

**nature***13 December 1979*

## Science in schools: progress barely satisfactory

IT IS not an entirely cheerful picture of science education at the secondary level which emerges from a report just published by Britain's Department of Education and Science (*Aspects of Secondary Education in England*: HMSO, £6.75). The Schools Inspectorate has been examining the performance of one tenth of all the secondary schools in England over the period 1975-1978. Of these 384 schools, 148 were still classified as grammar or secondary modern — the remainder were comprehensive schools of one sort or another. The inspectorate concentrated on the 4th and 5th years, the last two years before the majority of pupils leave and the remainder begin to focus more intensively on their specialist choice. And science was one of the subjects to which special attention was directed.

It is hardly surprising that within a range of nearly four hundred schools quite extraordinary diversity should be found in the provisions made for pupils; at one extreme a large school offered eight different science courses; at the other extreme a much smaller one, for girls only, offered just optional biology. Less than 20% of all schools have a science subject in their core curriculum of compulsory subjects and indeed 9% of all boys and 17% of all girls do no science at all. The numbers who only do one science subject are 50% and 60% respectively.

Even though there have been significant changes in attitude in recent years, the tradition that boys do physical sciences whilst girls do biology still prevails. 48% of all boys study physics and 31% study biology, whereas the figures for girls are 10% and 58% respectively. Some teachers claimed that physics was too difficult for girls, whilst in certain schools, the timetable for options was such that physics was set against a subject usually regarded as for girls — for example, home economics or typing. And there is fairly clear evidence for the often-quoted assertion that girls in single-sex schools turn more readily to physics than they do in mixed schools.

The qualifications of the teachers are, on the whole, appropriate to the subjects they teach in chemistry and biology. But many physics teachers lack any qualification in the subject: one in six did not specialise in physics but in some other science or

mathematics, whilst one in twenty has no scientific qualification at all. Whereas there are doubtless many excellent teachers in this group, the inspectors remark that in at least 10% of schools, one or more science teachers "did not know the subject sufficiently well and false information was taught".

It is to the style of teaching that most criticism is aimed, however. In around one-third of all schools the teaching was "always or nearly always overdirected, with insufficient pupil activity". Particularly in biology classes pupils were expected to take copious notes from the black-board or by dictation, leaving little scope for individual thought. And in all subjects, the doing of experiments was too closely tied to there being a right answer that had to be obtained; experimentation was not often regarded as something open-ended that pays dividends to those who are observant. The idea of science as a process, rather than purely as the contents of textbooks is still rarely instilled in young people.

Not that textbooks are in too plentiful supply. In more than half of all schools the extent to which books were available and used was 'disappointing'. The problem was particularly marked in the case of less-able pupils. Rarely were pupils encouraged to develop reference skills by consulting a range of books and other learning aids. Further, external resources such as industry, museums and field centres were generally thought to be underused. And teachers had given little consideration to how the scientific methods might impinge on other subjects, from geography to metalwork.

Financial constraints can no doubt be blamed for many of the problems that have been turned up. But the foreseeable future is likely to bring little relief in this direction, whilst it most certainly will bring fewer new recruits to the profession. So any steps forward have to make do with limited funds and the teaching profession as it now is. This means a concerted effort to provide much more in-service training than at present, not just to hand out extra information for those teachers whose background or formal education is now no longer totally adequate, but also to provide new horizons, such as science-as-a-process, science in industry, and the scientific approach in other disciplines □