SCIENCE POLICY

1. The Place of Science in The Curriculum

1.1 Numerous documents have, in recent years, emphasised the importance of Science in the primary school curriculum. However with the implementation of the National Curriculum it has become a compulsory part of every child's primary school education. The importance of Science in the primary school curriculum has been further enhanced by its position, alongside Mathematics and English, as one of the core subjects.

1.2 The new position which Science now enjoys means that every school must develop a policy for Science which will ensure that, not only is it taught throughout the school but that also guarantees continuity and breadth and makes provision for careful monitoring of children's progress at each level in the National Curriculum.

2. A Rationale For Primary Science

2.1 Science can no longer be looked upon as a body of knowledge to be transmitted. In a rapidly changing world where new developments in Science and Technology are occurring almost daily it is inappropriate to teach children only scientific "truths" many of which may become disproven. We want to train them to think and act as young scientists; carrying out their own experiments, inferring their own conclusions and understanding the relevance of their discoveries to the world in which they live.

2.2 This view of Science as a process rather than a body of knowledge has implications for the teacher's approach to the teaching of Science. No longer should the teacher be the fount of knowledge, imparting his or her learning to the children. He or she must now become a fellow investigator; posing problems, questioning, cajoling, directing and drawing together findings. Underlying the processes of Science are numerous skills necessary for manipulating equipment, developing ideas and interpreting information. This approach to the teaching of Science is embodied in Attainment Target 1 of the National Curriculum document.

2.3 Having stated that Science teaching should be child centred with active learning, the primary teacher cannot neglect the knowledge and understanding of scientific concepts. It would be impossible for children to "re-discover" all of the scientific knowledge gained by the human race over the centuries. Some factual input must be provided by the teacher but it should be presented in a way which enlightens and is enlightened by the children's own investigations. In short there must be a balance between the need to use and understand the processes and skills of Science and knowledge and understanding of scientific concepts to which these processes relate.

2.4 In addition to developing scientific processes and skills and concepts the teacher of primary Science must also endeavour to develop a range of attitudes relevant to Science. These include things like curiosity, sensitivity and willingness to co-operate with others.

3. Aims of Primary Science

3.1 The rationale is a broad description of what teachers should be aiming to achieve in their teaching of Science. In order to turn that rationale into a policy for the teaching of Science, it is necessary to be more specific about what one is aiming to achieve. These aims are expressed below in terms of what

children should know or be able to do as a result of their experiences of primary Science.

3.2 They are:-

Make observations and apply these to scientific investigations.

Seek and identify patterns and relate these to patterns perceived earlier.

Design and carry out experiments to test their explanations of patterns and observations.

Communicate verbally, mathematically and in writing what they have carried out and discovered.

Interpret written and other material.

Acquire scientific knowledge and understanding and relate this to their investigations.

Handle equipment safely and effectively.

Bring their knowledge to bear in attempting to solve technological problems.

Develop interests, attitudes and aesthetic awareness.

4. Selection of Experiences

4.1 Having said that due regard must be given to the development of scientific skills, processes, concepts and attitudes, there are several other factors to consider when selecting appropriate experiences for children throughout their primary school careers. These are breadth, continuity and progression, relevance and differentiation.

4.2 Breadth. In selecting topics or themes for study in our Science teaching we must guarantee breadth by ensuring children have experience in all of the Attainment Targets in the National Curriculum document. Not necessarily in the course of a term or a year but in the course of a child's career in the school.

4.3 Continuity and Progression. In addition to ensuring breadth of experience attention must also be paid to the need for continuity. Ensuring there is no unnecessary repetition and guaranteeing that when topics or ideas are re-introduced they build progressively upon what has gone before. Children should acquire progressively deeper understanding and greater competence.

4.4 Relevance. The experiences selected must show the children the practical relevance of Science to everyday life and the possible technological and social consequences of Science.

4.5 Differentiation. Some consideration must also be given to the diversity of ages and ability within a class. A range of experiences must be provided to ensure the fullest involvement of the whole class; the less able must be encouraged and the more able fully extended.

5. Links Across The Curriculum

5.1 There are two aspects of this subject. The first is the approach to teaching which the teacher or school adopts. Is Science to be taught as part of an integrated theme or topic (a thematic approach), or is it to be taught as a separate identifiable slot in the timetable (a core approach)?
Both approaches have their strengths and weaknesses and these must be borne in mind when adopting one or the other.

5.2 Thematic Approach. In teaching an integrated topic or theme the opportunity to develop links between Science and other areas of the curriculum is built in.

However, in choosing such an approach the danger is that scientific aspects of the theme may be neglected, or skirted around.

5.3 Core Approach. Teaching Science as a separate subject guarantees that Science is being taught but the danger lies in missing the many opportunities which arise to link the scientific work being done with other areas of the curriculum.

