas of the curriculum
- attend courses to develop coordinating skills
- be able to communicate enthusiasm for science to other members of staff, parents and governors
- be able to give help and guidance in science to staff on a day-to-day basis
- keep up to date with local authority initiatives
- be able to choose, order and organize resources for the use of the whole school
• keep up to date with new materials, books, etc., for both staff and children
• be given time in which to carry out these duties.

The staff should be:
• fully involved in creating and implementing the school’s policy for science
• fully involved in planning the science programme for the school
• engaged in developing satisfactory ways of recording a child’s progress in learning science
• willing to attend courses to develop their own knowledge, skills and understanding of science.

The governing body should:
• support the headteacher and coordinator by ensuring that money and time are made available to develop science education in the school
• understand the nature of primary science and support the school’s policy.

Parents should:
• be equal partners with the school in the development of children’s education in science, and, by understanding the aims and methods adopted by the school, be able to give children support at home.

Children should:
• understand when they are doing science, and be valued for their knowledge, understanding and skills in an area where the skills of writing, reading and mathematics are not the only measures of success.

In addition, the school environment (the buildings and the grounds) should reflect the school’s science policy as regards its use as a teaching resource.

What is the present-day reality? How are today’s schools trying to implement science in the national curriculum now?

THE ROLE OF THE HEADTEACHER

Headteachers are the product of anything between five and thirty years of working within the educational system. Their experience of science is likely to reflect the picture we see in primary staff as a whole—that is, having few formal science qualifications and with varied input from initial training. However, given the evident gender bias shown, with far more men reaching headteacher status, we are probably dealing with a population rather better qualified in science than the average class teacher. That being said, headteachers are often as apprehensive about science as are their staff.

As the role of the headteacher changes to cope with local management of resources, new powers of governing bodies, and the national curriculum, headteachers become more than ever managers of people, and allocators of resources and time, with less opportunity, perhaps, to involve themselves directly in the development of the curriculum. The headteacher has to prioritize the allocation of points to staff carrying responsibilities; in small schools this is often a major area of difficulty, with the school not being able to allocate sufficient points to cover what they see as necessary for implementing the national curriculum. There may therefore be no opportunity to give a teacher an allowance for coordinating science, and there may not be enough money available for building up the resources necessary to effectively deliver the national curriculum in science.
THE ROLE OF THE COORDINATOR

In order to support science in the curriculum and ensure that it is taught effectively, coordinators need to communicate with other interested groups. Colleagues who may be apprehensive about science, and about getting to grips with the national curriculum requirements for teaching it, will need reassurance as well as help and advice. Governing bodies are often at a loss to understand what science entails for a five-year-old, or what support and encouragement they should give to staff in their efforts to develop science in the school. Coordinators will need to inform and educate them so that they can make the most effective decisions. Parents also need to be informed about the nature of primary science, so that they can be aware of how their children are progressing. Children, who thrive on the practical approach demanded by primary science, often do not know that what they are doing is called science. Coordinators can ensure that sufficient information is available to enable staff to recognize what constitutes scientific activity, and to give any successes the children may have in this area their true value.

Set against this somewhat formidable list of responsibilities is the fact that the coordinator (paid or unpaid) may initially have no more understanding of science than other members of staff in the school, and certainly not the training necessary to advise and help other teachers. Coordinators will unfortunately often have to take on more than one area of responsibility, especially in a small school, and yet the tasks involved may include negotiating with the head for money, ordering, storing and refurbishing resources, running staff INSET and writing the school policy for science. This is clearly an undesirable overload, which is often carried out with little or no non-teaching time allowed for.

SUCCESSFUL SCIENCE AT PRIMARY LEVEL

What do we need to ensure the successful delivery of science in the primary school?

Outside agencies, local authorities, training colleges and universities can all contribute and cater for some of the needs. Other needs must be met from within the school, drawing on the resources of staff, governors, parents and the school environment.

Headteachers need courses run especially for them, on the philosophy and methods of science in the primary school, as well as information about the role of the coordinator and the need for resources.

Coordinators need courses on the content of the national curriculum for science, and on developing their coordinating role. This particular need is being addressed by the 20-day science courses being run under the local education authority training grant scheme, and the diploma schemes run by such bodies as the Association for Science Education (ASE).

Class teachers need courses to build up their confidence, and improve their own knowledge and understanding of science. It is important for them to appreciate the nature of science in the primary school, and the requirements of the national curriculum at the different key stages. Again local authorities, training colleges and universities, and the ASE’s certificate courses cater for the class teacher. It is essential that the headteacher provide cover to ensure that teachers are free to attend such courses.

Unless issues such as these are addressed adequately, and major improvements made in science education at primary level, science will be competing on unequal terms in the core curriculum.
DEVELOPING A PROGRAMME FOR SCIENCE IN SCHOOL

Only when these requirements are met will the staff be in a position to develop a common philosophy on the nature of science in the primary school—the first step on the road to formulating a school policy that is acceptable to all the staff. This will take time; it would be much quicker for the headteacher and coordinator to write the policy themselves. However, if the policy is something that the school will take on, then it is essential for the whole staff to be involved in its creation. An imposed policy is often put into the desk drawer and forgotten. The actual discussions leading up to policy-making should involve all the staff and may take up to a year to finalize. These sessions need careful managing by the headteacher and the coordinator, and will result in a shared perception of the nature of science, and the skills and attitudes to be developed by the children.

With the whole school policy in place, the staff can move forwards and agree on a programme for science, based perhaps on topic and thematic work, and reflecting the demands of the national curriculum. The coordinator may take these occasions to familiarize the staff with the printed material available to help with the planning.

There may be pressure to take on a published scheme—an apparently easy solution to the problem of constructing a programme that will meet the needs of all the children in the school. Many new schemes are currently being written to cover the national curriculum requirements for 5–16-year-olds, and existing schemes have rapidly produced guides that relate the published materials to the programmes of study and attainment targets. Informed discussion will be necessary before the school purchases something as expensive as a scheme for science. The staff must be sure that the scheme fits their requirements before making what may be an investment of several hundred pounds; for example, the school will need to have the resources necessary to carry out any activities included in the scheme. Constructing a scheme of work specific to the needs of the school is probably the most satisfactory approach; any published scheme or set of workcards will need a degree of modification to suit the class or the teacher. For staff, starting from topics or themes with which they feel comfortable will boost confidence and encourage further development.

**ACTIVITY 1: A SCHOOL SCIENCE POLICY**

Use the guidelines in either (a) or (b) below to prepare a short presentation on the topic of a school science policy. This can then be used as the basis for discussion at a tutorial.

(a) If your school already has a policy on science, use the questions below to help you structure your talk.

- Does the policy reflect the requirements of the national curriculum in science?
- Does a mechanism exist for introducing new members of staff to the policy?
- What provision is there for revising and updating the policy?

(b) If your school does not have a school policy, find out how your colleagues perceive science at primary level, and whether they think a formal policy would be useful. A short questionnaire might be helpful, and can be filled in anonymously.
SCHOOL RESOURCES FOR SCIENCE

When the science programme is agreed, it will be necessary for the science coordinator to ensure that resources are available and stored in a way that makes retrieval as simple as possible. Some schools may have resources rooms, with shelving or cupboards for easy storage. At the other extreme, very small schools may have only cupboards in corridors or corners of the classroom in which to store materials. Whatever the situation, equipment must be stored to facilitate practical activities in the classroom. Storage units, as well as their contents, may have to be purchased, and a system set up to enable staff to access materials. The choosing, ordering and storage of materials is very time-consuming; therefore time must be made available for the job to be done properly, and money must be allocated so that science resources can be built up. The science coordinator may have to compete for money with the other core curriculum leaders, and present a case to the governors to support the request.

