

ANGUS COUNCIL  
EDUCATION COMMITTEE

22 JANUARY 2002

STANDARDS AND QUALITY IN SECONDARY SCHOOLS 1995-2000: THE SCIENCES – A REPORT BY  
HM INSPECTORS OF SCHOOLS

REPORT BY THE DIRECTOR OF EDUCATION

## ABSTRACT

The purpose of this report is to seek the Education Committee's approval of proposals to take forward in Angus schools the recommendations made by HM Inspectors in the Science Standards and Quality Report.

## 1 RECOMMENDATIONS

1.1 It is recommended that the Education Committee:

- (a) notes the terms of this report;
- (b) notes and approves the detailed proposals for action outlined in the attached report; these proposals have been framed in the course of meetings with promoted Science teachers including meetings of the Biology, Chemistry and Physics Curriculum Advisory Group;
- (c) notes that the action plan seeks to take account of "**A Science Strategy for Scotland**" launched in August 2001

## 2 BACKGROUND

2.1 "Standards and Quality in Secondary Schools 1995-2000: The Sciences" was published by HM Inspectors of Schools in November 2000. The report recognises that much of the teaching and learning of Science in Scottish Secondary Schools is effective. However, in keeping with practice in similar reports in other subject areas, the report identified areas of weaknesses and recommended courses of action to be addressed by schools and Education Authorities in remedying those weaknesses.

2.2 Principal recommendations related to the need to:

- ensure that S1/S2 courses took better account of pupils' prior learning in primary schools
- improve pupil attainment including attainment, in relation to investigative and thinking skills, by providing more direct and more challenging tasks
- improve arrangements to monitor assessment and reporting of pupil progress in S1/S2
- where appropriate, to improve accommodation and resources with a view to meeting the needs of Science courses in the 21<sup>st</sup> Century
- enhance development planning procedures not least by ensuring that Science Departments make use of more rigorous self-evaluation strategies

2.3 In taking forward the action plan proposals detailed in Section 5 of the accompanying report, Angus schools will build on existing commitments detailed in the action plan established to respond to another report published by HMIE in relation to improving Science education 5-14. The related action plan was approved by the Education Committee at its meeting on 23 January 2001 (Article 10 refers)

2.4 In August 2001, the Minister for Enterprise and Lifelong Learning, Wendy Alexander, launched "**A Science Strategy for Scotland**". The five objectives of that Strategy which are provided in detail in Section 3.7 of the attached report include a commitment to "**ensure that enough pupils study Science to a standard and level which enables the future needs of the country to be met**"; In

pursuing that objective, the Executive will seek to support Science education in schools inter alia through advice and resources to be made available by Learning and Teaching Scotland particularly in relation to Science learning and teaching in primary and early secondary but also through the provision of additional targeted resources which are likely to include arrangements by Higher Education Institutions to train additional Secondary Science teachers.

- 2.5** Arrangements to take forward the attached action plan proposals will clearly seek to take account of any future advice and resources which are likely to be made available by the Executive in implementing the national Science Strategy for Scotland.

### **3 CONCLUSION**

The Education Committee is asked to approve the action proposals in the attached report and to note these are likely to support Angus schools in responding effectively to the recommendations for improvement in relation to Science education made by HM Inspectors.

### **4 FINANCIAL IMPLICATIONS**

Any costs arising from the attached action plan proposals will be contained within the Department's Revenue Budget.

### **5 HUMAN RIGHTS IMPLICATIONS**

There are no human rights implications arising directly from this report.

### **6 CONSULTATION**

The Chief Executive, the Director of Law and Administration and the Director of Finance have been consulted in the preparation of this report.

The Biology, Chemistry and Physics Curriculum Advisory Groups have been consulted in the preparation of the action proposals attached to this Committee Report.

JIM ANDERSON  
DIRECTOR OF EDUCATION

### **BACKGROUND PAPERS**

No background papers, as defined by Section 50D of the Local Government (Scotland) Act 1973 (other than any containing confidential or exempt information) were relied on to any material extent in preparing the above report.