5.4 The school policy does not lay down a correct approach. Either of these approaches may lend themselves to different topics and the individual ways of working of different teachers. However, due regard must be paid to their strengths and weaknesses when deciding which approach to choose.

5.5 The second aspect of links across the curriculum deals with ways in which Science might connect with other subjects. It is possible to link Science with most aspects of the curriculum and some links may appear more tenuous than others.
Here are some of the more obvious and substantial areas.

5.6 Mathematics.

This is the subject which most obviously offers links with Science. Science offers opportunities for practical application of many mathematical skills from basic computation to the drawing and interpretation of graphs. As well as recording using graphs, tables, histograms and pie charts, Science also provides many opportunities for practical measurement- of time, weight, length, capacity, area, volume and the weather.

5.7 English.
The links between Science and English development should not be restricted to writing about what has been seen or done. The whole range of English skills can be developed through Science in a variety of ways.

Speaking - Science lends itself to class and group discussion, debate, verbal description and the reporting back of findings from investigations.

Listening - Children develop listening skills from hearing their classmates reporting and from radio and television sources. However, as Science involves the children's use of all their senses in describing and analysing their discoveries, their auditory sense is being developed in the course of their investigations.

Reading - Children must learn to read instructions from sheets or workcards. In order to carry them out and in developing a theme they must be able to research from written sources. Linking the class reading book to a Science topic is also possible.

Writing - Science can obviously provide situations for the development of non-fiction writing, reporting, recording, instructing and describing. It can also provide an exciting source for creative writing both in poetry and prose.

5.8 Geography and History.

In examining how scientific ideas affect the world we live in links with geographical and historical aspects of our environment are inevitable. These links may be overtly expressed in common themes in the curriculum documents for these three subjects but they may also be identified more informally in individual teacher's own planning. These links tend to be more obvious in a natural Science context, however study of the environment also lends itself to work in structures and forces, the nature of materials, energy transfer and other aspects of physical Science.

5.9 Technology. Technology is often viewed as the appliance of Science. Although this is true for certain aspects Technology covers a much broader area. In making cross-curricular links between these two subjects the differences in approach need to be emphasised as much as the obvious connections. Scientists approach a problem by proposing a hypothesis and then testing that hypothesis. Technologists solve their problems by generating design alternatives then testing to see which is the "best design".

5.10 Health Education and Physical Education.
Both of these subjects lend themselves greatly to any scientific work on ourselves and growth. The practical application of the scientific concepts learned is in the children's enhanced awareness of how to maintain their bodies in a fit and healthy state. P.E. can also be linked to Science by developing a range of performance activities to develop measuring and information processing skills.

5.11 Expressive Arts.
Links with craft skills are apparent in aspects of Technology. Other artistic activities could also be linked to Science, not only in directly studying colour and sound but in recording and developing various activities through painting, drawing, modelling, music, drama and dance.

6. Topics to be Taught

6.1 The topics to be taught have been selected with due regard to aspects of breadth, continuity, progression, relevance and links across the curriculum as outlined earlier.

6.2 The topics are organised to be part of a two year rolling programme which has been created to facilitate the mixed age classes in the school. Each of the National Curriculum Attainment Targets is covered at least once in the first two years of the rolling programme and is revisited at least once in the final two years.

6.3 For each topic on the rolling programme there will be a double sheet of paper outlining in some detail the area to be covered in that topic. These double sheets with their various headings are to help teachers in their planning and to facilitate continuity and progression.

6.4 The format of each double sheet includes the following columns:-

(i) Content(activities, key ideas, skills as per Programme of Study)
This column will include the concepts, skills and knowledge which might be included in the topic and activities through which they might be taught. These are drawn up in line with the National Curriculum programmes of study (P.O.S.) for Science at Key Stage 2. Asterisked (*) in these columns are a number of key concepts and skills which should always be covered if we are to fulfil our aims.

(ii) Attainment Targets.
Listed in this column are the Statements of Attainment (S.O.A.) which the children could achieve through work on this topic. These are the objectives for the unit of work and should link to any assessment and evaluation.

Resources (workcards, books, equipment, video, software etc.)
This is a list of the various resources we have available in school to deliver this topic.

(iii) Cross Curricular Links.
This column contains a number of suggestions as to how a particular topic may be linked to other areas of the curriculum. It is neither compulsory nor comprehensive but simply a source of ideas.

(iv) Teaching strategies.

In this column are recorded various teaching strategies which lend themselves to aspects of a topic. Types of children's recording which are particularly appropriate are also listed.

(v) Assessment Opportunities.

In order to monitor and evaluate what has been learned assessment opportunities need to be identified . Some of these have been listed but others need to be discussed by teachers of parallel classes and recorded on the topic sheet. They should link with the objectives (S.O.A.) identified for the topic.

(vi) Review.

This column provides teachers with the opportunity to reflect on the teaching of a topic and evaluate how it went. To record any problems or things that went particularly well.