ACTIVITY 2: RESOURCES

(a) Compile an inventory of the resources for science in your school. This will involve calling in the resources at present distributed between all the classrooms, so allow yourself sufficient time and space. Can you identify any resource needs?

(b) Compile an inventory of the science-related books and other printed resources that are available in your school. Do these resources reflect the school’s equal opportunities policy?

(c) What equipment is available that promotes the skills of scientific enquiry and an investigational approach by the children, e.g. magnifiers, pooters, stop-clocks, collecting pots, measuring equipment, collections of rocks, shells or bones. Can you identify any gaps?

When these inventories have been completed, copies should be made available to all members of staff.

Compiling inventories of science resources is an enormous task, and one that is perhaps best tackled at the end of a term. Get the children to help you, and use the facilities of a computer database to keep the inventories up to date.

SETTING UP THE PROGRAMME

The coordinator also needs to be free to help staff in the classroom, as many teachers find the management of practical activities difficult. Colleagues may need first-hand support, with the coordinator working alongside the teacher in the classroom, or just specific advice on developing a topic and help in setting up investigations. This aspect of the coordinator’s job needs sensitive handling: going into another teacher’s classroom can make them feel very vulnerable. The coordinator needs to build on the teacher’s strengths, and avoid creating a threatening atmosphere.

The coordinator may also be expected to run parents’ evenings, to introduce them to the school’s policy and programme for science. This may involve asking a representative from the local authority advisory team or a training college to give a short introduction, and often includes displays of children’s work. Some parents’ evenings are run as practical workshops, encouraging parents to participate in activities carried out by the children. Curriculum evenings of this kind were held in the past when schools were introducing new mathematics or reading schemes, and are good methods of inviting parents to become more involved in their children’s learning. The class teacher who is relatively new to science will also benefit from the demystification exercise, which encourages the shared understanding of a difficult area of the curriculum. The coordinator may
also be expected to contribute to the reports to governors, and to attend meetings to explain school policies, and so on.

The coordinator may also be involved in the development of the school grounds to provide a suitable setting for the children's first-hand experience of the natural environment. Ponds may need to be constructed, wilderness areas planted and maintained, and although outside help may be obtained from the local authority, or local conservation groups, the day-to-day management may fall to the coordinator. Help is often available from other staff members, the PTA and children, and rotas can be constructed to spread the load.

**ACTIVITY 3: INVOLVING PARENTS**

Make a list of strategies that your school employs to encourage parents' involvement in their children's education. Can you suggest any other strategies that it might be useful to try?

Involving parents in science education can take many forms. Try giving your children explorations or observations to carry out at home, and then, at an appropriate time, encourage parents to come in to the school to discuss what the children have discovered.

Many parents will happily supply items of equipment for the classroom, such as a collection of small glass bottles for work on floating and sinking or a variety of metal objects for a topic on metals. If you ask parents for specific items such as these, you should very quickly build up a set of resources that can be used by many different children.

A strategy that may lead to interesting developments is to first decide on an area that you would like to develop, such as growing plants in school, making an aquarium, or investigating forces or electricity. Encourage any parent interested in that area of science to contact you. You could do this either by putting up a notice in the school or sending a note home with the children. You may find that you have an expert available for consultation. Look at the relevant programmes of study and attainment targets together with your expert, and discuss ways in which children could best be introduced to scientific concepts.

Any area of expertise can be utilized, but remember that parents' own perceptions of science will probably be based on their secondary school experiences, and will need careful modification for primary-age children.

**CONCLUSIONS**

As should be clear from the foregoing discussion, the management of science in the primary school is a multi-faceted undertaking. First, headteachers must have an appreciation of the general educational outcomes provided by scientific activities, as well as the more specific skills and processes. A clear understanding of the demands of the national curriculum, especially the core curriculum, will ensure that science is given the same emphasis as mathematics and English. Teachers need a coordinator to take responsibility for the day-to-day management of scientific work in the school—a considerable task. Coordinators need to be efficient, tactful and good organizers.

Although the headteacher is the ultimate decision-maker in the school, the management of science involves too much work for it to be regarded as part of his or her responsibilities. Conversely, however good the coordinator, progress is unlikely unless there is full backing by the headteacher. The new demands placed upon schools to plan and organize have made it essential that specific areas are delegated to other positions in the school; these positions must be held by good managers—not only of things, but also of people. Getting science established in the primary school needs a concerted effort from everyone, but the rewards are well worth achieving.
THE ROLE OF THE SCIENCE COORDINATOR

Fiona Allen

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The science coordinator has a key role to play in implementing science in the primary curriculum. In this article, Fiona Allen, a headteacher and former science coordinator, looks at some of the many tasks the coordinator must take on if science is to be taught effectively in schools. The job is not a simple one—many different skills are required. Management, effective team work and forward planning, as well as teaching, are all components of the science coordinator’s role.

INTRODUCTION

There is no doubt that the role of the science coordinator has changed beyond all recognition with the implementation of the Education Reform Act 1988. The job has become highly complex and requires many skills.

A school’s science coordinator not only needs to have a love of the subject but also requires good management and communication skills. This article looks at ways of developing the role to ensure the success of science teaching in the primary school.

KNOWLEDGE AND UNDERSTANDING

Part of the science coordinator’s task is to help train colleagues in science concepts and the processes of scientific enquiry. To do this, the science coordinator needs to be confident in his or her own understanding of the subject. Whether the coordinator’s knowledge of science is obtained through formal study or is self-taught is not important; but having an enthusiasm for and appreciation of science is. The biggest difficulty for many teachers who have no formal qualifications in science is their own lack of confidence. Science coordinators need to be aware of this and help colleagues to gain not only a knowledge of science but also the confidence to use it.

COMMUNICATION

Why do science coordinators need communication skills above all else? One of the most important tasks is to overcome the inherent fear many teachers have of science. Coordinators must be able to conquer their colleagues’ apprehension—which can be a result of unsatisfactory and unstimulating teaching in a teacher’s own educational background. The best way to do this is to communicate that science is fun, is part of everything we do in our daily lives and can be easily and effectively incorporated into the school day. Gaining the confidence of colleagues makes the task of organizing and structuring the science curriculum much easier.

PUTTING SCIENCE INTO THE SCHOOL CURRICULUM

Let us assume that the science coordinator has the support of the school’s senior management team and the confidence and trust of colleagues. Science can now be placed high on the development priority list. If support from the senior management team is lacking, the task will be much more arduous and
frustrating. However, the national curriculum does at least ensure that science is placed near the top of the agenda.

It is important to remember that an essential requirement of any curriculum initiative is that staff take on their own personal responsibility for adopting and implementing any new ideas. Staff should be involved in selecting particular areas of the curriculum for development and the strategies to be employed in this activity. The science coordinator has an obvious role to play in, first, identifying science issues and, at a later stage, supplying information so as to allow staff to define priorities.

A number of techniques can be used to involve staff in this process. One particularly effective method is to use the Guidelines for Review and Internal Development in Schools (GRIDS). This is a structured way of assessing staff views and gives a graphic demonstration of where the consensus lies (the GRIDS Primary School Handbook is available from the School Curriculum Development Committee). You may, of course, decide that for your school a more appropriate method would be to simply bring together all the interested groups to discuss what is needed and then develop your own list of priorities. Using a structured method such as GRIDS can still be useful, however, to pinpoint issues for discussion.

