

Strategic science provision in English universities : government response to the Committee's eighth report of session 2004-2005 : second special report of session 2005-06.

Contributors

Great Britain. Parliament. House of Commons. Select Committee on Science and Technology.

Publication/Creation

London : The Stationery Office, 2005.

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House of Commons
Science and Technology
Committee

**Strategic Science
Provision in English
Universities:
Government Response
to the Committee's
Eighth Report of
Session 2004–05**

Second Special Report of Session 2005–06

*Ordered by The House of Commons
to be printed 20 July 2005*

HC 428

Published on 25 July 2005
by authority of the House of Commons
London: The Stationery Office Limited
£8.00

The Science and Technology Committee

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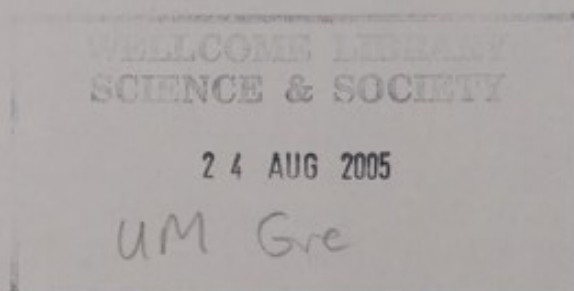
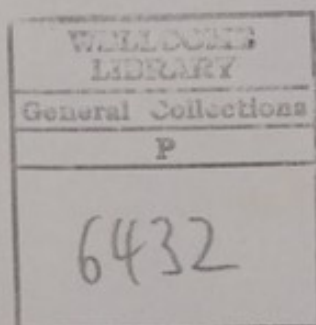
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The current staff of the Committee are: Chris Shaw (Clerk); Emily Commander (Second Clerk); Alun Roberts (Committee Specialist); Hayaatun Sillem (Committee Specialist); Ana Ferreira (Committee Assistant); Robert Long (Senior Office Clerk); and Christine McGrane (Committee Secretary).

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Second Special Report

On 11 April 2005 the Science and Technology Committee published its Eighth Report of Session 2004–05, *Strategic Science Provision in English Universities*. On 19 July 2005 the Committee received a memorandum from the Government which contained a response to the Report. The memorandum is published without comment as an appendix to this Report.

Research Councils UK (RCUK) and the Higher Education Funding Council for England (HEFCE) contributed to the Government's memorandum. Their comments are printed in italics in order to distinguish them from those of the Government.

Where relevant, the Committee's recommendations are given in bold type above the Government response to them.

Government response

INTRODUCTION

The Government, HEFCE and RCUK welcome the Committee's Report on *Strategic Science Provision in English Universities*. As the Committee notes, this is a complex subject, but one where there is a broad consensus on many of the key issues. We are pleased that the Committee's diagnosis reflects our own in many respects.

The main work of implementing policy on HE [higher education] science falls to the HE Funding Bodies (HEFCE in England) and to the Research Councils. Both RCUK and HEFCE have been active in assessing the health of "strategic disciplines" and advising on the conditions that might necessitate intervention and the form that intervention should take. The Committee will be aware that the Secretary of State for Education and Skills has recently received advice from HEFCE on the provision of strategic subjects (including, but not limited to, science subjects): the main conclusions of this advice are reported in this response and the Government will respond in due course.

We note the Committee's concerns about the funding of strategic subject provision, and especially about the distribution of funding between departments. The Government has made a substantial and sustained investment in the HE research base in recent years and is committed to continuing to do so. We are not and should not be its sole support, however, and another element of our strategy has been to increase the capacity of HE institutions to draw in funding from sources other than Government.

We welcome especially the Committee's recognition that student demand is fundamental to addressing not just the issue of departmental closures, but the underlying issue of maintaining a good supply of talent to all parts of our science base. Such a supply is indeed key to realising our ambitions for UK science, as outlined in the Science and Innovation Framework.

However, it should be noted that the overall number of young people studying for Science, Technology, Engineering and Mathematics (STEM) degrees has been rising steadily. Today there are 120,000 more young people studying for STEM degrees than in 1997/98 and the percentage of the total number of students taking STEM degrees has gone up from 38% to 41%. These include large increases in those studying the biological sciences but also a 78% increase in those studying computer sciences and a welcome 38% increase in those studying mathematics. The physical sciences have remained fairly constant at 50,000 and the only area where there has been a fall in the number of students studying is engineering and technology degrees, which has gone down from 87,000 in 1997/98 to 80,000 in 1999/2000 though this figure seems to have stabilised at this level. The number of doctorates awarded in the areas of science, technology, engineering and mathematics has also risen from 7,850 in 1997/8 to 9,865 in 2002/03, a 26% increase.

MAINTAINING THE CAPACITY AND ENSURING SKILLS SUPPLY

1. Recommendation 2—STEM graduates help to maintain the healthy operation of society at all levels—by driving the economy; by generating knowledge and innovating; by raising the scientific literacy of the population as a whole; by informing Government policy; and by aiding participation in international research networks. (Paragraph 10)

Like the Committee, the Government believes that STEM (science, technology, engineering and maths) graduates are important to our economy and wider society: STEM disciplines are “strategic subjects” and it is important that we address how they are provided. STEM subjects are not the only “strategic subjects”, however, and not all STEM subjects are experiencing vulnerabilities in provision: for example, the Committee has recently completed a report on the rise of forensic science courses. Science is an area we want to grow and develop, however. As the Committee notes, we want to increase the UK’s investment in Research and Development as a proportion of GDP to 2.5% in 2014, and we will need to increase STEM graduate numbers to achieve this.

Government action on STEM capacity falls under broader policy priorities, therefore:

- action on strategic subjects where there may be vulnerabilities in provision, including, but not limited to STEM subjects, and
- action to enhance science study and science careers, not limited to those where there are vulnerabilities in provision.

ACTION ON STRATEGIC SUBJECTS

2. Recommendation 3—Whilst it may be exaggerating to say that university STEM departments are in crisis, it is clear that their numbers are experiencing a sharp decline. Since the financial situation faced by these departments is unlikely to change in the short term, it is reasonable to assume that there will be further closures. If this process continues unchecked, there is a very real possibility that the system will no longer be able to provide sufficient numbers of STEM graduates to meet the needs of the UK economy. Unless the Government takes action now, it will have a crisis on its hands in the foreseeable future. (Paragraph 15)

3. Recommendation 4—Given the Government’s goal of increasing the number of students taking STEM courses, it is essential that sufficient capacity is maintained in the system to meet a possible future growth in student demand. (Paragraph 16)

4. Recommendation 5—Further closures of university STEM departments would be a source of serious concern to us. However, the closure of an individual department need not entail a permanent loss of capacity in that subject, providing that suitable alternative arrangements for current students and long term planning for potential future increases in student demand is in place at a regional and national level. (Paragraph 19)

5. Recommendation 6—There is little point in patching up the system in the short term if measures are not taken to address the underlying reasons for the difficulties faced by

university STEM departments. It is essential that any measures taken to prevent further loss of capacity in the system are underpinned by a strategic approach. (Paragraph 20)

The Research Councils and the Funding Councils have been working closely together on issues relating to health of disciplines, through the Research Base Funders Forum. As well as informing their individual work on strategic subjects, their co-operation has produced joint initiatives such as the EPSRC/HEFCE/SHEFC sponsored Science and Innovation Awards, aimed at securing strategically important areas.

Government shares the Committee's view of the importance of maintaining the health of disciplines. We look therefore both to the Research Councils and HEFCE for advice and to take forward action in this field. The Committee is already aware that the Secretary of State for Education and Skills wrote to HEFCE in December 2004 seeking advice on "...whether there are any higher education subjects or courses that are of national strategic importance, where intervention might be appropriate to enable them to be available... and the types of intervention which is believes could be considered". The Committee will be aware that HEFCE submitted its advice to Ministers in June 2005, and has subsequently published it: <http://www.hefce.ac.uk/pubs/hefce/2005/05-24>.

