

Press Release Immediate

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Incentives to Improve the Uptake of Secondary Science & Mathematics

Improving the uptake of science and mathematics at secondary level is vital.

- Increasing the scientific literacy and numeracy of the general population will empower all to make better-informed decisions on increasingly relevant scientific issues.
- Without massive increases in the number of science, technology, engineering and mathematics (STEM) graduates, the UK will not be able to produce the required numbers of skilled workers that form the basis of our knowledge economy.
- Workers in other sectors (e.g., finance, law) draw upon analytical and mathematical abilities developed by studying STEM subjects.

CaSE proposals to improve uptake and diversity

1. Higher UCAS Points for Science and Mathematics

The Government is striving to increase uptake of STEM subjects and has supported and initiated many schemes to do so, but without the necessary success.

CaSE proposes awarding more UCAS points for science, engineering and mathematics as an incentive for more students to choose these strategically important subjects.

This premium would apply to A levels, highers, diplomas and other similar qualifications. Currently all A level subjects accrue the same amount of UCAS points for each grade.

- Schools and colleges would be motivated to encourage students to pursue STEM subjects and provide optimal teaching to enhance their position in the league tables.
- Some universities already manipulate UCAS points, for example the University of Chester awards double UCAS points for Further Mathematics grades.
- Australian universities offer a similar Bonus Points scheme for important subjects.
- Science and mathematics are perceived to be among the most challenging subjects and several quantitative research studies support this perception.ⁱ As students, schools and colleges are assessed by performance, this can lower uptake of these subjects. Providing more UCAS points should counteract this effect.

2. A STEM Diversity Bursary

CaSE proposes a scheme of university bursaries for STEM targeted to the brightest students studying these STEM subjects in schools with a poor history of university access.

- Students throughout the target schools would be motivated to choose STEM subjects and to perform well in them. Even students not achieving the bursary would have had their aspirations raised.
- Targeting the bursaries at schools that send a low percentage of students on to higher education will include many schools in disadvantaged areas and also many with high numbers of ethnic minority students, thus widening participation.
- £5 million would secure a £3150 student bursary (thus covering student fees) for nearly 1600 students: this could be an average of the top 5 students in 320 schools or colleges.
- Many students are not aware of the bursary schemes available to them until too late.
 Locating this scheme within the schools should address this problem.ⁱⁱ
- Universities would have to recognise the potential that these students represent, even though their attainment may not be as high as traditional applicants. Reference to

some American plans should alleviate concerns. For instance, the Texan Ten Percent Plan guarantees students in the top ten percent of Texan high schools a place at public college or university. Students entering university through this plan complete their courses at normal rates and perform well.

Dr Hilary Leevers, Assistant Director of CaSE commented:

"We need to take a more radical approach to increase uptake of science and mathematics in schools and beyond. There are many great new initiatives, but even taken all together they are simply not having enough impact. Policies that widen participation are not only morally right, and help to diversify the workforce, but often have the greatest and most efficient potential for impact."

Current inequalities and shortages in STEM education

Provision of Separate Science GCSEs

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.

- In 2005-6, 26% of mainstream schools offered separate science GCSEs and 58% of science specialist schools did so, compared with 66% of grammar schools and 72% of independent schoolsⁱⁱⁱ. The Government does not have more recent data than that.^{iv}
- Unfortunately, information obtained by CaSE through a Freedom of Information request from the DCSF revealed that a fifth of schools that do not already offer triple science GCSEs have no plans to do so.

Shortage of Specialist Teachers

Unsurprisingly, Ofsted found that the quality of science teaching relates to teachers' qualifications and predicts student performance and their continued study of science.

 75% of mathematics lessons at grammar schools are taught by teachers with a degree in mathematics, compared with just under half (47%) of lessons in comprehensives to age 16 and 58% of comprehensives to age 18. The impact of school type is even greater for general science teaching, but less for the individual sciences.^v

Dr Hilary Leevers commented:

"The Government is spending a lot of money and effort trying to produce more mathematics and specialist science teachers. There should be a strategy to target new teachers to the schools where they are most needed and can have the most impact."

What we are watching for this August...

In 2007, the number of children taking some science and mathematics GCSEs and A levels had increased from previous years.

Dr Hilary Leevers commented:

"Given how large and sustained the decline in most sciences and mathematics has been over the past two decades, it is vital that we continue to see increased uptake. Until this happens there is absolutely no room for complacency. Last year many celebrated a small increase in the numbers of students taking A levels physics, by about 100, and chemistry, by about 200. Given that AS entries were up last year, we hope that A level entries rise again this year, but we need to see sustained increases in the thousands, not hundreds. Unfortunately, the number of biology students dropped last year by about 300, so we will be watching that carefully. We hope that Scottish students continue to show their high level of interest in physics and chemistry."

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ⁱ Coe et al, (2008). *Relative Difficulty of Examinations in Different Subjects.* The Curriculum, Evaluation and Management

 ¹ Coe et al, (2008). *Relative Difficulty of Examinations in Different Subjects*. The Curriculum, Evaluation and Management (CEM) Centre, Durham University.
 ⁱⁱ Davies, P, Slack, K, Hughes, A, Mangan, J & Vigurs, K (2008). Knowing Where to Study? Fees, Bursaries and Fair Access. Institute for Educational Policy Research, Staffordshire University, UK, & The Sutton Trust.
 ⁱⁱⁱ Parliamentary Question written answer, Dr Brian Iddon, 141487, 11 June 2007
 ^{iv}Parliamentary Question written answer, Michael Gove, 182172, 29th Jan 2008
 ^v Secondary School Curriculum and Staffing Survey 2007. DCSF 2008