One thing to remember is that development planning is a cyclical process; as well as developing and implementing initiatives, coordinators must be aware of the need to critically review any progress made and use the process to develop new goals.

Let us now examine the kinds of priorities that will arise from the review process and discuss the science coordinator's role in facilitating their development.

STRUCTURING THE INSET PROGRAMME

Any INSET programme for science must be tailored to the needs of the staff, and this can result in the science coordinator having to take on many different tasks. There is an obvious need to use some INSET time for meetings in which staff can develop their own ideas and preferred approach. The coordinator must effectively chair these meetings, which means spending time developing and preparing the agenda; preparing documents for discussion; and managing the meeting efficiently so as to get through the business in hand. Other INSET time may be used for talks or workshops. The coordinator should take a lead in collecting ideas, inviting outside speakers and preparing demonstrations. On occasions demonstrations of science techniques in the classroom may be more effective, and the coordinator should liaise with external agencies (advisors and advisory teachers) to set this up.

DEVELOPING AND INTEGRATING THE SCIENCE CURRICULUM

The main responsibility of the science coordinator is to ensure that staff fulfil the teaching requirements of the national curriculum. Given that most primary school teaching is predominantly topic based, the coordinator must ensure that sufficient science content is included in schemes of work. Further, the science curriculum must be structured in such a way as to guarantee progression in the areas of knowledge and understanding and of skills. Some topics that are predominantly science based are: 'Water'; 'Space'; 'Growing'; 'Ourselves'; 'Heat'; 'Light'; 'Colour'; 'Holes and cavities'.

To achieve progression it is not essential continually to change from one topic to another. Indeed, it may be preferable to stay with a particular topic, developing the curriculum content according to the abilities of the children.

The science coordinator's role here is to feed information and ideas to colleagues as they develop and teach topics. The coordinator should also make sure that
unnecessary repetition of material is eliminated, so that the children maintain their interest and enthusiasm as they progress. This obviously involves forward planning, which can be an extremely time-consuming process. However, the information can be presented in a structured way. One technique is to produce topic pamphlets containing topic plans together with all the activities appropriate to the various age groups. This can be cross-referenced to available resources and teaching aids (workcards, books, etc.).

As well as planning science into the curriculum, it is important to ensure that it is integrated into the topic work. This may require that teachers make significant changes to their methods of organizing work, and perhaps even to their teaching style. The coordinator can help here by setting up workshops—either in a structured way, as part of the INSET programme, or rather more informally with individual teachers. The objective must be to demonstrate science in action in the classroom. As an example, the coordinator could set up a practical workshop based on the topic of the term so that the staff can see and use available equipment. This provides a good opportunity for staff to raise questions and voice any worries, and it can also act as a catalyst for ideas.

RESOURCING THE CURRICULUM

To be effective, science has to be adequately resourced. Although good use can be made of everyday materials (washing-up bottles, offcuts of wood, scrap metal, etc.), this must be complemented by purpose-made science equipment suitable for young children.

Members of staff should obviously be involved in deciding what equipment they require in their classrooms. The science coordinator will help in auditing resources and advising on purchases before staff embark on a spending spree. As science equipment is expensive, it is a good idea to centralize it in a resource bank, to be available to all staff as and when it is needed, rather than providing equipment for each individual classroom.

If this approach is to succeed, the science coordinator must ensure that the equipment is easily accessible and mobile, and that all staff have updated information as to the content of the bank and its location.

Resourcing will continue to be difficult for many schools; however, all schools have one readily available resource—the local environment. The science coordinator can make colleagues aware of the value of their immediate environment. Setting up a science trail around the school is an ideal opportunity for the coordinator to demonstrate this. Some schools will be fortunate enough to have playing-fields or open ground where an environmental area could be established. A shallow pond (preferably fenced to avoid accidents) will dramatically increase the range of plant and animal life available for study.

Today, most schools regard ‘green’ issues as important, and where better to develop investigative work than the school’s own environmental area? In an urban situation, the impact of transport and industry on the local environment can be investigated and monitored.

RECORDING AND ASSESSMENT

As for other subjects, recording children’s progress in science involves monitoring achievement in relation to the attainment targets set down in the national curriculum.

What may provide more of a challenge is the use of the standard assessment tasks. The science coordinator will play an important role in advising staff as to their implementation.
PARENTAL INVOLVEMENT

Communication again comes to the fore with the issue of parental involvement. Many parents will find it difficult to think positively about science—as a consequence, perhaps, of their own inexperience of the subject. It is vital that the coordinator informs and enlightens as many parents as possible; there can be little doubt that parental support and reinforcement of work in the home will speed progress in school. A parents’ evening involving parental participation in investigations is a good strategy. Such events are often well attended, especially if children are involved in setting up and participating in the investigations—and perhaps even in 'supervising' the adults!

ACTIVITY 1: ASSESSING ASPECTS OF THE COORDINATOR’S ROLE

Assess the different aspects of the science coordinator’s role as presented in this article. What elements do you think should be given high priority? How would you, in your school, address these priority areas? Are there other important areas that should be included?

SUMMARY

We have seen that science coordinators need to have effective management and communication skills, a commitment to the subject and a desire to learn. Science works on many different levels; the simplest everyday phenomena can be extremely complex on detailed examination. The great advantage of science, above all else, is that it is fun. Children love performing scientific activities, and the achievement of the science coordinator is to enable children to use science effectively to gain a better understanding of the world around them.
DEVELOPING A SCHOOL POLICY FOR SCIENCE

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Developing a school policy for science is a long and arduous task, and one that is not made easier by the rapid changes that are taking place in science teaching at the present time. Jane Savage's article stresses the need to structure the organization and development of the work in order to establish a coherent and worthwhile policy document. Taking the school staff and its teaching methods as starting-points, she takes the reader through a series of stages—each one representing a unit of work. Combined together, these units can be used to build the elements of a science policy.

INTRODUCTION

When the staff of a primary school have decided that they wish to develop a science policy or to focus INSET activities on the area of science, it sometimes seems as if they are taking on an enormous, perhaps even impossible, task; it is often difficult to know where to start or how to progress. The climate of continuous and sometimes momentous change within which teachers work can also make it an anxious time: they have to try to assimilate and integrate statutory and non-statutory initiatives as well as come to terms with their own feelings about science and the constraints under which they have to work.

Looking at any area of the primary curriculum takes time; it is important therefore that a sufficient amount of time is allowed for, and that sessions are as meaningful and as helpful as possible. Formulating a clear plan at the outset of what the school wishes to achieve as a result of its science policy will make it easier to focus on smaller, more easily achieved, tasks which taken together will form the overall policy or curriculum statement. Success is more easily attainable if a huge task is broken down into smaller steps. In addition to making it easier to chart progress, having a series of small tasks also helps to keep teachers motivated and involved; endless unstructured discussions about science may result in consensus never being reached or a policy never being produced.

The remaining Sections of this article set out a series of steps; each step takes the school, and its staff and teaching methods, as starting-points, and forms a manageable unit of work. Taken together, they can be used to build the elements of a science policy.

ACTIVITY 1: WHAT SHOULD A SCHOOL SCIENCE POLICY COVER?

Writing a school policy for science can be a long and arduous task. Much of the work can be done in a series of staff meetings. Compile a list of suggested topics for staff meetings that would cover the main points to be documented in a school science policy. (Hint: Up to ten meetings might be needed.)

