



Secondary Science Education Briefing January 2008

Background

The Campaign for Science & Engineering (CaSE) is a pressure group that works to improve the health of science and engineering in the UK. CaSE is seriously concerned about the situation in secondary school science and mathematics, with many GCSE students offered restricted choices taught by non-specialist teachers and correspondingly low numbers continuing these subjects at A level and beyond.

Shortage of Specialist Teachers

CaSE believes that more students will study science and mathematics post-16 following an improvement in teaching pre-16. Unsurprisingly, Ofsted found that the quality of science teaching relates to teachers' qualifications and predicts student performance at and continued study of science.

- Three-quarters of mathematics teachers are specialists, a quarter of schools have no specialist physics teachers and a sixth lack a chemistry specialist.ⁱ Specialist teachers are less likely to work in the lowest-attaining schools or in socially deprived areas.
- Only 48% of science specialists and 42% of mathematics specialists have a 2.1 degree or better, compared with 58% overall.ⁱⁱ

Government targets for 2014:

- 25% of science teachers should have a physics specialism (currently 19%)
- 31% of science teachers, a chemistry specialism (currently 25%)
- 95% of mathematics lessons should be delivered by a specialist (currently 88%)

Recruitment

The Royal Society estimated that 1000 new physics recruits are needed into teacher training each year and 3000 in mathematics.ⁱⁱⁱ Unfortunately, in 2007, most recruits entered under general science, but 968 were biology specialists, 739 were chemists and 477 were physicists.^{iv}

The Government should set subject-specific goals for recruiting chemistry, physics, and mathematics teachers. As more specialist teachers become available, a strategy should be developed to target them to where they are most needed.

Low pay is the biggest deterrent for undergraduates choosing not to follow a teaching career.

Headteachers should be motivated to use pay flexibilities by including whether a school has specialist teachers in School Attainment Tables.

Retention

Only 50% of science and mathematics teachers are still in the profession 5 years after graduating^v. A recent survey found that mathematics and science teachers were dissatisfied with workload, pupil behaviour and shortages of support staff. In contrast, two thirds of technicians and support staff were satisfied with their work but many were dissatisfied with pay and career progression^{vi}. **Teacher retention should improve with more support staff and technicians who themselves experience improved remuneration and career prospects.**

GCSE and A level choice

Children may take separate science GCSEs in biology, chemistry and physics, two science GCSEs or a single award. Pupils are better prepared and more likely to take science A levels if they have studied three separated sciences, but only one in ten do so. Separate sciences are offered in 26% of mainstream, 58% of science specialist, 66% of grammar and 72% of independents.^{vii} By September 2008, all pupils achieving at least level 6 at Key Stage 3 will be entitled to study triple science GCSE (although, not necessarily in their own schools) and all science specialist schools should offer triple science GCSEs. **The current inequality in science and mathematics education across different types of schools is indefensible. Government must make sure that this entitlement become reality.**

Many students perceive mathematics and science A levels as particularly difficult. Much evidence, that the Government simply refuses to acknowledge, supports this. As students (and the places where they study) are typically judged solely on points accrued, easier subjects predominate. Some universities (e.g. Cambridge, LSE) now publish lists of A levels they do not consider to be academically rigorous. **The Government must recognise the inequality among A levels. The academic requirements of the less challenging ones should be increased, or the points awarded should better reflect the difficulty of the different subjects.**

Students have also been deterred from science as the practical element of classes has been reduced for many reasons such as: large classes including pupils with behavioral problems; lack of assistants; inadequate funding for large items of equipment; and unsafe and uninspiring facilities. **Sustained increase in recruitment of science technicians and support staff is needed to help deal with large class sizes and ease the burdens on class teachers. Schools should be allowed to carry over funds for large purchases. A central website should support practical work, including advising on Health and Safety Issues and coordinating a national scheme to share equipment donated from universities and other labs.**

Outreach

The Government and other organisations have introduced a plethora of science and mathematics outreach and enrichment schemes. **These schemes need to be evaluated.**

Further Information

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References

ⁱ Physics in Schools and Colleges: teacher deployment and student outcomes. Buckingham: Alan Smithers and Pamela Robinson, The Centre for Education and Employment Research, 2005

ⁱⁱ Training and Development Agency, July 2007

ⁱⁱⁱ Royal Society State of the Nation report on Science and Mathematics' teaching, December 2007

^{iv} Training and Development Agency press release, November 2007

^v Royal Society State of the Nation report on Science and Mathematics' teaching, December 2007

^{vi} Mathematics and Science in Secondary Schools. The Deployment of Teachers and Support Staff to Deliver the Curriculum. National Foundation for Educational Research & DfES, 2006.

^{vii} Parliamentary question, June 2007