

THE TEACHING AND LEARNING OF SCIENCE AT KEY STAGE 3

A CEG Seminar

Salters' Hall
Tuesday, 3 March 2009

Aim

The aim of the Seminar was to explore the impact of the changes introduced in 2008 to the national curriculum Key Stage 3 programme on the interests and enthusiasm of students for Science, and Chemistry in particular, during the 11-14 years.

Participants

Participation at the Seminar was by invitation, with an attendance of 44. These included representatives of the teaching professions in schools and universities, Government departments, examining and validating authorities, a range of employers, together with members of the Chemical Education Group (given below)

The Association of the British Pharmaceutical Industry
The Association for Science Education
The British Science Association
Chemical Industries Association
Institution of Chemical Engineers
The Royal Institution of Great Britain
The Royal Society
The Royal Society of Chemistry
The Royal Society of Edinburgh
The Salters' Institute
Society of Chemical Industry

Welcome

The participants were welcomed to Salters' Hall by Dr Richard Homan, Chairman of the CEG, and Sir David Harrison, Director of the Salters' Institute.

Presentations

The Seminar was opened by short presentations by Professor Robin Millar, The University of York, Dr Elaine Wilson, The University of Cambridge, and Mr Jeremy Webb, Editor-in Chief, New Scientist.

The Seminar then divided into six small groups which sought to address the three questions posed in a paper by Professor Millar entitled *Identifying priorities for Chemistry education at Key Stage3* which had been sent in advance to all participants.

The conclusions may be summarised as follows:

Question 1 (Aims and purposes)

Twelve possible aims of Chemistry education were listed and the groups were asked to form a view on how important they should be at Key Stage 3. The following were seen to be 'absolutely essential' for pupils by the end of KS3:

- Have begun to build up their knowledge of chemical substances and reactions
- Have developed some understanding of key chemical ideas and concepts
- Be able to carry out some standard chemistry procedures in the laboratory.
- Have carried out some chemistry experiments for themselves (following instructions)
- Be able to plan and carry out a simple practical investigation of a chemical question/problem
- Know how chemical ideas can be applied to help understand some everyday materials/processes/events

The following were seen as 'desirable but not essential'

- Be able to read, with some understanding, articles in the popular press on issues that involve chemical ideas
- Know about some of the kind of employment that requires chemical knowledge, and the careers to which a chemistry qualification can lead

The following were seen as 'optional'

- Be able to make informed points in class discussions of current issues that involve chemical ideas (e.g. CO₂ emissions, waste disposal, etc.)
- Be able, in Chemistry contexts, to propose explanations based on evidence, and to evaluate explanations proposed by others
- Know about something about key episodes, or people, in the development of chemical ideas and understanding
- Have visited a chemical industrial site, or had someone from the chemical industry talk to them in class

Question 2 (Course content)

Most agreement with the view, that there is some chemical knowledge/ideas that every pupil should have met before the end of KS3 – material that *has to be included* in any proper Chemistry course at that level. Moreover there was much support for Elaine Wilson's 'ladder' (in spiral form) of key ideas in Chemistry, which suggested that concepts should be revisited throughout KS3 in order to build up understanding.

Question 3 (Contexts and issues)

There was a large measure of agreement that the most valuable and engaging contexts that should be introduced at KS3 should include health and wellness, food/drink, and cosmetics.

Current issues involving chemical ideas that pupils at KS3 should have met included global water/food supply, climate change, and greenhouse gases.

Other observations

The following points with regard to KS3 attracted a large measure of agreement in discussion.

- The importance of hands-on practical experience in the laboratory received great emphasis
- Emphasis should be given to the understanding of chemical concepts and not necessarily to recall
- A prescriptive list of topics was not good but some teachers will struggle if this is removed entirely
- It is important to have regard to Science as a whole, keeping it relevant (food, health, cosmetics for example)
- The challenge of assessment awaits solution
- In many schools, the KS3 programme is becoming a 2 year course
- It has been said that 'Young people like Science but they don't like Science in schools', this is a particular challenge at KS3, and effective textbooks were few in number
- Generally, Science teachers can be burdened by the weight of material associated with their subjects which was a constraint not so obviously felt when teachers of English or History, for example, faced their classes. This made the excitement of good practical work in the Science classroom so important.