IDENTIFYING AREAS OF EXPERTISE

Many members of staff have interests and skills that can be of great use to the school as a whole when putting together a science policy. It is important that
these sometimes hidden talents are recognized and given status so that even those members of staff who are most intimidated or threatened by science feel that they have something to offer.

One of the major advantages of staff working together on a policy document is the sharing and increased mutual understanding that helps weld the individual teachers into a team. Identifying colleagues' areas of expertise can also highlight the cross-curricular nature of the science work that is already going on in the school. These cross-curriculum links are crucial, as it is never a good idea to work on a policy for any subject in isolation from other subjects. In the majority of cases the primary curriculum is planned and delivered so that the content of any subject is rarely independent of work in other areas. There may well be other policies or ideas in place which will affect any new policy. Curriculum links should be strengthened rather than weakened when any one curriculum area is being studied in detail. In addition there needs to be a common thread running through all curricular and non-curricular policies in order that the primary curriculum being delivered does not become fragmented, disjointed and difficult to deliver. You may find that plans or resources that have been discussed with respect to another area of the curriculum have much to offer the development of a primary science policy.

ESTABLISHING KEY PRINCIPLES BY WHICH CHILDREN LEARN

In common with many other professions, our discussions often contain phrases whose meaning and relevance is open to interpretation. Jargon such as, 'Our topic work is relevant, real, practical and meaningful' and 'We believe in child-centred learning' abounds. It is important that, if members of staff use phrases such as these, they and their colleagues are clear about what is meant; they can then go on to discuss how these ideas translate into classroom practice. Clear-thinking and clarity of expression will enable colleagues' perceptions of the principles of good practice to be shared and developed, and teaching methods can be refined to take account of these principles.

What do individual teachers mean by 'open-ended problem-solving' and how are they going to organize and manage it within their classrooms? Actual examples of children's work brought along to staff discussions to illustrate this teaching method often give valuable insights into how expectations of standards vary throughout a school. Junior class teachers may be surprised at the high quality of work that is expected from the infants, and infant class teachers may be disappointed at the seeming lack of progress made by some children, or the complexity of work that is undertaken in classes of older children. This exercise will be particularly interesting if there have been no mechanisms in place before, either formal or informal, for teachers to examine what is going on in other colleagues' classrooms. A very easy practical step to take to help busy teachers to share their experience is for staff meetings to take place in all classrooms on a rotating basis. Not every meeting has to be in the staffroom or headteacher's office. Teachers should also begin to discuss various definitions of primary science and attempt a definition of their own. Those definitions found in publications such as Wynne Harlen and Sheila Jelly's Developing Science in the Primary Classroom (Oliver and Boyd, 1989), may be a useful starting-point.

It may also be appropriate at this stage to begin a close examination of AT1 of the national curriculum together with its associated programmes of study. What strategies are already being used that encourage these kinds of experiences and how can they be improved upon? Has any member of staff been on any INSET courses that shed light on this area? Are there any INSET courses in the near future that should be attended by a representative of the staff in order to widen the debate? What additional provisions will have to be made? What gaps are there in present policy and practice and how can these be resourced and incorporated in work that is already in place in the school? What do the statements in the national curriculum document actually mean? How can they be translated into ideas that are more meaningful and accessible to the staff? Is there a match
between AT1 and work already being undertaken in the school? Through discussions of this kind staff may move towards a clear policy statement on children's learning in the area of primary science.

**ACTIVITY 2: PROGRESSION IN CONCEPTUAL DEVELOPMENT**

Taking one attainment target in profile component 2, discuss in a tutorial how best to promote progression in children's conceptual development. Design a series of activities that could help children achieve this progression.

**REVIEWING CURRENT SCIENCE WORK**

Even where a school has a clear consensus on certain issues and where policy statements have been produced that have been the result of staff discussion and INSET, there may still be a mismatch between what should be, or is thought to be, going on in classrooms and what is actually going on. Therefore, before the school embarks on creating or modifying its science policy to take account of the national curriculum and other initiatives, it is important to review in some detail what is already taking place. This could be described as a curriculum audit, and will provide information about all areas of the curriculum, not just science. This will help teachers to identify what is taking place and provide a positive starting-point for further development. It may, of course, be an activity that the school has addressed earlier.

Questions that could arise during this audit may include such general points as:

- how much time is allotted to different curriculum areas?
- how much time is spent on a particular task and how much is spent introducing the task, preparing materials, waiting for help, clearing away, etc.?
- how much time is spent on management tasks, such as organizing and collecting dinner money, marking the register, etc.?

More science-specific points might be:

- when the teaching is cross-curricular and topic based, how is an activity defined as scientific?
- how do the children record their science work?

As well as identifying positive features, this activity may also provide strong evidence, especially when teachers compare their 'audits', of fragmented and unconnected patterns of learning; it should also focus on those activities that take up disproportionately large amounts of time. This evidence can be used to draw up a 'curriculum balance sheet' and should result in improvements in how time is allocated and spent.

**EXAMINING NATIONAL CURRICULUM SCIENCE TOGETHER WITH PREVIOUS SCIENCE WORK**

Like all the national curriculum documents, that for science needs a considerable amount of time spent on it to discuss, interpret and digest what is contained within it. The more you look the more you see! Time has to be allocated to examine in some detail not only the attainment targets and their associated programmes of study but also the non-statutory guidance and any inconsistencies that are perceived in the document. This is such an enormous task that it makes sense for small groups or pairs of teachers to study particular sections in detail and then report back to the whole group on their observations and discussions. Following this method has the added advantage that teachers will develop their own area of expertise as regards the national curriculum document, and will be good sources of information and advice for their colleagues. This pooling of
knowledge is much more satisfactory than all members of staff having a superficial and inadequate understanding of the whole document.

However, it is worth remembering that the science curriculum offered to pupils will contain more than just the bare bones of the national curriculum document, which, of course, has to be studied in depth, but also should be compared and contrasted with other resources that are available. These may include existing school policies on science, science policies in neighbouring schools, documents and guidelines produced by local education authorities (e.g. ILEA’s *Helping Children to Become Scientific—Primary Science Guidelines, 1988*), and articles and publications from the Association for Science Education (ASE), together with other notes and handouts from INSET courses. Again materials from other diverse sources may be useful, such as articles on working with children having special needs and teaching in a multicultural community. All these sources need to be examined and combined to make use of their strengths and minimize their weaknesses. It could be particularly useful at this stage to invite to the school speakers from other schools or from the advisory services to gain a fresh perspective and different point of view. This stage in the development of a policy will need a considerable amount of time.

### ACTIVITY 3: FINDING RESOURCE MATERIAL

Start to compile a reference list of useful books and documents dealing with aspects of primary science and policy. Try to obtain the most useful books as resource material for your colleagues.

### WHOLE SCHOOL PLANNING

When individual teachers or small groups of teachers come together again and pool their areas of expertise, it will be time to record and develop these ideas in a whole school policy which will build on statutory guidelines and the identified strengths of many other sources of information. This has to be done in such a way as to allow teachers to develop their individual strengths and interests but at the same time have a framework which will ensure continuity and progression. This means that children should not revisit themes or topics at the same level at different times in their primary school career and it should give teachers a clearer picture of science work throughout the school. Individual teachers will no longer be able to work completely independently from one another but will have to take their place in the overall plan.

