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The Science National Curriculum

A response to the consultation on proposals for a revised National Curriculum for 2000.

Summary

This statement is issued by the Royal Society in response to the consultation on proposed changes to the science content of the National Curriculum in England. Its main conclusions and recommendations are:

- We firmly support the Government's overriding aim of the current review to provide schools with clarity and stability and to ensure that the Curriculum is manageable and focused at all Key Stages. We also welcome the Government's drive to ensure that the National Curriculum is challenging and motivating for all pupils, including those who are gifted and talented.
- The contribution science makes to a balanced curriculum is essential and unique. We therefore warmly welcome the restatement of the core status of science at all Key Stages and the more explicit rationale for the science curriculum.
- We welcome the moves to reduce the level of prescription in the current science Orders and the planned production of a QCA scheme of work for Key Stage 3.
- We strongly support the proposed introduction of the "Scientific Enquiry" attainment target.
- Science cannot be adequately taught to any Key Stage 4 pupil in less than 20% of curriculum time.
- The explicit recommendation that the vast majority of Key Stage 4 students should spend 20% of their curriculum time studying science must be included within the revised version of the National Curriculum.
- Science lessons can provide the factual knowledge to support Personal, Social and Health Education (PSHE) and Citizenship and also many of the learning contexts in which pupils may explore the key issues.
- The contribution of science to PSHE and Citizenship education can only continue if sufficient time is available for science teachers to develop these aspects at the appropriate time in the science topics.

- It is vital that, from September 2000 onwards, the curriculum time for science is not in any way reduced.

Introduction

- The Royal Society welcomes the opportunity to comment on the proposals from the Secretary of State for Education & Employment for a revised National Curriculum in England. We have restricted our comments to those pertaining to the core subject of science. This statement, prepared by a working group of the Education Committee, has been endorsed by the Council of the Royal Society. It follows a statement of policy issued in January 1999 in which the Society and nine other science and engineering organisations made broad recommendations regarding science provision for 14-16 year olds. Such is the importance of these fundamental principles that we restate some of them within this document.
- We firmly support the Government's overriding aim of the current review of the Curriculum to provide schools with clarity and stability and to ensure that the Curriculum is manageable and focused at all Key Stages. We also welcome the Government's aim of ensuring that the National Curriculum is challenging and motivating for all pupils, and we strongly support the proposal that the QCA should produce curriculum guidance for teaching gifted and talented pupils.
- The contribution science makes to a balanced curriculum is essential and unique. School science provides pupils with a knowledge of the natural world, the skills of investigation and experimentation, and an appreciation of the importance of science to individuals and to society. Science also develops such personal skills as curiosity, motivation, teamwork and the ability to communicate. These are widely recognised as particularly important skills and values, both in science and as part of a broader education. They help prepare pupils for further study and for a broad range of careers, as well as providing a basis for informed citizenship. It is gratifying to see this acknowledged in the restatement of the core status of science at all Key Stages. The Society also warmly welcomes the more explicit rationale for the curriculum in general, and for science in particular.

Revision of the science Orders

- Moves to reduce the level of prescription in the current science Orders, taken together with the announcement of a Qualifications & Curriculum Authority (QCA) scheme of work for Key Stage 3, are to be welcomed, as these should help teachers to feel that they have time to make their lessons as wide-ranging and engaging as possible. We also welcome the moves to broaden the curriculum for pupils in Key Stage 4 and to encourage the development of courses which link National Curriculum subjects to the world of work.
- We strongly support the proposed introduction of the "Scientific Enquiry" attainment target and the incorporation into other sections of the requirements formerly expressed in the introduction to the programme of study (science in everyday life, the nature of scientific ideas, communication, etc). It will be important that teachers are given every encouragement to exploit the increased breadth of the new attainment target by developing a

wider range of activities for pupils. The proposed QCA Key Stage 3 scheme of work together with revisions to the existing Key Stages 1 and 2 scheme will have a crucial role to play here.

