



Standards and Quality in the Sciences

Conference Report 2002 – Excerpts

Introduction

Two key documents relating to science education were published in 2001:

- Standards and Quality in Secondary Schools 1995–2000: The Sciences
- Assessment of Achievement Programme Fifth Science Survey

These documents, along with ‘How good is our school?’ 2002 version, provided the context for four national conferences which were held at the following venues.

Hibernian Football Club, Edinburgh, 17 June 2002

Ramada Jarvis Ayr Hotel, Ayr, 18 June 2002

Jury’s Glasgow Hotel, Glasgow, 19 June 2002

Aberdeen Football Club, Aberdeen, 20 June 2002

Participants

The four conferences were attended by a total of 179 representatives from:

- Scottish education authorities
- The Scottish Council for Independent Schools
- teacher education institutions
- other bodies including HMIE, LT Scotland, SEED and the SQA.

Background

The conference dealt largely with secondary science education and, accordingly, education authorities were invited to nominate delegates who were secondary science teachers along with and Advisers or Education Officers with a responsibility for the sciences.

In preparation for the conference all delegates were circulated with two sets of materials. The first was a document produced by Dr Douglas Buchanan, University of Edinburgh, entitled ‘Self-evaluation Support Materials for Science Departments’ with associated pre-course activities. The second was a series of questions relating to the structure, content and scope of the AAP Science surveys.



Main findings

Although a survey such as this throws up many findings it was felt that the following were notable:

- S2 performance remains well below target
- weaknesses at P7 and S2 in *Earth in space*, plant biology, and magnetism
- *Planning* and *Interpreting and Evaluating* was poor at P7
- more use could be made of computers in S1–S2.

Workshop outcomes

Delegates were invited to carry out two workshop tasks. The first was to discuss pre-conference responses to a set of questions relating to the scope and focus of the AAP survey. In the second activity delegates were asked to recommend action at school, local authority and national level that ought to follow publication of the next report. Summaries of both activities follow.

Activity 1 – Responses to questions

Question 1

Does the S1/S2 course delivered in your school emphasise teaching for knowledge and understanding (KU) or teaching for skills (as defined by the 5–14 guidelines)?

Schools generally develop their units or topics from the knowledge and understanding attainment targets. Consequently, skills tend to be defined by the topic context and in some topics there is more scope for teaching and developing skills than in others. A number of groups made the point that concentrating on teaching the KU targets was valid because assessment of this provides a better indicator of future performance than does the assessment of skills.

In the majority of schools the emphasis is therefore on knowledge and understanding with the balance lying somewhere between an 80/20 split and a 50/50 split. The most commonly reported balance was 60/40 in favour of KU.

There was a feeling in some quarters that when pupils come to secondary with a more consistent primary learning experience the two elements may become more in balance. Many delegates reported that the introduction of ‘Thinking Science’ was improving the balance, while others acknowledged that much of current investigative work was based on fairly closed questions and that there was very little emphasis on evaluative skills.

Question 2

In the last AAP survey the balance of assessment was significantly weighted towards knowledge and understanding rather than skills. Is this an appropriate balance or, if not, where should the balance lie?



A small majority of responses favoured a move towards a more even balance. However, it was felt that KU should still be the more dominant of the elements. The fact that there are three KU outcomes and one skills outcome was cited as a sound reason for this. The move to a more even balance was countered by those who argued that testing the full range of skills through objective test items was problematic.

A number of delegates called for more help in 'levelling' the skills.

Question 3

To what extent do you think performance in skills gives a better measure of overall standards in science than that in KU?

This question provoked a lot of thoughtful discussion.

Nobody reported that they thought skills assessment gave a better measure of overall science standards. Most delegates felt that both were important with KU being slightly more so. It was argued that problem-solving skills are rarely content free.

Many felt that understanding was the most important element but felt this was difficult to test through objective items. Some also noted that evaluation skills tend to be poorly taught, despite their importance.

There were contradictory views on the value of skills testing. While some felt that at least assessment in this area provided a more consistent and reliable measure others felt that most of the skills were cross-curricular and so were not a particularly good measure of, specifically, standards in science.

Question 4

Should we move towards addressing performance in skills only in AAP and see knowledge and understanding as merely the context?

The response here was unanimous – a resounding 'no'. The only comments related to identifying and emphasising the essential knowledge and, in similar vein, trying to assess more understanding.

Activity 2 – Post report action

National level

The dissemination of outcomes from the survey was welcomed although it would have had greater impact had the national conferences been held closer to publication date.

There were some concerns about the mismatch between what was assessed and what was taught in each school in the sample and the extent to which this might skew results and hence the interpretation of results. In this context there was a feeling that the national Improving Science Education project should result in most schools teaching the same programme, allowing the AAP survey to report science standards in Scotland more accurately.



Five points were consistently raised:

- it would be interesting to track the progress of pupils through to Standard Grade to see if the survey had any predictive value, although it was acknowledged that this was not the purpose of the survey
- it would be interesting to see if the data showed any difference in performance between those schools using an integrated science approach in S1/S2 with those teaching pupils discrete science subjects
- use the generalised outcomes to support teachers in the areas of weakness identified, through in-service and resources
- use the actual questions in a variety of ways ranging from:
 - providing advice and exemplification of ‘levelling’ skills assessment items
 - providing a greater range of exemplars to allow schools to see the standard more clearly
 - provide an item bank of questions for schools to use
 - produce standardised AAP-style tests for all schools to use so each school can respond to its own identified development areas
- use national follow-up conferences to open up debate on the nature.

Local authority level

A number of delegates felt that the real value would come if school-specific reports were provided. However, it was generally agreed that local authorities should respond to the publication of an AAP science report by organising meetings of local secondary schools and their associated primary schools to discuss the findings with a view to supporting areas of weakness through in-service and resource provision.

School level

The idea of reflecting on the survey results at individual school level did not come through strongly. As before, a number of responses indicated that a school-specific report would be most likely to generate debate. Most felt it would be more useful to discuss the ideas with colleagues in other schools.