IMPROVING Science

in Post-Primary Schools

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eti
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A number of quantitative terms are used in the report. In percentages, the terms correspond as follows:-

More than 90%	-	almost/nearly all
75%-90%	-	most
50%-74%	-	a majority
30%-49%	-	a significant minority
10%-29%	-	a minority
Less than 10%	-	very few/a small number.

INTRODUCTION

The findings in this paper are based on inspections of and visits to science departments in post-primary schools in Northern Ireland during the period 1996-2000.

1. Strengths

1.1 Almost all teachers of science are hardworking and conscientious; they set and maintain a suitable climate for learning and foster good to excellent relationships with their pupils.

1.2 In a majority of schools, the science department is organised effectively and the science teachers meet regularly and frequently, for example, to plan and organise their schemes of work or to consider the effectiveness of the departmental assessment arrangements.

1.3 Most science teachers take a pride in the resources available to them and ensure that they are well maintained and used appropriately. Furthermore, a majority create an interesting and stimulating learning environment within their laboratories.

1.4 In a majority of science lessons, there are either significant strengths or the strengths outweigh the weaknesses; such lessons are conducted at a good pace, the pupils speak with confidence and interest in science and generally achieve good standards in their work.

1.5 A majority of science teachers use a range of learning and teaching strategies including whole-class teaching, group, paired and individual work. Furthermore, they achieve an appropriate balance between practical and theoretical work and have realistically high expectations of their pupils.

1.6 When afforded the opportunity, most pupils choose and handle scientific equipment with confidence, competence and due regard for safety; when working in pairs and small groups they combine effectively. A majority of pupils have good science vocabularies, are able to present and interpret information in the form of tables, charts and graphs and understand the concept of a fair test.

1.7 A majority of pupils display a good knowledge and understanding of, and interest in, science; a similar proportion achieve satisfactory to good standards in school and public examinations in the subject. For example, over the last five years there has been, in the main, a sustained trend of improvement in the performance of candidates in General Certificate of Secondary Education (GCSE) science examinations.

1.8 At key stage 3 (KS3), almost all pupils follow a broad, and balanced science programme in terms of work in biology, chemistry and physics.

1.9 In a majority of schools, the accommodation for science is adequate for the range of practical work appropriate to the subject.

2. Areas for Improvement

2.1 Only a minority of science teachers take sufficient time to monitor and review the effectiveness of their work; in a small minority of schools the leadership of the head of science is not good enough.

2.2 In only a small number of schemes of work for science is there appropriate reference to the learning outcomes which the teachers intend to achieve with their pupils; in a majority of cases, the written planning for attainment target (AT) 1-Experimental and Investigative Science, is inadequate. When planning their lessons and topics, approximately one-half of science teachers take insufficient account of the ability and interests of individual pupils.

2.3 In almost all schools there is inadequate curricular collaboration between the teachers of science and the teachers of technology and design. Equally, there is inadequate curricular collaboration between the teachers of science in post-primary schools and their counterparts in contributory primary schools.

2.4 In a significant minority of science lessons the weaknesses outweigh the strengths or there are significant weaknesses. In these lessons the pupils' learning is adversely affected and the standards they achieve are not good enough; the teaching is frequently dull and routine and does little to stimulate the pupils' interest in science. The pupils have too few opportunities for practical work.

2.5 Just over one-half of the pupils can successfully plan and carry out investigations in a logical manner and make informed observations. Most pupils are unable to formulate hypotheses, to apply scientific knowledge in unfamiliar contexts or to evaluate scientific evidence objectively.

2.6 In general, the pupils have too few opportunities to record their thinking, findings and observations in science by expressing their ideas in writing using their own words. Just over one-third can apply their understanding in science to moral, social, economic and environmental issues.

2.7 In general, the work in science makes too little contribution to developing the pupils' skills in literacy, numeracy and information communications technology (ICT).

2.8 At KS4 almost 40% of pupils follow a science programme which lacks sufficient breadth; in the main, these pupils follow a restricted programme of study for science leading to a limited grade single award GCSE. In the sixth form, the uptake of courses in science at GCE level is too low.

2.9 In a small number of schools, there are major deficiencies in the accommodation for science. Consequently, the scope and quality of the pupils' experiences in practical work are significantly impaired. Most science departments do not have the basic level of provision of two computer systems for each laboratory as recommended by the Department of Education (DE). In general, the level of technical support for science is inadequate.

3. Priorities for Action

Given the areas of weakness above, and to promote further improvement in the teaching and learning of science there is a need to:

3.1 improve the planning and implementation of AT1;

3.2 identify and include the intended learning outcomes for science within the departmental schemes of work; plan more carefully to meet the ability and interests of individual pupils;

3.3 enhance significantly the curricular collaboration between the teachers of science and technology and design and between the teachers of science in post-primary schools and their counterparts in the contributory primary schools;

3.4 increase opportunities for, and improve teaching and learning in, practical work;

3.5 enhance the contribution of science to developing the pupils' skills in literacy, numeracy and ICT;

3.6 improve the pupils' achievements in the higher order scientific skills and their abilities to apply their understanding in science to moral, social, economic and environmental issues;

3.7 decrease significantly the number of pupils at KS4 following a restricted programme of study in science, and increase the uptake of science courses in the sixth form;

3.8 continue to effect improvements in:

i. the accommodation for science

ii. the level of computer resources available to support learning and teaching in science; and

iii. the level of technical support for science teachers.

CONCLUSION

Schools and the Inspectorate recognise the importance of self-evaluation as a basis for improvement and development. It is intended that this publication, and the publication 'Evaluating Science', will support science teachers and departments in their evaluation and improvement of their teaching and of their pupils' learning and standards of achievement.

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Copies of this report may be obtained from the Inspection Services Branch, Department of Education, Rathgael House, Balloo Road, Bangor, Co Down BT19 7PR. A copy is also available on the DE website: www.deni.gov.uk