As all members of staff will have been involved in the development of the emerging school policy, individual teachers should not feel too isolated or constrained—they will have had ample opportunity to put forward their own views and to listen to those of their colleagues. Decisions may be taken, for example, about such questions as: how the science attainment targets should or could be clustered in order to build on links between different science subjects and provide a more manageable spread of work; how topics or a choice of topics in a particular field can be allocated to year groups or age ranges; or how long topics should last in order that sufficient material is covered in the course of a year. These decisions may well have an impact on other areas of the primary curriculum.

### ACTIVITY 4: PLANNING TOPIC WORK

Tables 1 and 2 show examples of ways of planning topics. Note that Table 2 includes the relevant attainment targets. Consider the examples carefully and comment on their usefulness. Does your school use similar documents to plan topic work?
TABLE 1  Planning topic work for science in the primary curriculum

<table>
<thead>
<tr>
<th>Reception/nursery class</th>
<th>Middle infants</th>
<th>Top infants</th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
</tr>
</thead>
<tbody>
<tr>
<td>ourselves under your feet</td>
<td>Barnsbury Wood</td>
<td>life cycles</td>
<td>environment</td>
<td>growth and change</td>
<td>sex education</td>
<td></td>
</tr>
<tr>
<td>houses and homes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weather</td>
<td>changes around us</td>
<td>land, sea, space</td>
<td>air and water</td>
<td>rocks, minerals, soils</td>
<td>pollution, recycling</td>
<td></td>
</tr>
<tr>
<td>toys</td>
<td>transport</td>
<td>structures and forces</td>
<td>buildings</td>
<td>communication</td>
<td>bridges, machines</td>
<td></td>
</tr>
<tr>
<td>senses</td>
<td>pattern</td>
<td>food and heat</td>
<td>transport</td>
<td>energy</td>
<td>light and colour</td>
<td></td>
</tr>
<tr>
<td>clothes streets where we live</td>
<td>flight</td>
<td>canals</td>
<td>kitchen chemistry</td>
<td>materials</td>
<td>conservation</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 2  Grouping attainment targets into clusters to help plan topic work

Cluster 1
- ATs 2, 3 and 4

Cluster 2
- ATs 1 and 12

Cluster 3
- ATs 10 and 11

Cluster 4
- ATs 13, 14 and 15

Cluster 5
- AT 6

Cluster
Attainment targets
Possible topics

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Attainment targets</th>
<th>Possible topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 The Variety of Life</td>
<td>ourselves; environment; health; minibeasts; growth and change</td>
</tr>
<tr>
<td></td>
<td>3 Processes of Life</td>
<td>weather; conservation; seasons; air and water; day and night</td>
</tr>
<tr>
<td></td>
<td>4 Genetics and Evolution</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5 Human Influences on the Earth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 Earth and Atmosphere</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 The Earth in Space</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10 Forces</td>
<td>toys; movement; buildings; structures; machines; communications; transport</td>
</tr>
<tr>
<td></td>
<td>11 Electricity and Magnetism (and Technology)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>13 Energy</td>
<td>communications; change; video and TV; food; heat; performing; transport</td>
</tr>
<tr>
<td></td>
<td>14 Sound and Music</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 Using Light and Electromagnetic Radiation</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6 Types and Uses of Materials (and Technology)</td>
<td>models; kitchen chemistry; flight; canals, toys; change</td>
</tr>
</tbody>
</table>

AT1 Exploration of Science will be addressed at all times. AT12 IT: The Scientific Aspects of Information Technology Including Microelectronics permeates all clusters. Children should be encouraged to use computers, tape recorders, turtles and videos.
Any new policy may also have implications for the availability of resources within the school. These implications will have to be carefully considered: the ordering, collection and organization of resources is time-consuming and expensive. A school may decide that selected science resources should be in all classrooms at all times. Other, more specialized, resources may be shared and stored in a central area. ‘Specialist’ equipment may be needed for specific topics or activities. Again, schools may need to carry out ‘stocktaking’ to determine exactly what resources the school actually has, possibly hidden away in a classroom, before drawing up a detailed, prioritized plan for organizing resources for the emerging policy. A science equipment and resources ‘amnesty’, in which long-lost items can be returned to a central collecting point anonymously, can work wonders! Advisory teachers and specialist teachers’ centres can be of great help in advising on ‘best buys’ or supplying information about equipment and resources that can be borrowed or hired.

REVIEWING, EVALUATING AND FUTURE PLANNING

Once there is an agreed draft policy, members of staff will need to be aware that there must be a trial period, in which time is set aside to review and monitor progress, and to discuss difficulties and improvements. Any policy will have to be reviewed and updated at regular intervals. New staff will join the school who will have different perspectives and experiences; although many new members of staff, especially probationary teachers, will welcome an existing framework or policy to help them to structure their teaching in an unfamiliar environment, any policy must take account of staff changes and curriculum initiatives, which are so much a part of primary education in the 1990s. No policy should be written ‘in tablets of stone’ and then forgotten.

In order to evaluate the effectiveness of a science policy, evidence for discussion will need to be collected. Teachers will have to decide on a mechanism that will allow them to record the delivery of the science curriculum in the classroom and monitor its progress, from the perspective both of the whole class and of the individual child. Any change in policy will have a direct impact on the learning experiences of the individual children and teachers in the school. Evidence of this change, the way in which the evidence is collected and when it is collected, may form part of a wider policy on record-keeping and assessment that may cover areas other than science.

When this evidence (which might, for example, take the form of collecting regular samples of children’s science work), is discussed, it should contribute to the review of the policy. In this way, policy planning, assessment, evaluation and modification should form part of the whole planning cycle, which will enable a policy to be regularly updated and improved to keep pace with both a school’s internal development and external changes. New policies that are being worked on may also have an impact on previous ones. Lessons that have been learned from following a model such as that outlined in this article, should affect the development of subsequent policies and curricular statements.

There are several models that schools may find helpful when devising a science policy, and numerous sources of information. The key principles seem to be that schools have a model to work to; that they allow sufficient time for what is an extremely complex activity; and that practice is continually shared and reviewed.

RESOURCES

Be Safe: Some aspects of safety in science and technology in primary schools (1989) Association for Science Education.


The National Curriculum: Making it Work for the Primary School (1989) Association for Science Education.
ACKNOWLEDGEMENT

We would like to thank Thornhill Primary School, London Borough of Islington, for the use of material in Table 1, and the North London Science Centre, London Borough of Islington for the use of material in Table 2.
ORGANIZATION AND EVALUATION OF SCHOOL-BASED INSET TO SUPPORT PRIMARY SCIENCE

Mary Kelsey
General Inspector for Science, Guildford, Surrey

Your study of Science for Primary Teachers means that you will no doubt be in demand to provide ideas or training sessions to help your colleagues teach science. If you are involved in organizing and running school-based INSET it is important to think carefully about a number of different aspects. This article provides details of the planning and preparation stages for INSET sessions and makes suggestions about the types of activities you may wish to include in an INSET day.

As important as running a successful INSET day is how to evaluate the effectiveness of the sessions. This is considered towards the end of the article.

INTRODUCTION

Strictly, school-based INSET is an activity that takes place in the school. However, the term has become widely accepted by teachers to include school-centred work engaged in to meet the requirements of the school and the professional needs of the staff, but not necessarily carried out in the school. For the purposes of this paper, we will regard INSET as an approach rather than as specifying a geographical base, and be concerned primarily with science INSET.