HEFCE ADVICE ON STRATEGIC SUBJECTS

6. Recommendation 28—We endorse the principle of university autonomy. We also acknowledge that, in practice, the decisions taken by universities are in large measure dictated by the need to win funding and respond to changes in student demand. Where market conditions and the university funding system make it financially difficult for universities to continue providing subjects of national or regional strategic importance, HEFCE may need to intervene to prevent their decline at a national or regional level. We support HEFCE's proposals to require universities to give a period of notice before closing a department and to consider offering financial support to individual departments where it is in the national or regional interest to do so. Without the introduction of these mechanisms, many STEM departments will struggle to survive in the short term. (Paragraph 83)

7. Recommendation 29—It is essential that any additional HEFCE funding for strategic subject provision is used only as measure of last resort. In order to qualify for such funding, universities should have to prove to HEFCE that no alternative financial arrangements can be made. HEFCE should also have to satisfy itself that, without the allocation of such funds, capacity in the subject in question would be severely damaged at either a regional or a national level. (Paragraph 84)

8. Recommendation 30—We commend HEFCE for its support for minority subjects deemed to be in the national interest. It is clear, however, that the arrangements that have been made to secure the provision of such subjects would not be applicable to mainstream STEM subjects. (Paragraph 87)

The main conclusion, endorsed by the HEFCE Board, is that any HEFCE intervention should be deployed within a clear framework and only where there is evidence to warrant intervention. The key principles of the framework are:

- A clear evidence base

- Wherever possible to support a market-led solution
- To look at issues holistically and ensure that problems of demand are not addressed with supply solutions (and vice versa)
- To seek wherever possible to work in partnership with all those with an interest in protecting strategic and vulnerable subjects
- To intervene only where HEFCE has a clear understanding of the nature of the problem, where it is located and where HEFCE intervention is appropriate.

HEFCE agrees with the Committee's observation that it would be exaggerating to say that university STEM departments are in crisis. A report prepared by the Research Councils reached the same conclusion – analyses showing that, whilst there have been a number of departmental closures in these disciplines, a significant level of activity remains. The analyses also showed that, although named departments may close, activity in that discipline or sub-discipline often continued elsewhere in the university alongside cognate subjects. Capacity is not necessarily lost therefore, and often a subject is strengthened and invigorated by new teaching and research links formed through closer proximity to other disciplines.

Notwithstanding this, HEFCE recognises that in some circumstances action is required to sustain capacity in certain subjects. One conclusion drawn in the report of Sir Gareth Roberts' advisory group to HEFCE on strategic subjects is that each subject is different, and that it would be inappropriate for HEFCE alone to develop an intervention strategy for each. The report recommends that HEFCE should invite the relevant learned society and/or representative body to provide further evidence to support the case for intervention. They should then work with the Council to explore bespoke interventions which will address the most pressing issues. Thereafter the most appropriate funding route would be identified.

In the then Secretary of State's original December letter, he made clear that no additional public funding should be expected for interventions—a condition assumed by the Committee and addressed elsewhere in this response. Nevertheless, HEFCE anticipates that, by using a focussed approach and, wherever possible including other funding bodies in discussions, strategic and longer-term solutions can be found. This case-by-case basis for strategic intervention will also guard against the "accidental" support which is of concern to the Committee.

HEFCE has noted the Committee's commendation for the support it has given minority subjects and agrees that this mechanism would not be appropriate for use with mainstream STEM subjects. HEFCE also noted the Committee's remarks about a notice period for departmental closures: this was a proposal in the 10 Year Framework rather than one from HEFCE. HEFCE is keen to encourage early dialogue with institutions prior to course closures, and already has in place a number of mechanisms (including funded student numbers to aid transfers) to support capacity in or across regions where this is considered a strategic issue.

RCUK WORK ON HEALTH OF DISCIPLINES

HEFCE's consideration of strategic subjects will continue to be informed by the Research Councils' work on health of disciplines, and HEFCE is drawing on the work of the Funders' Forum to inform its approach and consider joint action to support and develop particular

sub-disciplines where existing provision may be both important and vulnerable. The Research Councils have indicated their support for HEFCE's proposed framework for intervention.

RCUK flagged up in its evidence to the Committee the research areas of strategic importance to both the UK economy and the broader science base where Research Councils were taking immediate action to address risks to provision and safeguard the longer term. All Research Councils have highlighted plans in this area in their original submissions to the Committee, and updated this information in their recently published delivery plans. Examples of areas supported to date include statistics, energy research and development, and electronics design. By 2007/08 EPSRC plans to have established 20 strong new research groups in key areas. Another example is the joint ESRC/MRC scheme for studentships and fellowships in areas drawing on the combined approaches of medicine and the social sciences, addressing interests in areas such as occupational health and delivery of health services

The Research Councils also recognise the broad range of strategically important subjects, and the range of areas in which a discipline may be important. For example, the growing importance of the Creative Industries in the UK economy reinforces the need to sustain and build capacity in the creative and performing arts subjects. It is likely that scientific disciplines will contribute to the creative industries.

The Research Councils are particularly aware that reduced provision of science courses could have a significant consequence for the attractiveness of Research Careers in STEM. They agree with the Committee that sufficient undergraduate capacity should exist that lack of courses does not contribute to dissuading students from entering STEM disciplines. They are also conscious that the long lead times to produce highly skilled PhD graduates mean that a serious loss of capacity in key disciplines could make recovery difficult. They are working with Government and the Funding Councils to ensure capacity is maintained.

ACTION TO ENHANCE SCIENCE STUDY AND SCIENCE CAREERS

HIGHER EDUCATION COURSE DESIGN

9. Recommendation 10—The Sector Skills Councils should help the Government and universities to improve their management of the interplay between the supply of, and demand for, graduate skills. In particular, we recommend that they develop a system of “kite marks” for employer-led higher education courses. This would send out much clearer signals to students about the likely value to their future career of the course that they choose. It would also help to avoid the problems associated with the over-provision of courses such as those in forensic science relative to the number of jobs available. (Paragraph 31)

10. Recommendation 17—Degrees in the same subject from different institutions are not necessarily interchangeable. Along with overall levels of subject provision, diversity of provision needs to be taken into account in national and regional planning in order to cater sufficiently for student choice and differing levels of attainment. (Paragraph 45)

11. Recommendation 19—If the standard for entry on to university STEM courses is lowered as a result of decreased demand, there is a danger that the currency of the resulting degrees will be devalued. This would not be in the interests of either the students taking those courses or their potential employers. It is important that, in the drive to increase student demand for university courses in STEM subjects, the quality of the student intake is not sacrificed for the sake of increasing student numbers. (Paragraph 51)

12. Recommendation 20—There is a strong case for continuing to provide a diversity of STEM degree courses to cater for the varying abilities of the students opting to take science subjects. Joint honours courses and many of the new “softer” STEM subjects attract many students into science who may otherwise have studied something else altogether, or not studied at all. Chemistry, physics, mathematics and engineering will not suddenly become more popular if students are prevented from studying other subjects. Nonetheless, there is great variability in the quality, scientific content and entrance requirements of some non-core STEM subjects, some of which are only nominally “science” courses. Some of these courses will be of limited value to graduates seeking a scientific career and will not help to increase the supply of skilled scientific personnel. Students enrolling on these courses need to be clearly informed at the outset about whether or not they will be qualified upon completion to pursue a scientific career. (Paragraph 59)

Some closures of science courses have resulted from institutions seeking to re-design or rationalise their provision to increase appeal to prospective students. There is some evidence that vocationally based courses (e.g. forensic science) are more attractive than traditional courses (e.g. chemistry). The Committee has suggested that students were not always well informed about the quality and employment prospects of such courses. We believe that course quality is good, and HEFCE has assured us that it takes seriously its remit, through the Quality Assessment Agency, to assure the quality of teaching provision throughout the English HE system.