7. Classroom Organisation

7.1 There is no one correct way to organise a class to teach Science in the primary school. There are a number of ways and each of them has its own strengths and weaknesses which makes it suitable for different teachers in various situations. What is important is that a variety of methods should be used when appropriate.

7.2 Enclosed are a number of ways of organising a classroom to teach Science along with an outline of their advantages and disadvantages.
(Courtesy of Primary Science Development Project.)

8. Children's Recording

8.1 Although Science teaching in the primary school is chiefly activity-based, there are occasions when it is necessary to make a record of what has been seen or done.
The reasons for recording fall broadly into two categories;
recording in the whole curriculum
and
recording for Science.

8.2 Recording in the Whole Curriculum.
Reasons for this include:-

- communication
- sharing ideas
- seeing other peoples' perspectives
- use of specialist language
- their efforts in relation to a whole theme
- sense of accomplishment
- development of transferable skills

8.3 Recording Specifically in Science.
Reasons for this include:-

- data handling
- tabulation
- helping to plan an activity
- comparing data examining patterns
- assessing data, sorting it out and drawing conclusions
- predicting, challenging pre-concepts and reinforcing if proven
- making further predictions from outcomes
- observation skills
- helping to assess/ evaluate what has gone on

training to record so that children can concentrate on other aspects.

8.4 Ways of Recording.
Ways of recording should be as varied as possible. Listed below are a number of different ones. Many of them are cross-curricular and English, Mathematical, Artistic and Craft skills may be developed at the same time.

written accounts; factual and non factual
pictorial
graphical
photographic
tabulation
audio tape
video tape
Venn diagram
collage or frieze
model making
cloze procedure
data base
word processor
dramatisation
keys
oral
flow diagrams

8.5 Some of these ways of recording lend themselves to certain topics, themes or processes. Here is a check list for use when selecting an appropriate one:-

(i) Is it necessary? - not always.
(ii) Is it already built in? e.g. weather.
(iii) Choice of the method most appropriate:-
    (a) For the activity.
    (b) For that particular child.
(iv) The importance of bearing in mind that children become weary of writing an account every time.
(v) Progressively widening the scope of recording skills and thereby Science skills.
(vi) What is the purpose of recording?

8.6 A column has been created in the topic planning sheets where particularly relevant modes of children's recording for a particular topic or activity have been noted.

8.7 A problem which may arise when using an activity approach is that the quantity of recording does not match the amount of work done or time spent on the activity. This may lead to misunderstandings with parents on Parents' Nights, and has implications for parent education.

9. Resources

Storage organisation
Monitors
Breakage and replacement
Deficiencies

9.1 Resources needed for Science are numerous. Keeping track of these resources and satisfying demands is a difficult task.
We use a "total" system where all the Science and Technology equipment is kept together in a specifically designated room. Access to this room is available to both staff and certain pupils to draw upon whenever needed.

Equipment is stored within broad topic areas in numbered cupboards or areas in the room.

9.2 Designated monitors are responsible for keeping the room tidy and equipment in its correct place.
Each class may also have trained monitors to collect and return items to their correct position in the room.
When larger pieces of equipment are shared and need to be returned to a central resources area every day then pupils should be trained to do this conscientiously.

9.3 Breakages and replacement of items needs to be reported to the person in charge of Science and requisitioning. It can be reported by staff or pupil monitors.

9.4 Deficiencies. When doing a topic if there is a glaring omission as regarding equipment or any other resource it can be noted on the "topic planning sheet" in the "review" column and also reported to the Science organiser.

10. Monitoring and Evaluation

10.1 There are two inter-related parts to this section , the monitoring of pupils progress and through this the teachers evaluation of whether their objectives were achieved.

10.2 The monitoring of children's progress through assessment is described in detail in the school policy on assessment. As is stated in that document there is a danger that our assessments will concentrate on easily observed outcomes of learning rather than on the processes of learning. It is especially important given the nature of Science and scientific investigation that we avoid this danger when assessing Science.

10.3 Teacher's evaluation of their Science teaching should be informed by the results of their assessments. This should allow them to measure whether they have achieved their objectives and if not how they might adjust their teaching the next time they teach that topic.

11. Safety

11.1 With children as active participants in scientific enquiry there are obvious dangers involved. Staff should be constantly aware of these dangers.

12. Implementation

12.1 This is a review of the policy based upon the first set of Attainment Targets. These have now been replaced and the new topics reflect some of the changes and the need to create a scheme which fits into the double rolling programme.
The new sheets for topic planning will be available in the term prior to them being needed for teaching.

12.2 In order to avoid repetition of topics interim topics have been planned for Y5 and Y6 children for 1991 until 1993 when the new rolling programme will be fully operational. Details of these arrangements are attached as Appendix B.

12.3 There is yet another set of Attainment Targets to replace those dated May 1991. Until they become available we must work with those we have available.

W.N.E.B. & R.W. 6/91. Reviewed 1/92.

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