Many teachers perceive school-focused INSET as being particularly successful; this may be because it is more directly related to their own day-to-day concerns. The problems encountered by members of staff, whether individual teachers or the whole group, are affected by factors specific to their school as well as by general ones. It therefore makes sense to use the school itself as the starting-point in finding solutions. The notion of the ‘thinking school’, where members of staff act in a corporate way to define and then solve their own school’s problems rationally and professionally, and to create improved teaching and learning opportunities for the children, involves school-based INSET almost as a continuous process. It can certainly provide an excellent forum for teachers to reflect on their own practice, and to work towards a shared vision of the education their school is providing for its children.

PLANNING INSET PROGRAMMES

INSET, whether for science or any other area, should be considered as part of a whole school programme. INSET coordinators therefore need to be aware of the type of work that has gone on before and have a reasonable idea of what may come later. Staff development thus should be organized in a programme to be part of a school’s development plan. Science INSET has to compete for time and resources with other areas of the primary curriculum. To effectively utilize resources it is important to consider whether there are any areas where training might overlap; sometimes this overlapping can be beneficial, for example in certain skill developments relevant to science, mathematics and technology. Other days may perhaps be entirely given over to science if this is thought to be appropriate.
You may be asked to organize or help with an INSET day for science at your school. Careful preparation and planning are the keys to success and well worth spending time on.

An outline of the aims of the INSET may have been given to you, or you may need to establish these yourself. In both cases it is crucially important that the whole staff be involved from this early planning stage—and be genuinely involved rather than just consulted from time to time. A school-based course is unlikely to be truly successful unless all the staff are involved in the planning right from the start.

However, before you can begin to make detailed plans about an INSET programme, an early priority will be to establish the needs of the staff. Below are a few suggestions for ways you might do this:

- chatting informally to colleagues, either in a group or individually
- designing and using a questionnaire
- brainstorming
- using priority cards
- considering a checklist of pros and cons
- using the Delphi technique (see Appendix 1)
- using the nominal group technique (see Appendix 2).

### ACTIVITY 1: DECIDING PRIORITIES

The following list of aims for school-based INSET days was collected by a primary science advisory team over the period 1985–90.

- To build up the confidence of teachers.
- To get science teaching established in every classroom.
- To set up a resources area for equipment.
- To begin to formalize a school policy for science (including updating an existing one).
- To plan the science curriculum for a specific period of time (for a term, a year, etc.).
- To improve liaison with other schools.
- To consider the cross-curricular links.
- To match the curriculum to the national curriculum science document.
- To develop and use the school grounds for (science) teaching and learning.
- To visit other schools and set up a follow-up discussion.
- To look at particular attainment targets in the national curriculum document.

Decide which aims you would concentrate on if you were planning to run three INSET days for your staff over the school year.

### PREPARING INSET

Once the main aim(s) for the day has been ascertained, the next important thing to consider is who should do what. Advice and help can be sought from a number of sources including: advisors/inspectors; advisory teachers; teachers' centre staff; local colleges and other schools.

Speakers and workshop leaders often come highly recommended (or otherwise) from colleagues. Remember that what one group of teachers regard as
stimulating, challenging and thought-provoking may be perceived by another group as threatening, or even antagonistic. You should know the strengths and weaknesses of your own staff well enough, but you will need to discuss with the senior management team just what is required. Usually different skills are needed for different sorts of input. Keynote speakers need to be able to communicate well with larger groups but not necessarily to interact with them. They should be reliable in keeping to a time schedule and it obviously helps if they can deliver a clear message in an entertaining way.

However, to lead a workshop in an area such as primary science, where many teachers feel insecure about their own knowledge, you may well need someone who comes over as non-threatening and can relate to groups and individuals in a friendly way. It is essential that they can take the lead where necessary, but they also need to be facilitators and give the group or individuals support and security.

Personnel may be brought in either as keynote speakers or workshop leaders. In either case, they need to be briefed very carefully or involved at an early stage so that they can contribute to the planning and preparation stages. If they are experienced INSET providers they should have valuable expertise to offer. You should confirm any arrangements in writing, for all invited speakers, making sure that the following points are covered:

- note down any equipment that is to be provided by the school, such as an overhead projector
- describe how the room will be arranged, for example whether the chairs will be placed in a circle or in rows facing a screen
- give details of car-parking arrangements; workshop leaders, in particular, tend to arrive with a car full of equipment and will usually appreciate help with loading and unloading
- confirm the timing; if possible send them a copy of the day’s programme well in advance
- give details of any attendance fees or travel expenses that will be paid if this is relevant
- give clear travel directions (including a map) if this is relevant.

THE INSET PROGRAMME

As you devise the programme you will need to consider the balance between ‘active’ and ‘passive’ sessions. It may be helpful to consider which of the following types of session are relevant to your overall aim(s), and where they are best fitted into your programme:

- pre-course task
- review sessions—especially if a pre-course task has been used
- lead talk (keynote speaker)
- workshop(s)
- small group discussions
- large group discussion/plenary session.

Some of these will be considered in detail later in this article.

For science INSET it is important to consider including a session providing core knowledge that the teacher needs to know, perhaps relating it to a workshop activity in the programme. Such a session, focusing on science content for the teacher, helps individuals to increase their confidence about effectively delivering the necessary science to the children. If such a session is included it is important that both the speaker and the teachers are clear that it is intended to be for the teachers’ own knowledge and development. For this session, it may be appropriate to ask colleagues from the secondary sector to provide the input. No
more than one hour should be devoted to this type of session. Many schools that have built up good liaison working groups with their secondary schools find that they are able to extend these sessions to a series of after-school self-help groups on a variety of topics. In return, many secondary colleagues enjoy sharing ideas with primary colleagues who can often help with areas that are generally more common in primary practice such as:

- open-ended teaching and learning strategies
- group work with children
- adequately catering for children with special needs
- displaying children’s work appropriately
- using a variety of recording techniques
- using an integrated approach to the curriculum
- planning for progression with a class or group.

The programme may have certain constraints, such as the time set for coffee or tea breaks, or the finishing time of the session. These constraints will affect your planning and the flexibility of the programme.

Give careful thought to the breaks you are going to include in the programme. Lunch arrangements can often influence how successful the day is. If one of your aims is for the INSET day to contribute to team-building, but at lunchtime everyone disperses, then a valuable opportunity has been lost; similarly, if one or two members of staff are preoccupied with providing lunch so that they miss vital sessions, then the group dynamics may not recover. Ensure that the lunch arrangements support the day rather than detract from it.

Short breaks in the programme, for coffee and tea, are usually much appreciated. They allow participants to reflect on what has been covered and to discuss issues with colleagues. Try not to fill the day too full—if the organizer and participants are constantly chasing the timetable it introduces a frenetic note. The day needs to be stimulating and useful, but also relaxing and conducive to reflection.

Additional factors to consider when planning an INSET day include resources and funding. It is more than likely that the INSET is funded via the school INSET budget and will therefore have been identified on the staff development plan.

Table 1 provides a checklist for planning school-based INSET.

IDEAS RELATING TO SPECIFIC SESSIONS

In this Section, we give some ideas for structuring and presenting different types of session that you may wish to include in an INSET programme.

PRE-COURSE TASKS

Although not essential, assigning certain pre-course tasks, such as reading a particular chapter or document beforehand, can sometimes be a useful way of ensuring that everyone has a common starting-point. It can help to focus participants’ attention on what is being discussed and can save time during the actual programme. The disadvantage is that if some members have not ‘done their homework’ it can delay or detract from the programme.