We believe that it may be rather that students are not well informed about the employment prospects of some traditional science courses—and so choose courses that advertise themselves as linking to a career. We are encouraged by the work that the Royal Societies, the Research Councils and others are doing to make clear the prospects of science careers.

The Committee suggested that Sector Skills Councils (SSCs) should develop a “kite-marking” system for HE courses. HEFCE is working with the Sector Skills Development Agencies (SSDAs) and SSCs and, with DfES, has supported the first four pilot SSCs to engage with the HE sector to address both supply and employer and student demand issues.

In particular, HEFCE is encouraging SSCs to develop closer partnerships with institutions to deliver the provision required by employers, for example through involvement in Lifelong Learning Networks, Foundation Degree sector frameworks and collaboration on the design and delivery of curricula. SSAs will identify more effective routes for brokering engagement between the HE sector and SSCs.

HEFCE will continue to work closely with these bodies, and welcomes the Committee's recommendation that SSCs should help higher education institutions (HEIs) to improve their management of the interplay between the supply of and demand for graduate skills. We can foresee difficulties with the Committee's proposal for "kite marks" however. Any such a system would need the buy-in of HEIs and be agreed between them and SSCs.

The introduction of Foundation Degrees addresses an important skills gap, identified by private and public sector employers, at the associate professional and higher technician level. They are vocational higher education qualifications, designed to provide the specialist knowledge and employability skills that employers are demanding as well as the broader understanding that equips graduates for future professional development. Foundation Degrees have the potential to attract students who would not otherwise have considered science, as well as those from backgrounds where there is no tradition of higher level study. Although Foundation Degrees are relatively new qualifications, they are becoming increasingly popular, with nearly 38,000 students pursuing them in 2004/05. The Science, Engineering, Maths and Technology Sector Skills Council (SEMTA) is proposing to develop a fast track Foundation Degree apprenticeship which would enable students to gain a joint qualification in four years rather than 6.5.

INCREASING THE HE SCIENCE WORKFORCE

13. Recommendation 9—If the Government is to meet its ambitious target of increasing the UK's investment in R&D as a proportion of GDP to 2.5% in 2014 it will need to take steps to significantly increase, not simply maintain, the total number of STEM graduates, as well as the proportion of those graduates that go on to pursue careers in science, engineering and technology. Evidence suggests that the UK may need to produce at least 5,000 additional researchers each year. (Paragraph 25)

The Government, the Funding Councils and the Research Councils agree with the Committee that a significant increase in researcher numbers will be required to meet the Government's 2.5% GDP target.

The Research Councils note that many areas of STEM are experiencing demographic changes in the academic workforce which both represent additional demand—and therefore additional opportunity—for skilled researchers, and pose capacity issues for further training. Economics is a particular concern cited by ESRC but many disciplines face problems of differing degrees of severity.

All Research Councils have addressed training issues in their delivery plans including plans to ensure sufficient supply to contribute to future demand; removing barriers and encouraging participation in research by under-represented groups such as women returners and ethnic minorities, and making the system more demand-led through interaction with employers. Examples of activities include PPARC's decision to increase the volume of quota studentships by 50% by 2007/8. EPSRC will shortly be publishing an analysis showing that in order to meet their share of the growth target Research Council PhDs may need to grow by up to 4% per annum over 10 years.

RESEARCH CAREERS

14. Recommendation 15—It will be important for the Government to address negative perceptions about research careers. Without specific action in this area, it could take a long time for any improvements in research career paths to filter through to schoolchildren and students making choices about their future careers. (Paragraph 39)

A key part of increasing the science workforce is addressing factors that may make certain science careers—particularly those in HE research—unattractive to some students, and perceptions about some STEM careers that cause people not to choose them. Early career researchers and those on short term contracts are among those who may be or feel at a disadvantage. The Roberts Review made recommendations regarding funding for contract staff.

The Research Councils recognize the potential for improvements resulting from the EU code and charter for contract researchers, increasing their rights, improving their status, and which might thus encourage recruitment and retention.

HEFCE too shares concerns about difficulties experienced by early career researchers in establishing their position as part of the permanent workforce. This is a management issue which HEIs as employers will need to resolve. HEFCE has undertaken to do what it appropriately can to support them in this and will be publishing the outcome of a research study exploring the current state of policy and practice in resource management and career development of early career researchers and inviting the sector to consider the implications of its conclusions for their developing practice.

The Government and the Research Councils have paid significant attention to making careers in research (particularly those involving high level skills) more attractive. The Research Careers Initiative and the implementation of the Roberts and Lambert Reports are creating a more favourable environment for young researchers (both financially and in terms of skills training and career development opportunities such as the Roberts/RCUK Academic Fellowships). Work such as that of the Research Careers Committee through its Career Paths Working Group aims to produce career maps to assist recruitment into research careers.

The Research Councils are also working to foster relationships with Wellcome and other funders to address areas of mutual interest in improving the attractiveness of careers such as skills training for post-doctoral researchers or common data-requirements to underpin analyses of the impact of funding schemes (as reported in response to the Committee's scrutiny of RCUK). Further work to understand the impact of implementation of these policies is likely to be necessary and will include the views of researchers, universities and employers (which also includes universities).

There is evidence that women face particular challenges in developing research careers. The Research Councils recognise that there has been a reliance on a "traditional" cohort, i.e. white males, to keep up the supply of STEM graduates. This also has consequences for research capacity in universities which are heavily dependent on the base of permanent academic staff. Research Councils are now taking steps to ensure that representation of women and black and minority ethnic (BME) students in the STEM HE area better reflects that in the wider population/ workforce.

The Research Councils are also involved in a number of initiatives to get females of all ages to consider graduate careers in "non-traditional" areas such as engineering and physical sciences. The Resource Centre for Women in SET is to work with Sector Skills Councils (SSCs) and employers to identify cultural and structural barriers which militate against women seeing certain STEM careers as attractive. DTI is also about to commission research into SSC's own diversity policies.

GOVERNMENT RESEARCH AND ENGAGEMENT WITH EMPLOYERS

15. Recommendation 7—Making sure that the UK can meet the demands of employers for skilled personnel is key to ensuring that it can maintain its competitive edge in a global market. (Paragraph 21)

16. Recommendation 8—Whilst it is "good news" for STEM graduates that so many of them find employment so quickly, it is not necessarily good news for employers in the sector. The relative ease with which STEM graduates find employment suggests that there may not be enough of them to fully meet employer demand. (Paragraph 24)

17. Recommendation 11—We recommend that the Government undertakes a comprehensive survey of existing research into the supply of, and demand for, STEM skills, including lessons learned from other countries. This will enable it both to take stock of the current situation, and to form a strategy that will meet the UK's future skills needs. (Paragraph 32)

18. Recommendation 14—In order to formulate a credible policy on attracting graduates into careers in science, engineering and technology, the Government needs to develop a sophisticated understanding of the motivating factors in graduates' choices of careers. Given that they are in the best position to act upon any findings, we recommend that the Government commissions the relevant Sector Skills Councils to carry out further research into these factors. (Paragraph 38)

The Committee has suggested that Government pursues a comprehensive survey of existing research into supply of and demand for STEM skills, including international comparisons. An overview of such research informs, and will continue to inform, our policymaking, but we are aware that the position is a changing one and that research will tend, inevitably, to lag behind it. We believe staying abreast of current trends is better achieved through good working relationships with employers' organisations and contacts with the sector (including international representatives), and we are pursuing these.

The Committee has also recommended that we commission the SSCs to carry out research on the motivating factors in graduates' choice of careers. Again, this is an area where there is a range of information available: for example the British Association for the Advancement of Science's report *Connecting Science* has some interesting insights into student choices. The Gateway to the Professions Literature Review also looked at students' choices, and concluded that career decisions depended—as might be expected—on factors including socio-economic circumstances, family preferences and interests. It observed that most studies agree that by the time a student reaches university, processes that occur during primary and secondary education tend to have already decided the career path.