NL/AR

## Angus Council – Education Department Standards and Quality in Secondary Schools 1995 – 2000: The Sciences

### 1. Background

- 1.1 “Standards and Quality in Secondary Schools 1995-2000: the Sciences” was published by HMI in November 2000. This report was the sixth in a series of Standards and Quality reports dealing with individual subjects in the secondary school.
- 1.2 The evidence for the analyses, conclusions and recommendations was obtained from evaluations based on published performance indicators deployed by HMI in 325 inspections of Biology, Chemistry, Physics and Science departments. Two of the schools involved were Arbroath High School and Arbroath Academy.
- 1.3 The report identifies success in Science Education but also identifies significant weaknesses in courses, assessment and teaching particularly at S1/S2 and in Standard Grade Science. To address these areas it is suggested that principal teachers need to be more systematic in monitoring and evaluating learning and teaching and need to take corporate responsibility for managing S1/S2 courses and Standard Grade Science. In many schools accommodation and resources including ICT, are judged to need improvement.
- 1.4 Identified strengths and development needs have been referred to under the following headings:
  - The Curriculum
  - Standards of Attainment
  - Quality of Learning and Teaching
  - Ethos
  - Resources
  - Management and Quality Assurance
- 1.5 In response to “Improving Science Education 5-14” (HMI, 1999) Angus Council set up a short life working group composed of primary school managers and teachers, secondary school teachers and members of the Educational Development Service to produce a Council Action Plan. This plan was approved by the Education Committee on 23 January, 2001.
- 1.6 In May/June and November 2001 Curriculum Advisory Groups (consisting of the Principal Teachers of Biology, Chemistry and Physics) and Assistant Principal Teachers of Science were invited to comment on the Science Standards and Quality Report and on an initial draft Council action plan.
- 1.7 The views of these Groups have been used in producing this final draft Council Action Plan which complements the Council’s Improving Science Education 5-14 Action Plan.

### 2. Summary of the Report’s Findings

#### **The Curriculum and the Quality of Learning and Teaching**

- 2.1 Good quality Standard Grade, Higher Grade and CSYS courses were judged to be in place in almost all departments and the teaching of these courses was generally found to be effective.
- 2.2 In S1 and S2 pupils’ needs were well met or very well met in only 35% of departments. Common weaknesses included:
  - failure to take account of pupils’ prior experience and attainment in primary schools and in the wider community
  - lack of challenge and pace for most, and particularly able, pupils both in knowledge and understanding and in investigative work
  - lack of opportunities to develop investigative, problem solving and thinking skills
  - lack of space in teaching and learning due to insufficient direct teaching and an over-dependence on worksheets which included undemanding tasks
  - generally low expectations of how well pupils could perform
  - courses not adequately designed to take account of content as specified in the revised 5-14 national guidelines document

- variable quality of support for low attaining pupils.

2.3 Common weaknesses of S3/S4 courses included:

- an over emphasis on resource based learning and a lack of direct teaching
- slow pace of progress
- insufficient attention to differentiation
- inappropriate, or almost no, practical work.

### **Standards of Attainment**

2.4 Attainment at S1/S2 required significant improvement in relation to knowledge and understanding and investigative and thinking skills. The Report recommended that there should be more direct interactive teaching and that courses should offer a broader range of more challenging and interesting tasks.

2.5 Assessment as part of teaching was judged to have significant weaknesses in 30% of science courses, most relating to S1/2. The Report recommended that there should be:

- closer links between what is taught and what is assessed
- more regular monitoring of classwork, to include reference to standards of presentation and spelling
- better feedback to pupils about how they might improve their attainment, and
- greater use of 5-14 levels to build on prior attainment, monitor progress and report performance to parents.

2.6 From S3-S6 departments have well-structured systems for assessing pupil progress but in S1/S2 there is a need for improved monitoring, assessment and reporting of pupils' progress.

2.7 It was judged that unmotivating coursework and over-concentration on routine and unchallenging tasks sometimes contributed to poor behaviour and attitude particularly in S1-S4 Science classes.