Pre-course tasks can also include the participants being asked to bring along some examples of children’s work; or individuals or pairs could undertake research on a particular aspect and bring their findings to the meeting.
TABLE 1 A checklist for planning school-based INSET

<table>
<thead>
<tr>
<th>Planning</th>
<th>Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Identify needs</td>
<td>1 Timings</td>
</tr>
<tr>
<td>2 Establish main aim</td>
<td>2 Rooms allocated</td>
</tr>
<tr>
<td>3 Other aims</td>
<td>3 Specific resources</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preparation</th>
<th>After the event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Time</td>
<td>1 Letter of thanks</td>
</tr>
<tr>
<td>Day session</td>
<td>a</td>
</tr>
<tr>
<td>Twilight session</td>
<td>b</td>
</tr>
<tr>
<td>Evening session</td>
<td>c</td>
</tr>
<tr>
<td>2 Funding</td>
<td>2 Return of resources</td>
</tr>
<tr>
<td>3 Lunch arrangements (special diets?)</td>
<td>a</td>
</tr>
<tr>
<td>4 Coffee/tea arrangements</td>
<td>b</td>
</tr>
<tr>
<td>5 Outside support</td>
<td>c</td>
</tr>
<tr>
<td>a</td>
<td>3 Evaluation</td>
</tr>
<tr>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>c</td>
<td>b</td>
</tr>
<tr>
<td>6 Staff responsibilities</td>
<td>4 Follow-up</td>
</tr>
<tr>
<td>a</td>
<td>c</td>
</tr>
<tr>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>c</td>
<td>b</td>
</tr>
<tr>
<td>7 Non-teaching staff</td>
<td>c</td>
</tr>
<tr>
<td>a School helper/secretary</td>
<td></td>
</tr>
<tr>
<td>b School catering staff</td>
<td></td>
</tr>
<tr>
<td>c School caretaker</td>
<td></td>
</tr>
</tbody>
</table>

VISITS

As part of an INSET session, you may consider visiting colleagues’ classrooms, or alternatively arranging a visit to a neighbourhood school. Such visits provide useful material for discussion. These visits will be more profitable if the teachers are well prepared and have a particular theme on which to concentrate. If other schools are to be visited, advice may need to be sought from the advisory team so that the schools chosen are appropriate.

Activity 2 suggests an exercise that is helpful in focusing teachers’ attention on what constitutes good practice in science teaching at primary level. Although it would be useful to do at any time, it is of particular benefit if carried out before an INSET visit to a different classroom.

ACTIVITY 2: ASSESSING GOOD PRACTICE

Consider the statements given below about children ‘doing’ science and then, in a tutorial, carry out the activities that follow.

Children are trying out ideas to ‘see what happens’.
Children are busily engaged in drawing diagrams from a reference book.
A group of children is working on science activities while the rest do other activities.
Children are making predictions about what they expect to find or to happen.
Children have watched a television programme and are now engaged in experiments suggested in the accompanying pamphlet.

Children are working on science activities in a small group.

Children are working on investigations using interesting items provided by the teacher.

Children are taking the initiative in suggesting what to do and how to set about it.

Children are keeping some record of what they find out or observe.

Children are working individually on science projects.

Children are engaged in 'egg-race' activities.

Children are working with an 'expert' science teacher at some time during the week.

Children are using instruments for aiding observations or measurements.

Children are working from workcards that give them guidance on how to perform experiments.

Children are busy looking up facts in science reference books.

Children are working as a whole class, and are all doing similar experiments.

Children are handling 'real' test-tubes, chemicals, magnets, etc.

Children are tackling science activities as part of an integrated day.

Children can choose the most appropriate form of communication from a wide range of methods.

Children have a clear idea of what they want to find out, investigate or observe.

Children are trying different ways of approaching a problem.

Children are classifying things according to their properties or characteristics.

Children are trying to quantify their observations.

Children are busy working with interesting things that they have brought into school.

Children are devising and applying tests to find out what things do.

The whole class is working on a 'circus' of science activities.

Children are observing things closely, perhaps watching, listening, smelling and touching.

1 Photocopy the above statements and then cut them up into strips so that each statement is on a separate strip of paper.

2 Sort the strips into an order of priority according to your view of good practice in science education at the primary stage. Do not include any equal pairs at this stage.

3 Now, working with a partner, try to agree a priority order for the top 10 statements. If you find it impossible to negotiate an absolute priority order, you may pair some statements.

4 Pool your results with those of the rest of your group and see whether you can agree an overall top 3 and bottom 3 statements.

GROUP DISCUSSIONS

If you intend to include group work in the session, you need to think about the structure of the group as regards personalities and distribution of expertise, as
well as the physical layout of the room(s) allocated. In larger groups, discussion can be greatly facilitated by arranging the chairs in a circle. If the group is very large, it may be a good idea for members to do some work in pairs; the pairs can then be combined into small groups to further discuss the issues and to share their results before everyone is brought together for a plenary session. This way of working ensures that more diffident members get the chance to contribute.

WORKSHOPS

The very nature of primary science means that practical workshops take up a large proportion of INSET time. Despite the time and considerable effort they take to set up, and the space and resources they need, they are an essential element in learning and testing the ideas of science.

It is advantageous for the leader of a workshop to have some INSET expertise—as an advisory teacher or a skilled science coordinator perhaps. They will need to spend a good deal of time interacting with groups and individuals, providing help and guidance.

It is important for leaders to have confidence and experience in what they are doing because there will almost certainly be outcomes that could never have been predicted. However, this reflects conditions in a primary classroom. In the hands of a good workshop leader an unexpected event or outcome can be very profitable for the participants.

Workshops may either concentrate on activities that are appropriate for teachers to do with the children, or provide the opportunity for staff to develop their own professional knowledge and expertise.

Workshops can also provide an opportunity to review and evaluate a range of equipment. This activity can be incorporated into the programme: for example, an excellent way of evaluating the best magnet for a particular task is actually to try out several different types in a workshop session.

Practical techniques can also be practised or developed: for instance how to use a stop-clock or a microscope.

If a workshop activity involves constructing something, say, an anemometer, then the resulting piece of equipment is important in its own right, as well as being useful in developing design skills.

PLENARY SESSIONS

At the end of any INSET activity, and especially at the end of a workshop, it is useful to build in a plenary session. It can be an ideal opportunity to explore teachers’ understanding of what science is and what we mean by process skills (AT1). Many people lose sight of the requirements of AT1 in their concern about the science content, but content and AT1 skills need to be tackled together. (Remember that AT1 is one whole profile component and carries 50% of the weighting at key stage 1 and 45% at key stage 2.) So, for instance, you could organize a plenary session to explore AT1 activities in relation to what has been happening in a workshop.

A plenary session can help to end the day on a positive note rather than people just drifting away. It may be appropriate to get participants’ reaction to the day during such a session: ask them how useful they think they will find suggestions made during the day in their future teaching activities.

EVALUATION

How to monitor or evaluate the INSET is probably the least understood part of the work. We need to have some measure of how successful a programme has been in terms of the teachers’ own self-development and the impact on the
children's learning in the classroom. This is a difficult task, but some possible issues to address are considered here.

**CHANGES IN STAFF ATTITUDE**

- Have any teachers on the original INSET course requested follow-up sessions?
- Can any changes in motivation be detected in the teachers who participated in the programme?
- Are any of the skills and knowledge gained on the course being used in the classroom?
- Have there been any changes to classroom/school organization?
- Has the communication of ideas improved?