We welcome the Committee's recognition that the needs of employers are key when considering the provision of STEM subjects in HE. We are keen, however, that the market is allowed a role and will take care to ensure that the market forces at play between employer demand and graduate supply are not artificially skewed by any intervention we may make. Second guessing the market may ultimately reduce the dynamism of the English HE sector.

Government, the Funding Councils and the Research Councils actively encourage collaboration between universities and industry in support of research training. Initiatives such as Collaborative Training Accounts; CASE and Industrial CASE and Engineering Doctorates all encourage employer involvement in postgraduate Masters and Doctoral training.

The Performance Management system for the Research Councils also includes indicators reflecting the scale and depth of the Research Councils involvement in collaborative and employer driven training particularly in relation to Knowledge Transfer.

RCUK reports anecdotal evidence that some HE courses, and the premises in which they are taught, are unwelcoming for women and BME groups. Research Councils are in discussion with various stakeholders about whether some empirical research would be valuable in this area.

GOVERNMENT FUNDING OF RESEARCH AND TEACHING

19. Recommendation 1—Given the unlikelihood of increased overall funding, this Report focuses on ways in which existing funds can be used more effectively to ensure good provision of STEM subjects in English universities. (Paragraph 7)

The Committee contends that Government funding policy has contributed to making some science departments vulnerable to closure. Its criticism focuses on the allocation of funding between subjects and institutions, but it also suggests that overall funding levels are inadequate, but “unlikely to increase”.

In fact, of course, we have already significantly increased our commitment to supporting science, as our evidence to the Committee noted. We have invested more in both dual support streams, and developed the Higher Education Innovation Fund (HEIF) to support knowledge transfer, and the Science Research Investment Fund (SRIF) to address historic under-investment in research infrastructure. Overall, we are raising science spending by over £1 billion by 2007/08 compared with 2004/05 on top of an additional £1.25 billion investment in the previous Spending Review. This is a substantial and sustained commitment.

FUNDING TEACHING

20. Recommendation 37—Research concentration is not an evil *per se*: it only becomes a problem when it occurs in a uniform system, where universities that do not carry out world class research but are nonetheless strong in other areas of their work, are disregarded. (Paragraph 103)

21. Recommendation 38—It would be unacceptable if universities had to use research funds to subsidise teaching activity. In order to ensure that both teaching and research are supported at a sustainable level, the Government needs to have a clear understanding of the costs of each type of activity. We recommend that it uses the TRAC methodology to produce a comprehensive analysis of the costs of research and teaching relative to the level of funding that each activity receives. (Paragraph 108)

22. Recommendation 39—Departmental expenditure is a flawed basis from which to calculate the level of teaching funding allocated to STEM departments. This seems to have been accepted by HEFCE: we understand that it has commissioned research on possible cost-based approaches to funding, including an approach based on the TRAC methodology. (Paragraph 109)

23. Recommendation 40—STEM subjects might have seen a slight increase in their levels of teaching resource, even after the change in subject weightings for their category was reduced from 2.0 to 1.7. However, any such increases need to be set against a history of chronic under funding for teaching. We recommend that the Government uses its research into the costs of teaching, facilitated by the TRAC methodology, to reach a settlement for STEM subjects that accurately reflects their cost. (Paragraph 111)

24. Recommendation 41—It would be a matter of regret if, when HEFCE changed the subject weighting for teaching funding, competition between the science and

engineering bodies about the relative importance of their areas of specialism had prevented some subjects, such as chemistry and physics, from receiving the funding uplifts that they so badly needed. The scientific community needs to pull together to ensure that future discussions about funding are resolved in the interests of science as a whole, regardless of the interests of individual specialisms. (Paragraph 112)

25. Recommendation 42—Many students benefit from exposure to research during their undergraduate degree, particularly if they want to go on to pursue a career in research. However, research intensive departments are not essential to train all STEM students. It is an inevitable, if inadequately foreseen, consequence of the drive towards higher levels of participation in higher education that it is unsustainable for every student to be taught in a research active environment. This is unfortunate, but not necessarily damaging, provided that all STEM students are taught on the basis of scholarship, if not research. We recommend that the Government and universities recognise that teaching-focused departments are not only accepted, but supported sufficiently well to ensure that they retain good quality staff and a commensurately high status. (Paragraph 118)

Both teaching and research funding are allocated to universities as a block grant. We do not hypothecate it, and have no plans to do so. We believe institutions should have the ability to use limited cross subsidy as part of their management strategy. Indeed, we have sought to increase the flexibility available to university managers to draw on different funding streams. The development of Full Economic Costing is a key policy in this respect, and the introduction of variable fees also increases flexibility for universities to manage their finances. Programmes like the Science Research Investment Fund (SRIF) are helping to build institutions' strategic planning capabilities and allow them to make best use of the flexibility available to them.

The Committee does not entirely welcome this flexibility, stating that it would be unacceptable if universities had to use research funds to subsidise teaching activity. We agree that significant or enforced use of research funds for teaching could threaten the research quality that won the funding in the first place, and we do not believe institutions would be likely develop their strategies on this basis. Teaching and research are linked not parallel processes, however. In its advice to Ministers on teaching and research, the HE Research Forum noted that one of the strongest links between teaching and research is the way in which research based information resources are accessed for information that is then incorporated into delivery of teaching.

The Committee itself recommends that "all STEM students are taught on the basis of scholarship if not research". In the latest grant letter to HEFCE, DfES provided £25m to support a "research-informed teaching environment" to be allocated by a formula in inverse proportion to research funding.

HEFCE has decided to allocate this as £10m in 2006/07 and £15m in 2007/08 and has recently taken advice from an expert panel on the nature of links between teaching and research, and how funds can best be used to support an appropriate environment. Proposals will go to the HEFCE Board in September, and a consultation will follow.

HEFCE is currently exploring appropriate formula, and considering issues which arise around HE delivered in FE [former education] as well as inviting contributions from the Teacher Training Agency (TTA) and NHS.

HEFCE has undertaken to continue monitoring carefully the impact on the HE sector and on STEM disciplines in particular, of its grant allocation decisions and of changes in approach by the Research Councils and other partners. Work on monitoring sustainability led by the Research Base Funders' Forum can make an important contribution to this. HEFCE has undertaken and is commissioning a considerable body of work using TRAC approaches to improve its understanding of the full costs of undertaking both teaching and research in HE across the range of activities and disciplines. This work will inform a planned review of grant allocation methods for teaching, and decisions on funding for research following the next Research Assessment Exercise (RAE).

Good information on costs of teaching and research will also be key in making any future case for additional Government funding.

RESEARCH ASSESSMENT EXERCISE

26. Recommendation 31—The funding allocations made as a result of RAE 2001 have severely compromised the financial viability of departments rated 4 or lower, particularly in those institutions that do not have an overall majority of research staff in departments rated 5 or higher. In order to prevent the continued decline of many 4-rated departments, there needs to be a reduction in the steepness of the “cliff edges” between the funding allocated to departments falling within different funding bands. (Paragraph 93)

27. Recommendation 32—We hope that the new “quality profiles” to be used in RAE 2008 will help to reduce the steepness of the funding scale for the allocation QR funds. In the meantime, however, many departments are still feeling the adverse effects of the funding arrangements made as a result of RAE 2001. The Government may have to recognise that short term measures, such as those proposed by HEFCE, are required to support departments currently rated 4 or lower until the new arrangements have had time to take effect. (Paragraph 94)

28. Recommendation 33—The move towards Research Councils meeting the full economic cost of the research projects that they fund should improve the financial viability and thus the sustainability of STEM departments carrying out a significant volume of research. In turn, this may mitigate against some of the more negative consequences of the RAE. We hope that our successor Committee will have the opportunity to assess the impact of this new policy once it has had time to take effect. (Paragraph 95)