2.8 Pupils at all stages should be encouraged to follow appropriate courses in the Sciences to enable their needs to be satisfactorily addressed and to enable them to achieve success.

### **Resources**

2.9 Accommodation and resources, including ICT, should be improved to provide safe and modern working environments, designed to meet the needs of the 21<sup>st</sup> century (a detailed description of key weaknesses in this area can be found on page 20 of the Report).

### **Ethos and Management and Quality Assurance**

2.10 Teamwork and morale were particularly strong where the Principal Teachers shared a corporate responsibility for the management of Science courses, promoted good working relationships with staff and pupils and had high expectations of them.

2.11 Effective teamwork was observed to have developed in departments where unpromoted teachers were delegated reasonable but challenging tasks.

2.12 More systematic monitoring and evaluation of teaching and learning was required in order to identify and promote best practice.

2.13 Departments needed to improve their development planning, making use of more rigorous self-evaluation and focusing on strategies which would improve motivation and raise attainment at all levels. Weaknesses identified in development planning were:

- a need for the choice of priorities to be related to departmental aims and based on an audit of strengths and weaknesses
- action plans which lacked definition of strategies to be adopted, specific personnel involved and target dates for the completion of tasks
- too much emphasis on the production of worksheets and other course materials, and not enough on ways of improving learning and teaching in order to raise pupils' attainment
- a lack of information on how the success of each project would be judged

### 3. National Developments

- 3.1 Revised 5-14 National Guidelines have been published.
- 3.2 Revised 5-14 Assessment National Guidelines are awaited.
- 3.3 An updated version of the Renfrewshire Programme of Study in line with the new 5-14 National Guidelines has been published.
- 3.4 The Science On-Line Support Network (SOLSN) interactive website will be reviewed in line with the updated Renfrewshire Programme of Study.
- 3.5 In the longer term a curriculum development project, to be led by Learning and Teaching Scotland and the Scottish Science Advisory Group, will produce support and assessment materials and practical advice for 5-14 Science.
- 3.6 Consideration is being given to introducing National Testing in Science.
- 3.7 “A Science Strategy for Scotland” which was launched in August 2001 by Wendy Alexander, the Minister for Enterprise and Lifelong Learning, sets in place a framework which will inform the development of policy for the support and use of Science in Scotland. The key objectives of this national strategy are:
  - 1 to maintain a strong Science base fully connected to UK and International activity and funding sources
  - 2 to increase the effective exploitation of scientific research to grow strong Scottish businesses and provide cutting edge Science to meet the needs of the people of Scotland
  - 3 to ensure that enough people study Science to a standard which will enable the future needs of the country to be met
  - 4 to promote the awareness, appreciation and understanding of Science across society

Objective 3 is of the most direct relevance to Science education in schools. In pursuing this objective the Scottish Executive is committed to work in partnership with local authorities, Learning and Teaching Scotland, the Scottish Qualifications Authority, Teacher Education Institutes, the Science community and Scottish business and industry. Key priorities will relate to:

- an increase in the number of secondary Science teachers
- high quality continuing professional development
- the development of a more rigorous approach to the assessment of Science across the 3-14 stages
- the provision of modern accommodation and resources for Science education
- the provision – by the Science community, the network of Scottish Science Centres and business and industry – of practical support to Science education

### 4. Angus Council Developments

- 4.1 An action plan, produced in response to Improving Science Education 5-14, is being implemented and most of the action points have now either been overtaken or are being addressed. The action plan seeks to take account of the priorities relating to Objective 3 of the Science Strategy for Scotland described in the previous section of this report.
- 4.2 The SOLSN CD ROM disc, which provides teacher notes and resource information related to the Renfrewshire Programme of Study, has been purchased for each school.
- 4.3 A range of resources has been purchased for use in each Cluster.
- 4.4 Local Support Groups have carried out the following tasks:
  - the identification of links between Science and other areas of the curriculum
  - preparation of Topic Outlines which highlight opportunities to teach, practice and assess skills