**TANGIBLE OUTCOMES**

Some INSET days may have as their aim an expected 'outcome', which can be seen and thus evaluated after a specific period of time. Examples of such tangible outcomes are:

- preparing and writing policy documents
- writing schemes of work
- setting up a centralized resources area for equipment
- designing an outdoor habitat area.

These results are clearly tangible; however, their quality will need to be evaluated, and their future use and development will require reviewing.

**PERFORMANCE INDICATORS**

These are the specific outcomes used to make judgements about the effectiveness and efficiency of the INSET. Indicators can relate to staff attitudes or changes in organization (as above), or to the INSET activity itself, such as staff attitudes to the programme.

Indicators that may be useful for evaluating the INSET on staff development include:

- the recognition of specified behaviour during or after the INSET
- an increased/decreased involvement in an area of concern
- the degree of post-INSET support sought by staff.

In terms of science INSET it is possible to devise some very specific indicators relating to:

- the INSET
- the impact on staff taking part
- the impact on the children in the classroom.

**APPRAISAL**

While not all local education authorities or all schools have embarked on a system of formal appraisal, it can be a valuable tool for evaluating INSET.

Any improvement that comes about as a result of INSET needs to be encouraged. Obviously, the headteacher or deputy can be a tremendous source of encouragement; likewise the science coordinator or INSET coordinator can also
help to keep motivation high by active participation, advice, encouragement and the provision of resources.

Before embarking on a system of appraisal you need to establish who will carry it out. In most primary schools, appraisal and evaluation will be done internally. However, if external evaluation is involved, it is important that any feedback is two-way.

HOW TO COLLECT THE DATA

The sort of evaluation required will obviously have a bearing on the way data are collected. The alternatives range from a brief, informal review to a formal written report. Some suggested methods of collecting data are offered below:

- paired classroom observation (make sure the observers know exactly what they are looking for)
- classroom observation and feedback by colleagues, such as headteacher, advisory teacher or inspector
- video-recordings of the children’s science activities
- talking to the children about their science activities.

USING A QUESTIONNAIRE

If you are intending to use a questionnaire it should be well designed and the participants should be informed of the results.

Some advantages of using a well-designed questionnaire are that:

- it saves time
- it can be useful for the organizer
- it can provide immediate feedback during or immediately after an event; alternatively it can encourage reflection if is not completed until some time after the event
- very specific questions can be asked
- general trends can be noted
- it can be anonymous if desired.

Different sorts of questions will need to be asked depending on the type and duration of the INSET programme.

Consider the following points in your design:

- Will you need to indicate to whom it should be returned and when? Where should this information appear?
- Do you want to use multiple choice questions? If so, how many choices will you give?

Remember that if you want to analyse data on a computer the use of a scale will be of great assistance. You may want to have as many as 10 options or a much more limited number.

Example 1

How useful was the content of the first workshop to your needs?

Ring one choice only: 1 = low; 5 = high

1 2 3 4 5
Example 2
The keynote speaker was very successful in setting the context for the day and getting us off to a good start.

Ring one choice only to indicate your views on this statement.
Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4
There is some evidence to show that many respondents plump for the middle slot. The use of four options, as in Example 2 would not allow this to happen—in other words, it would stop people 'sitting on the fence'.

INVITING COMMENTS
The following Examples invite participants to write comments. If you do this it is important to allow sufficient space for replies.

Example 3
Which session was most useful to you?

Example 4
As a result of this workshop have you developed any skills that you did not feel confident about before?

Example 5
My expectations at the beginning of the course were . . .

In the case of Example 5 it would be worth considering whether or not to collect this information before the course. Similarly, should data relevant to particular sessions, as in Example 4, be collected throughout the day?
If you would like to arrange some staff interviews as part of your evaluation you could introduce a question to facilitate this:

Example 6
I would like the opportunity to discuss the course/part of the course. (Note that, depending on your school's circumstances, you may need to specify a particular person with whom participants can discuss the course.)
Please tick the appropriate box.
Yes ☐ No ☐

Example 7
I would be willing to be interviewed about my reactions to the course at a later date.
Please tick the appropriate box.
Yes ☐ No ☐

As a final question, you may find it useful to ask participants for suggestions for future INSET courses.
ACTIVITY 4: DESIGNING A QUESTIONNAIRE

For your next INSET session, design and use a questionnaire to evaluate the programme. Use the suggestions given above to help you.

REPORTS

These can be written or oral, and are likely to be as valuable to the participants as to the organizer. Written reports can be submitted by an individual or a group, and are useful for planning future INSET programmes.

ACCIDENTAL FEEDBACK

This refers to the spontaneous reactions of participants. Unless a note is kept of this sort of feedback it will not be useful for the future. Also, one cannot rely on there being any accidental feedback, so it is far better to use more formal procedures for evaluation.

EVALUATION AS AN ACTION PLAN

A good piece of evaluation will not only provide feedback as to how worthwhile the various sessions and the INSET activity as a whole have been, but will help you to gauge how far the programme has gone towards fulfilling your initial aim(s).

It should also point the way to what needs to be done next to keep momentum going and to implement any ideas that have arisen out of the programme. Finally, evaluation of what has been achieved as a result of a particular INSET programme may suggest future INSET needs.

APPENDIX 1: THE DELPHI TECHNIQUE

This is a very simple way of establishing consensus in a group without necessarily bringing the group members together for a meeting. It offers feedback on what others think without putting pressure on them to express conforming views. It also enables a record of divergent opinions to be preserved.

1 Individual teachers are asked to write down a list of their own INSET needs.

2 All the responses are then collated and a summary is circulated to everyone.

3 Each individual then rates the needs on that list according to his or her own personal priorities, and returns the list to the organizer.

4 These ratings are again summarized and a new list circulated. This time the lists are individualized, showing both the group rating and that of the individual respondent.

5 Individuals are then asked to reconsider their ratings. If they decide to diverge from group consensus they are invited to give reasons (space being allowed on the form for this).

6 A third report is circulated, and normally this will be sufficient, although in principle the process can be continued by repeating stages 4 and 5 until a broad consensus is reached.

APPENDIX 2: THE NOMINAL GROUP TECHNIQUE

This technique resembles a highly structured form of brainstorming. It allows for the ideas that have been generated to be evaluated through a consensus of those present. There is, however, very little interaction within the group—a sharp contrast to normal group meetings. It is a group in name only, hence the title.
The following information will be enough to allow you to try it out:

1. The recorder writes down the task so that the whole group can see it (e.g. on a flip-chart, blackboard or overhead projector). (The recorder can be a group member, but need not be.)

2. The task is then open to general discussion so that everyone understands what is required.

3. Individuals note down their ideas in an order of priority. There should be a time limit for this and no conferring.

4. The recorder asks each group member for an item and writes it down where the whole group can see it. The recorder should not allow questions or comments at this stage. The recorder works round the group until no further ideas are put forward.

5. Clarification can be allowed when the list is complete. For example, if two contributors agree that their differently worded ideas mean the same thing, then one can be removed. No pressure should be placed on anyone to withdraw an idea if they believe it to be unique, but the words may be altered to make this unique meaning evident to everyone. No criticisms or other comments are allowed.

6. Individuals then vote for the ideas they regard as most important, using a weighted vote system. For example, five points can be allocated for the most important, four for the next and so on. (With small groups, or where only a few ideas have been contributed, you could use a two- or three-point system.)

7. The recorder then collates the votes and an order of priority emerges to which everyone has had an equal chance to contribute.

8. An optional stage is group discussion of the composite picture that has emerged.

RESOURCES