29. Recommendation 34—The concentration of research funds is an inevitable consequence of a system that funds research on the basis of excellence from limited funds. The Government is responsible for this system. It is therefore disingenuous of the Government to deny that it has a policy to concentrate research. (Paragraph 96)

30. Recommendation 35—Instead of resolving the financial difficulties experienced by some STEM departments, the wholesale redistribution of research funds would diffuse

those problems more widely. Such a policy would threaten the ability of 5 and 5* rated departments to continue performing at a high level. It would also risk their international standing, a move that could have adverse consequences for the UK's international competitiveness and for individual careers. In the absence of increased overall funding, "robbing Peter to pay Paul" is not a viable solution to the financial difficulties of some STEM departments. (Paragraph 101)

31. Recommendation 36—We urge the Government to reconsider its rejection of proposals for a three-tier research assessment process. Such a process would allow departments to bid for funding on the basis of merit instead of imposing an arbitrary cut off point for departments upholding the same standard of research activity. Although this would not increase overall levels of funding for research, it would distribute existing funds more fairly amongst lower performing departments. (Paragraph 102)

The Committee has taken issue particularly with the distribution of Quality Related research funding based on the Research Assessment Exercise. It has suggested that Government is disingenuous to deny that we have a policy to concentrate research. Nevertheless, we do not have such a policy. We have a policy to fund selectively on the basis of excellence. Selectivity may have resulted in some concentration, but, as HEFCE noted in its evidence, concentration has not increased significantly in recent years, and there are still some 70 institutions with at least one 5* department. We remain to be convinced that selectivity inevitably produces concentration, and expect that the 2008 RAE will show pockets of excellence spread throughout a wide range of institutions.

As well as selectively funding excellent research, our policy is to secure a dynamic and responsive research base and adequate targeted support to research in fields that may be less well developed or otherwise exceptionally in need of support to secure excellent provision for the future. HEFCE's approach in allocating research funding reflects this, protecting resourcing of the highest quality research, while maintaining the diversity and sustainability of the overall research base. The Research Councils, whose own funding is allocated on a competitive basis, also recognise the need to continue to build capacity and capability in areas where there are only a small number of excellent departments.

As part of our commitment to excellence, we are committed to ongoing review of the RAE; however, we do not intend any further review of funding decisions taken following the 2001 RAE. We accept that 4 rated institutions could not have expected the cut in their funding, but it was a consequence of an improvement in research quality that itself exceeded expectations. The number of departments receiving the "excellent" 5 or 5* rating rose to 821 in the 2001 RAE—an increase of 324. This put pressure on funding for the 479 departments which received the "good" 4 rating. Institutions themselves will be familiar with this situation: in a field of applicants where far more than expected receive "A" grades, those with perfectly respectable "B" grades find it harder to obtain places. We are pleased that the Committee recognises the pressures at work here and agrees that "robbing Peter to pay Paul" is not a viable option.

HEFCE and the RCUK agree with the Government and the Committee that the next RAE should proceed. HEFCE and the Research Councils are working closely together to ensure that it successfully identifies all forms of research excellence. Research Councils are

represented on the RAE panels, and panels have instructions to recognise outputs other than standard academic publications, and impacts beyond the research discipline. For example, the Research Councils advise that chemistry is an indispensable component of world class biomedical science, and the RAE should consider excellence achieved by chemistry working not just alone, but in inter-institutional and multi-disciplinary configurations.

Another area where the RAE has been criticised is in its potential indirect impact on the research careers of specific groups, particularly women, who will take career breaks at times when for many people research is the major part of their work. The Funding Councils have required RAE 2008 panels to take account of early career staff and to explain how they are doing this in the subject specific criteria published for consultation. All panel members and secretaries are receiving Equal Opportunities training from the Equality Challenge Unit, and submitting institutions will also be required to have an internal code of practice on selection of staff for submission.

As the Research Councils (and others) have noted, it is possible for individuals to undertake world class research within 4 rated departments. The introduction of "quality profiling" in the 2008 RAE will help to better identify such pockets of excellence within good or improving departments. HEFCE believe that quality profiling will also go a long way to counter the risk of rating scale and funding arrangements producing the "cliff edge" effect noted in RAE 2001, where the award of a 4 rather than a 5 rating to one department made an uncomfortably significant difference to the host institution's grant.

The Committee recommends that we consider intervention to help departments rated 4 in the run up to the 2008 RAE. HEFCE has already guaranteed to maintain levels of funding to these departments. We are not inclined to make further support available on the basis of 2001 RAE ratings, but, as we have already said, we will be considering HEFCE's advice on the potential for responding to specific vulnerabilities.

As we have said, we are committed to keeping the RAE under review, and a metrics exercise is proceeding in shadow to the 2008 RAE to inform discussions about what happens after that. We made clear in our response to the Roberts review that we do not support a three-tier research assessment system, however. HEFCE have observed that it would be cumbersome to operate, would unacceptably exclude whole institutions from the highest level of assessment, and does not command the support of the sector. In the face of opposition from the sector, we believe that imposing a three-tier approach would be particularly unhelpful, and we feel it would do nothing to improve the recognition of "pockets of excellence".

The Research Councils agree with the Committee's observation that their move towards meeting the full economic costs of the projects that they fund should improve the viability of some STEM departments.

THE HUB AND SPOKES MODEL AND REGIONAL PROVISION

32. Recommendation 44—The hub and spokes model of university provision would allow STEM departments to capitalise on their areas of strength, whether they are research, teaching or knowledge-transfer, whilst still ensuring that undergraduates received a rounded education in the discipline of their choice. By collaborating on their provision of STEM courses, departments would make more efficient use of resources, and thereby ease the financial difficulties currently being experienced by many STEM departments. We recommend that the Government encourages the acceptance and implementation of this model throughout the system via HEFCE, the RDAs and Universities UK, and by means of the funding regime for higher education. (Paragraph 125)

TEACHING AND RESEARCH

The Committee concludes that universities should focus on their strengths, whether in teaching, research, knowledge transfer or other areas. The Government holds a similar view: believing that all universities should offer excellent teaching, and that beyond this they should focus on their strengths. Teaching is so fundamental that every institution needs to do it well.

We accept the HE Research Forum's advice of July 2004 that excellence in teaching requires that teaching is "research informed". The Research Councils too are keen that teaching should occur in a research environment as far as possible. Based on the Forum's advice, we have provided additional funding to HEFCE to develop "research informed teaching". We do not require that all teaching staff are research-active, but we do expect to see current research findings and research methods included in teaching. "Research informed teaching" funding will help universities to develop their links to research, and has the potential to produce some interesting new ideas and partnerships.

COLLABORATION AND THE HUB AND SPOKES MODEL

33. Recommendation 43—Universities are not islands. If the way to healthy provision of STEM subjects in English universities lies in collaboration between institutions, they will need to work together in the national and regional interest. (Paragraph 119)

34. Recommendation 46—Under the hub and spokes model of university provision, a greater number of universities may choose to focus on their knowledge transfer activities. Third stream funding (HEIF) is still relatively modest in comparison with the funds available for teaching and research. The Government may need to consider developing HEIF further in order to encourage more universities to concentrate on knowledge transfer. A concomitant increase in research funding from industry will also need to be encouraged if universities are to have a real opportunity of diversifying. (Paragraph 131)

The HE Research Forum also provided the Government with valuable advice on how to encourage collaboration between institutions. A key finding is that such collaboration should be "bottom-up", led by the institutions themselves.

Again, this reflects Research Council views, and those of HEFCE. RCUK advises that from the perspective of both research and postgraduate training, bottom-up collaboration is preferable. HEFCE adds that collaboration requires trust and effective relationships between the partners.