- the production of an assessment package which contained skills checklists for pupils and teachers at different levels, investigation templates, assessment activities and advice on the management of assessment
  - the production of enrichment materials at level F.
- 4.5 Science has been made a whole Authority development priority and schools are being actively encouraged to adopt the Renfrewshire Programme of Study to ensure cohesion within and across clusters.
- 4.6 Development of the Programme is being supported by a Staff Tutor through school visits and attendance at Cluster Group meetings and Cluster Science Co-ordinator meetings.
- 4.7 In-Service training focused on activities in the Renfrewshire Programme of Study is being offered at levels A/B and C/D for primary practitioners.
- 4.8 A Science Co-ordinator has been appointed in every school. Cluster Science Co-ordinator Groups meet regularly to share good practice.
- 4.9 Two secondary schools have released science teachers to work with associated primary schools.
- 4.10 Secondary schools are being supported to deliver the Cognitive Acceleration through Science Education C.A.S.E. Programme.
- 4.11 In-Service training is being offered on Thinking Skills in general and in the delivery of C.A.S.E. in particular.
- 4.12 Local Support Groups have been set up to:
- write knowledge and understanding assessment items for the Renfrewshire Programme of Study (P7-S2)
  - provide strategies to make contexts defined by levels E and F knowledge and understanding attainment targets accessible for lower attaining pupils.
- 4.13 In-Service training on Leadership and Management skills has been provided for all Principal Teachers.
- 4.14 Best practice in relation to development planning has been disseminated at Principal Teacher and Head Teacher meetings.
- 4.15 Procedures to monitor and evaluate learning and teaching are being implemented in all primary and secondary schools.
- 4.16 Two secondary schools are piloting the use of Intermediate 1 Units in S3/S4 instead of Standard Grade Science.
5. Standards and Quality in Secondary Schools 1995 – 2000 (The Sciences): Angus Council Proposed Action Plan

#### Notes

- Some of the action points in the HMI Standards and Quality Report are already being addressed through the Council's Improving Science 5 - 14 Action Plan and through other initiatives as detailed in 4.13, 4.14, 4.15 and 4.16.
  - The main purpose of action points 5.1, 5.2 and 5.3 is to sustain the provision of high quality Science Education in primary schools. Another purpose is to enable secondary Science teachers to work with primary teachers and therefore to become familiar with the learning experiences of pupils in the primary school. This should help them to take account more easily of S1 pupils' prior learning and attainment and therefore to provide appropriate pace and challenge.
- 5.1 Two Cluster Science meetings per session should be organised and notes of these meetings submitted to the Authority.

## **Cluster Groups Ongoing**

- 5.2 Cluster Science meetings to be used to share good practice, collate staff development needs and resource requirements and to plan how these are to be met.

5 Cluster Science Co-ordinators Ongoing

- 5.3 Secondary school Senior Management Teams and Science Departments should consider appropriate liaison arrangements to help meet the staff development needs of Cluster primary schools eg through timetabled working in primary schools and the provision of in-service training activities.

## **Secondary school Senior Management Teams and Science Departments Ongoing**

- 5.4 Science Curriculum Advisory Groups to plan the production of units of work, based on the Renfrewshire Programme of Study, for S1 and S2 Science courses.

## **2 Curriculum Advisory Groups and Science Departments June 2003**

- 5.5 Items for an assessment item bank to be produced by a Local Support Group.

EDS June 2002

- 5.6 Strategies and exemplification materials to enable all pupils to access units of work in Science in S1 and S2 to be produced by a Local Support Group.

EDS June 2002

- 5.7 Authority procedures to monitor the quality of Science provision across Angus schools to be devised and implemented.

EDS June 2003

- 5.8 S1/S2 Science courses to be reviewed and amended, where necessary, in relation to Primary Science developments, the Renfrewshire Programme of Study and CASE.

Science Departments June 2004

- 5.9 S3/S4 Intermediate 1 pilot projects to be evaluated in the context of curriculum flexibility developments.

Schools and EDS October 2003

- 5.10 Science Departments to review procedures to monitor and evaluate learning and teaching; these reviews should take account of Authority and whole-school developments in particular the recommendations of the Boyd/Simpson Report.

Science Departments and Senior School Management Teams June 2003