- In order to have adequate experiences of all aspects of science which can successfully contribute to their development, pupils at Key Stage 4 need to spend at least 20% of curriculum time studying it. How this 20% of curriculum time is used should vary with the ability, motivation and background of pupils. Some pupils will benefit from courses where links with other subjects, such as technology, can be fully exploited and where opportunities to apply their developing science knowledge in real work situations will be of value. Some pupils will not be able to attempt any GCSE examination and will look to alternative forms of certification to record their progress. Others will decide to enter for Double Science and still others, who have spent up to 30% of their time on science, will enter GCSEs in the separate sciences. Despite all the differences in provision, the extent of science, and therefore of its contribution to the full development of all pupils, means that science cannot be adequately taught to any Key Stage 4 pupil in less than 20% of curriculum time. The explicit recommendation that the vast majority of Key Stage 4 students should spend 20% of their curriculum time studying science must be included within the revised version of the National Curriculum. We consider the absence of this recommendation in the draft materials to be a crucial omission and stress most strongly the need for its inclusion in the final version of the revised National Curriculum. The problems of under provision, and inequality of provision between the sexes, which were all too apparent before the National Curriculum, will return if a significant number of Key Stage 4 pupils are allowed, or indeed expected, to spend less than 20% of their curriculum time on science.
- The proposed Single Science programme of study at Key Stage 4, despite its revisions, will still be seen by many teachers as lacking appropriate vocational content for the small number of pupils who will study it. Opportunities must be taken by QCA to demonstrate the possibilities which exist within the Single Science proposals for engaging and relevant science courses.

Science, PSHE and Citizenship

- Science lessons can make a valuable contribution to the coverage of the non-statutory framework (Key Stages 1 and 2) and the programmes of study (Key Stages 3 and 4) for Personal, Social and Health Education (PSHE) and Citizenship. The "distinctive contribution of PSHE and Citizenship to the curriculum" includes many key objectives (attributes) which a science lesson would naturally support. For example, a knowledge of science is an essential component to becoming "*informed, active and responsible citizens*" and many science lessons "*offer opportunities for pupils to reflect on their experiences and understand how they are developing personally and socially*".
- The contribution of scientific knowledge to health education is well recognised but perhaps not so well appreciated is the contribution which science lessons can make to seeing the global picture about health issues such as HIV, drug misuse and balanced diet.

- Science lessons have a major contribution to make to providing "*support for pupils as they learn to deal with the personal, social and moral issues they face*" since many of these involve an element of scientific knowledge, eg. smoking-related disease or the understanding of risk statistics. Science lessons will also feature exploration of issues such as the proper use of finite medical resources, abortion and the environmental implications of the application of new technologies such as gene modification. Many issues relating to the application of science and technology involve the crucial area of how individuals can influence the decision-making processes locally, nationally and globally, thus giving pupils a clearer understanding of their developing role as citizens.
- Science lessons can provide not only the factual knowledge to support PSHE and Citizenship, but also many of the learning contexts in which pupils may explore the key issues. Many of the skills outlined in the draft framework for PSHE and Citizenship at Key Stages 1 and 2 can be developed in activities which take place currently in science lessons. For example, pupils may "*play an active role as future citizens*" when they "*observe the conditions in a local habitat*" as described in the QCA science scheme of work, (Unit 4B: Habitats), especially if the habitat were under threat and they could "*recognise ways in which living things and their environment need protection*" (Unit 4B also).
- At Key Stages 3 and 4, science can make an even greater contribution because the knowledge base of the pupils is larger and arguably science impacts more obviously on pupils' lives. The skill of "*expressing and justifying a personal opinion relevant to a topical social issue*" can be developed when pupils in science are "*considering the benefits and drawbacks of scientific and technological developments*" (proposed Key Stage 3 science programme of study). Similarly, at Key Stage 4, pupils can develop their skills of "*researching a social or political issue*" at the same time as they are "*communicating ideas and developing an argument using a wide range of scientific, technical and mathematical language*" (proposed Key Stage 4 science programme of study).
- It must be stressed that the major contribution which science lessons can make and currently are making to PSHE and Citizenship education can only continue if sufficient time is available for science teachers to develop these aspects at the appropriate time in the science topics. Evaluations of the current National Curriculum in science suggest strongly that such work is seriously threatened by teachers' perceptions of overload in the current Orders. It is vital that, from September 2000 onwards, as the revised science Orders deal with the issue of overload, the curriculum time for science is not in any way reduced.

Relevant publications from the Royal Society

The teaching profession (April 1999)

Science and the revision of the National Curriculum (January 1999)

Response to QCA consultation on work-related learning at Key Stage 4 (April 1998)

Re-appraising post-16 education (December 1997)

Science teaching resources: 11-16 year olds (November 1997)