A number of successful collaborations are already underway, some of them along the lines of the "hub and spokes model" the Committee proposes. Initiatives such as the Promising Researcher Fellowship Scheme already provide opportunities for staff from less research intensive institutions to spend some time in a research intensive environment. Lifelong Learning Networks are being put in place to offer progression routes to students, enabling movement through from Foundation Degrees to honours, or, indeed, research-led degrees across a number of institutions. This year, HEFCE has also funded 74 Centres of Excellence in Teaching and Learning (CETLs). Funding for these Centres will total £315 million over five years from 2005/06 to 2009/10, with each receiving recurrent funding ranging from £200,000 to £500,000 per annum for five years, and a capital sum ranging from £0.8 million to £2 million. This initiative represents HEFCE's largest ever single funding initiative in teaching and learning. The CETLs were selected through a competitive bidding process, and are well distributed geographically and reach across all the main subject areas and involve many aspects of student learning.

RCUK reports that the Research Councils are also involved in "bottom up" collaborations such as EPSRC supported research consortia and Collaborative Training Accounts which involve more than one university. In Scotland proposals are being developed linking physics and chemistry departments in several universities. In economics such a consortium has successfully operated via the Scottish Doctoral Programme in Economics for many years with similar moves under consideration in other social science disciplines.

The Committee proposes that Government "encourages" implementation of a "hub and spokes" model of regional provision, by various means including via the funding regime. We recognise that, in focussing on their particular strengths, institutions or departments may draw their funding in different proportions from different sources e.g. HEIF. Gearing the funding regime to a hub and spokes model seems to us to be too much "top down", however, and would be likely to appear to institutions as imposition rather than encouragement. Government, Funding Councils and Research Councils would all be very cautious about this.

HEFCE notes that models of specialisation are attractive when they can be considered from the beginning, but efforts to impose such arrangements would require new funding and HEFCE is not sanguine that they would meet with success. HEFCE can see benefits arising, however, where institutions choose of their own accord to co-operate in a "hub and spokes" model.

REGIONAL DISTRIBUTION OF RESEARCH

35. Recommendation 45—We recommend that a Regional Affairs Committee is established within HEFCE to coordinate the implementation of the hub and spokes model within the regions. The Committee should contain representatives from each of the Regional Development Agencies, who would each be responsible for ensuring the

implementation of decisions taken by the Committee within their region. The Committee should draw upon the valuable work being carried out by the Research Base Funders' Forum on the health of disciplines, giving this work some practical effect. HEFCE's Regional Affairs Committee would also be responsible for monitoring the implementation and success of the hub and spokes model in the regions. (Paragraph 127)

36. Recommendation 47—The proximity of a source of skills and research capacity is one of the main considerations when a business decides where to locate. This is particularly the case for smaller companies. (Paragraph 134)

37. Recommendation 48—If university departments suffer particularly heavy losses in one region, there is a possibility that businesses within the region would also suffer or, worse, migrate to a region where conditions were better. In this way, universities play a pivotal role in their regional economies. (Paragraph 136)

38. Recommendation 49—There are sound economic and social arguments for ensuring that there is a strong research presence in each of England's regions. We do not agree that protecting this research presence would involve lowering standards. Quality can be preserved if every university and every region play to their individual strengths instead of concentrating all their efforts on the same goal, and the same limited pot of research money. (Paragraph 137)

39. Recommendation 52—Whilst we believe that all prospective STEM students should have the opportunity to study within their region, it would be unreasonable, and a strain on resources, to expect provision of each and every subject to be maintained in every sub-region. Sub-regional provision can be addressed through regional collaboration between universities. (Paragraph 143)

We do not want to limit institutions to one particular model of collaboration, or to collaboration only with other HE providers: FE, employers and others can all form partnerships helpful to research. Neither do we want to limit collaboration to regional boundaries. Universities operate on a national and international scale as well as on a regional and local one. We would expect that in circumstances where departmental closures cause problems for local employers that other institutions in the neighbouring regions as well as other institutions within the region would be able to step in.

RCUK reports that the Research Councils would emphasise the principle of funding research on the basis of excellence, irrespective of geographical location: they do not wish to go down the route of regional quotas/allocations of funding. The Research Councils observe that whilst the "hub and spokes" model would appear to be a sensible approach to provision in regions, it is important also to consider the specific needs of individual subject areas. In subjects such as specialist language-based area studies, there are very few departments across the UK and a very small number of centres of excellence. In order to maintain the UK's research standing in these areas, the Research Councils suggest it may be appropriate to invest in existing centres of excellence, and thereby ensure national provision, rather than to spread investment across a large number of centres.

HEFCE believes that it cannot, and should not, attempt to prescribe where subjects should be provided, or to interfere in proper institutional decisions about their strategic direction. The

advice HEFCE has provided to Ministers on strategic subjects recognised the importance of accessibility, but nevertheless did not see a need to have departments in all subjects in all regions. HEFCE does not feel, either, that there is a need for specific regional planning of research provision. It believes that action to support a strong research base across the disciplinary range is best planned and executed at national level; and that, in fact, research provision of high quality across the range, together with a broad portfolio of other activities, is at present to be found in all regions. In that light, HEFCE endorses the Committee's view that institutions should play to their established strengths in all activities. Whilst keeping under review which of its programmes should properly reflect regional priorities, HEFCE sees no justification for establishing explicit regional structures to plan research provision; these would carry a high risk of costly duplication of activities in a few fields of perceived current policy interest.

The Committee recommended that HEFCE establish a "Regional Affairs Committee" to coordinate implementation of the "hub and spokes model". We have already made clear that we do not intend to impose this model.

HEFCE notes, however, that it is already working closely with Regional Development Agencies (RDAs) in all of the nine English regions, and has established Regional Advisory Groups, which include the RDAs, Government Offices and other funding bodies such as the LSC. These meet regularly to discuss policy initiatives with HEFCE, and often to offer advice about funding allocations where there is an appropriate regional focus: for example, they have recently met to help in defining regional priorities for the allocation of additional funded numbers.

Institutions in the regions—both HE and FE—also already collaborate on the regional and sub-regional provision of higher education within regions through fora such as Lifelong Learning Networks.

VARIABLE FEES

40. Recommendation 50—If STEM departments continue to close, there is a real danger that some STEM students will be unable to study their chosen subject in their home region, should they choose to do so. (Paragraph 140)

41. Recommendation 51—It is too early to assess what impact the impending introduction of variable tuition fees will have on departmental closures as universities position themselves in preparation for the new system. We agree, however, with the reply given to the Committee by the Director General of the Research Councils, that the impact of variable tuition fees on STEM departments should be kept under constant review, and that emerging evidence should be published as part of the Government's ongoing reviews to make clear what the impact of the scheme has been. It is also logical to assume that, given increasing levels of student debt, an increasing proportion of the student population will be unable to live away from home. It is therefore extremely important that provision for core STEM subjects is maintained in every region. (Paragraph 142)

As outlined elsewhere in this response, our introduction of variable tuition fees aims to increase the flexibility for universities to manage their finances. Payment of fees is deferred,

and, as we have noted, a number of bursaries are available – some of which are targeted at STEM subjects. Demand from employers for STEM skills should mean that students see that the costs incurred in studying these subjects are outweighed by the benefits. We are committed to keeping the impact of variable fees under review, and will consider the effect on STEM subjects as part of our wider consideration of factors influencing student demand.

The Research Councils are also interested in reviewing the impact of student debt on progression to postgraduate study, and recognise that they may need to improve and emphasise the selling points of postgraduate study (transferable skills, increased employability, perhaps through more CASE awards), and, potentially, consider developing incentives.

The Committee suggests that financial considerations will lead more students to study locally. Students' decisions to study locally may involve factors other than cost, of course: some may have dependents to consider; others may fear losing established networks of friends. We will use research available on factors influencing young people, and our review of the initiatives in place to promote STEM subjects and reach particular groups to ensure we recognise the factors at work.

HEFCE has considered the potential effect of financial considerations as part of its examination of strategic subjects, and advises that student and graduate mobility should not be underestimated, and that new opportunities from distance learning and short intensive courses are increasingly being offered.

STIMULATING STUDENT DEMAND

42. Recommendation 16—There are currently more places on undergraduate chemistry courses at a national level than there are students to fill them. Whilst it might be desirable to increase the number of places available in the long term, in the immediate term such a measure will not necessarily increase the number of chemistry undergraduates. In order to achieve the latter aim it is essential to stimulate student demand for chemistry courses. (Paragraph 44)

43. Recommendation 18—Student demand is a powerful player in the higher education sector under the current funding regime. If the Government is to secure good provision of STEM subjects for future cohorts of students it must ensure that demand is further stimulated. (Paragraph 49)

Like the Committee we believe that strategic science provision depends in the long-term on stimulating demand for science courses. We have set out elsewhere in this response what we are doing to enhance the appeal of HE science courses and careers. A key element in stimulating demand is communicating the “natural assets” of science study, in terms of both interest and employment prospects, to young people at the stage when they are making decisions about what sort of career to pursue. This is not to say that people may not move or return to science careers later in life—we are particularly active in encouraging women returners. But if we do not convince young people to choose science, it is unlikely that we will succeed with others.

Understanding students’ needs and interests is key to persuading them that science is for them, and as part of this we are working to recognise the different influences that may be at work on particular sub-groups of students.

SCHOOLS

44. Recommendation 12—Instead of arbitrarily increasing by a round number the amount of money given to trainee and new teachers as a financial incentive, the Government should gather evidence on the level of incentive that is required to achieve the necessary increase in school science teachers. (Paragraph 34)

45. Recommendation 13—The Government is to be commended for taking action to increase the number of school science teachers. There are signs that its incentives are having some positive effect on overall teacher recruitment levels, despite continuing problems in some subjects. However, difficulties in retaining newly-qualified teachers suggest that financial incentives are not a long term solution to teacher shortages. (Paragraph 35)

46. Recommendation 22—The poor quality of science education in secondary schools plays a significant role in the lack of student demand for university STEM courses. (Paragraph 63)

47. Recommendation 23—It is a pity that the Government has missed its first major opportunity, offered by the Tomlinson Report, to reinvigorate the school science curriculum. (Paragraph 65)

48. Recommendation 24—The only way of securing high levels of future student demand for STEM subjects is by enthusing them about those subjects from an early age. Until school science teaching improves, the Government must expect that school leavers will continue to view mainstream STEM subjects as too difficult, irrelevant or simply too boring. The Government needs to apply itself to resolving these issues. It should not be deterred by the possibility that its efforts in this area will not bear fruit for several years. If it does not invest in school science education for the long term, the difficulties experienced by university STEM departments in recruiting students, and thus staying open, can only continue to get worse. (Paragraph 66)

We agree with the Committee that creating demand for HE science means first stimulating young people's interest at school. Schools inform and inspire: they equip and encourage students to pursue higher level study. Good-quality specialist subject teaching is essential to achieving this. The Government therefore agrees with the Committee that there is a need for recruitment incentives for prospective school teachers to be based on an objective analysis of labour market conditions.

The achievements of the Government's policies to date are substantial. Following the introduction of training bursaries and Golden Hellos, between 2000/01 and 2004/05, the numbers of new recruits to conventional teacher training courses in all STEM subjects rose substantially: by 17% in science; 39% in technology; and 57% in maths. In the same period, numbers of recruits to employment-based training in the same subjects more than doubled. In the current academic year, total numbers of new entrants to teacher training reached a 30-year high, while numbers of graduate entrants reached their highest level ever.

The position on the retention of newly-qualified teachers is also not as gloomy as is sometimes claimed. About three-quarters of those who complete initial teacher training in England each summer take up a teaching post in a maintained school in England by the following March. Others find their first posts in other parts of the UK, or start their teaching careers later. Many teachers will take a break in service at some stage during their careers—for example, to have a family—but about three-quarters of those who enter teaching are still in the profession 10 years later.

The Science Learning Centres network provides a facility for science teachers to undertake high quality continuous professional development, not only improving their subject knowledge, but also refreshing their enthusiasm and passion to reinvigorate the classroom.

These facts are not, however, grounds for complacency. On 20 December 2004, the Secretary of State invited the Teacher Training Agency to review the structure and value of the financial incentives that it administers with a view to ensuring that they remained appropriate to likely future teacher recruitment needs in the new higher education climate. On 9 June 2005, the Agency published the results of its review, taking into account research on the factors which influence graduates to apply for teacher training and which influence those who eventually gain Qualified Teacher Status to take up posts in the maintained schools sector. The review report is available online at www.tta.gov.uk/incentivesreview. The Secretary of State has accepted in full the Agency's recommendations, which include increasing the training bursary for mathematics, science and technology to £9,000 from September 2006.

The Committee is concerned that schools are not only failing sufficiently to inspire students, but are also not providing the quantity and quality of science teaching that will equip students for higher level study. We do not agree. Science is a compulsory subject in the National Curriculum. The 14–19 White Paper states our expectation that at least 80% of students will study science leading to two GCSEs, and sets out a framework that creates a number of varied pathways into STEM occupations such as the new specialised diplomas.

The curriculum review at KS3, and the new programme of study at KS4 will lead to changes that will develop skill sets allowing students to continue studying sciences post-16. These changes focus on making science more applicable, practical and enjoyable for young people so that they can participate fully in the modern world. They will help young people do better in science, and encourage studying it post-16.

We have also developed Young Apprenticeships, giving young people an opportunity to combine practical application of skills in a vocational context with pursuing qualifications relating to particular sectors. The first group of 1,000 Young Apprenticeships started in September 2004, and include apprenticeships in Engineering.

Research Councils report that they are also working with a wide range of partner organisations to encourage teaching of science in ways that are relevant and interesting to all children, regardless of gender or ethnicity. They note that science subjects are a gateway to many different careers, not just those in science, and it is important to encourage curiosity and engagement of school pupils throughout their education, demonstrating that current scientific understanding is a dynamic and evolving field.

CAREERS ADVICE

49. Recommendation 25—The Government should consider measures to promote scientific careers to people of all ages, for example, by using advertising campaigns such as those used to improve the image of teachers, policemen and recruits for the armed services. (Paragraph 68)

50. Recommendation 26—Degrees in STEM subjects generally have good career prospects, particularly given current skills shortages in many areas. The Government should ensure that all schools are in a position to offer impartial careers advice to schoolchildren well before the time that they choose their A-level, and subsequently degree, subjects. The advice should be proactive rather than reactive, and should seek to make children aware of the full range of exciting possibilities offered by scientific careers. A realistic indication of job and salary prospects should also be given. (Paragraph 71)

Of course, inspirational teachers are to be found in subjects other than science, and families, peer pressure, television and other influences also inform young people's choices. The Committee recommended that we consider an advertising campaign for scientists similar to those we have used in teaching. It might be difficult to focus and gauge the success of any such campaign, given the range of jobs and organisations in which scientists can be employed, and the overall position on the recruitment of scientists is reasonably encouraging. We will, however, be looking at what is the best way to increase the number of undergraduates in engineering and technology.

We are also encouraged by the increasing media interest in popularising science—for example projects such as Channel Four's Famelab. Groups such as the Public Awareness of Science and Engineering Group (PAWS)—which provides advice to TV drama writers on presenting science, and sponsors the Women in Science and Engineering in TV Drama awards—also help to connect scientists via the media to the public.

We are responsible for more formal careers guidance, and we have recently extended to years seven and eight the statutory duty on schools to provide a planned careers education programme. We undertook a review of Careers Education and Guidance last year to ensure we have the right systems in place to help young people in the increasingly complex choices they face. The findings were published on 18 July 2005 alongside our Youth Green Paper.

We have also developed the very successful Connexions support service for young people aged 13–19. Connexions has a budget of £475 million in 2005/06 (almost double the pre-Connexions careers service budget of £240m in 2000/01), and at the end of April 2005, was making around 343,000 interventions with young people—a rise of 76,000 on the same point last year.

The Research Councils tell us that they believe work in the area of careers advice could do much to stimulate demand for STEM subjects. They are looking at their own careers advice, taking advice from organisations that represent women and black and minority ethnic (BME) groups to seek to eliminate any stereotyping. They are also working, through the Career Paths Working Group of the Research Careers Committee (chaired by Julia Goodfellow on behalf of RCUK) to produce maps of the various paths possible for those undertaking a research career, whether in industry, academia or elsewhere. Initially the focus will be on the opportunities for postgraduates, but in the longer term it is anticipated that it will target a wider audience. The Wellcome Trust is leading on this work in collaboration with the Research Councils and the Royal Society.

STEM INITIATIVES

51. Recommendation 21—Given the importance of the degree choices made by students to the health of the economy, it is essential that the Government takes a keen interest in the impact of its initiatives designed to attract students into science, and applies itself wholeheartedly to finding solutions to the problem of declining demand for STEM subjects. (Paragraph 61)

As the HE Minister said in his evidence to the Committee, there are a large number of initiatives specifically aimed at stimulating interest in STEM careers.

Some examples are:

HEFCE is currently working with the Royal Society of Chemistry, who, together with Aimhigher, the University of Leicester, eleven other HEIs, three multinational pharmaceutical companies and two SSCs have launched Chemistry, the next generation. This programme aims to develop materials and activities to raise the aspirations of potential students to take up courses in chemical sciences, and to provide subject-specific support and materials for Aimhigher partnerships.

In another example part-funded by HEFCE, an Aimhigher partnership between the University of Teesside, SETNET (Science, Engineering, Technology and Mathematics network) and the British Association for the Advancement of Science aims to raise aspirations into science and engineering through activities such as summer schools, discovery days and awards events focused on science and engineering. HEFCE has been encouraged by the positive responses from the Royal Academy for Engineering, the Institute of Physics and the Institute of Mathematics in pursuing similar opportunities.

Research Councils support the Researchers in Residence scheme which allows school pupils to spend time with active researchers, thus improving understanding of scientific careers and also encouraging interest. Since 1995 more than 3,500 researchers have worked with over 1,000 schools, and 400,000 pupils. These people bring their passion for science and research into the classroom in a way that children can connect with, in addition to providing a better idea of the breadth and scale of contemporary science.

The Department for Education and Skills is currently mapping STEM initiatives to identify the most effective. As part of this, we are improving our understanding of motivations for student choices.

BURSARIES

52. Recommendation 27—We recommend that the Government introduces a national bursary scheme, based on the scheme currently being run by the Institute of Physics, for outstanding university applicants in shortage STEM subjects. Such a scheme would give a much needed boost to levels of student demand in the short term. However, bursaries are not a cure-all, and the Government will need to introduce further measures to sustain increases in demand in the long term. (Paragraph 75)

The Committee has recommended that Government introduces a national bursary scheme for outstanding university applicants in shortage STEM subjects, based on the current Institute of Physics scheme. As we have already said, Government bursaries have shown some success in encouraging applications for teacher training. At the present time, however, we are not attracted to a wider bursary scheme for science students. The link between science study and science careers is not as direct as that between teacher training and teaching, and the skills of STEM students are valuable to others as well as the public sector. We are therefore minded to ask potential employers of STEM students to play more of a part in making incentives available.

We do regard the Institute of Physics scheme and schemes developed by institutions themselves (for example, the universities of Reading and Lancaster) as positive developments, and encourage others to consider such support. It is also open to institutions to vary fees for shortage subjects.

Reports from the Science and Technology Committee in the 2001-05 Parliament

Session 2004-05

First Report	The Work of the Economic and Social Research Council (Reply 401)	HC 13
Second Report	Annual Report 2004	HC 199
Third Report	Office of Science and Technology: Scrutiny Report 2004 (Reply HC 453)	HC 8
Fourth Report	The Medical Research Council's Review of the Future of the National Institute for Medical Research (Reply HC 454)	HC 6
Fifth Report	Human Reproductive Technologies and the Law	HC 7
Sixth Report	The Work of Research Councils UK (Reply Cm 6498)	HC 219
Seventh Report	Forensic Science on Trial (Reply HC 427, 2005-06)	HC 96
Eighth Special Report	Inquiry into Human Reproductive Technologies and the Law	HC 491
Eighth Report	Strategic Science Provision in English Universities	HC 220

Session 2003-04

First Report	Annual Report 2003	HC 169
Second Report	Chief Executive of the Medical Research Council: Introductory Hearing (Reply HC 629)	HC 55
Third Report	The Work of the Biotechnology and Biological Sciences Research Council (Reply HC 526)	HC 6
Fourth Report	Office of Science and Technology: Scrutiny Report 2003 (Reply HC 588)	HC 316
Fifth Report	Too Little too late? Government Investment in Nanotechnology (Reply HC 650)	HC 56
Sixth Report	Within REACH: the EU's new chemicals strategy (Reply HC 895)	HC 172
Seventh Report	Director General for Higher Education: Introductory Hearing (Reply HC 1015)	HC 461
Eighth Report	The Work of the Council for the Central Laboratory of the Research Councils (Reply HC 1199)	HC 462
Ninth Report	Director General of the Research Councils: Introductory Hearing (Reply HC 1059)	HC 577
Tenth Report	Scientific Publications: Free for all? (Reply HC 1200, 2003-04)	HC 399
Eleventh Report	Research Assessment Exercise: a re-assessment (Reply HC 34, 2004-05)	HC 586
Twelfth Report	Government support for Beagle 2 (Reply HC 301, 2004-05)	HC 711
Thirteenth Report	The Use of Science in UK International Development Policy (Reply HC 235, 2004-05)	HC 133
Fourteenth Report	Responses to the Committee's Tenth Report, Session 2003-04, Scientific Publications: Free for all? (Reply HC 249, 2004-05)	HC 1200

Session 2002-03

First Report	The Work of the Particle Physics and Astronomy Research Council (<i>Reply HC 507</i>)	HC 161
Second Report	Annual Report 2002	HC 260
Third Report	The Work of the Medical Research Council (<i>Reply Cm 5834</i>)	HC 132
Fourth Report	Towards a Non-Carbon Fuel Economy: Research, Development and Demonstration (<i>Reply HC 745</i>)	HC 55
Fifth Report	The Work of the Natural Environment Research Council (<i>Reply HC 1161</i>)	HC 674
Sixth Report	UK Science and Europe: Value for Money? (<i>Reply HC 1162</i>)	HC 386
Seventh Report	Light Pollution and Astronomy (<i>Reply HC 127, 2003-04</i>)	HC 747
Eighth Report	The Scientific Response to Terrorism (<i>Reply Cm 6108</i>)	HC 415
Ninth Report	The Work of the Engineering and Physical Sciences Research Council. (<i>Reply HC 169, 2003-04</i>)	HC 936

Session 2001-02

First Report	Cancer Research – A Follow-Up (<i>Reply Cm 5532</i>)	HC 444
Second Report	The Research Assessment Exercise (<i>Reply HC 995</i>)	HC 507
Third Report	Science Education from 14 to 19 (<i>Reply HC 1204</i>)	HC 508
Fourth Report	Developments in Human Genetics and Embryology (<i>Reply Cm 5693</i>)	HC 791
Fifth Report	Government Funding of the Scientific Learned Societies (<i>Reply HC 53</i>)	HC 774
Sixth Report	National Endowment for Science, Technology and the Arts: A Follow-Up (<i>Reply HC 276</i>)	HC 1064
Seventh Report	The Office of Science and Technology: Scrutiny Report 2002 (<i>Reply HC 293</i>)	HC 860
Eighth Report	Short-Term Research Contracts in Science and Engineering (<i>Reply HC 442</i>)	HC 1046

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