Gordon House, 29 Gordon Square
London, WC1H 0PP
T: 020 7679 4994
E: info@sciencecampaign.org.uk
W: www.sciencecampaign.org.uk

CaSE
Campaign for Science and Engineering

Letter to Michael Gove and Education Briefing

14th February 2011

This is a copy of a letter which was sent to Michael Gove MP, Secretary of State for Education, on 10 February 2011. It outlines CaSE's concerns over the latest White Paper on Education.

Rt. Hon. Michael Gove MP
Secretary of State
Department for Education
Great Smith St
London
SW1P 3BT

Dear Secretary of State

Congratulations on your department's White Paper – 'The Importance of Teaching'. We share the Government's very apparent concern that the education of children in the UK could and should be improved.

However, we are also very concerned that some aspects of the Government's plans may prove detrimental to provision of science and maths education, and we would like to discuss these with you.

We believe, first, that every child should have the right to the best possible grounding in science, technology, engineering, and mathematics. This is not only essential for successfully navigating the modern world, but these subjects are also an integral part of Britain's culture and history, and therefore our collective heritage.

Second, we worry that the UK may only get less and less competitive in low-skills sectors in the coming years and decades. A highly-skilled workforce is essential for the future prosperity of our nation and competitiveness of our economy.

Schools must therefore teach the concepts and details of science and maths. However, they must also inspire more of the next generation to realise that these subjects provide the basis for stimulating and highly important further study and careers, often leading onto more specialised science and engineering subjects.

On that basis, please find comments, questions, and suggestions to the White Paper, attached. Given the importance of the Education Bill, CaSE would welcome the opportunity to discuss these thoughts with you or your colleagues at your earliest convenience.

Yours sincerely,

Imran Khan
Director
Campaign for Science and Engineering

This letter is supported by the following individuals, in a personal capacity:

Prof Sir George Alberti PRCP
Dr Simon Campbell FRS FRSC
Ian Gibson
Prof Hugh Griffiths FREng
Prof Dame Julia Higgins FRS
Prof Sir Hans Kornberg FRS
Prof Sir Harry Kroto KCB FRS
Prof Lord Robert May OM AC FRS
Dame Bridget Ogilvie AC FRS
Prof Martyn Poliakoff FRS
Prof Lord Martin Rees OM FRS
Dr Simon Singh MBE
Sir David Smith FRS FRSE
Ian Taylor MBE
Dr Ivan Yates CBE FREng

CC: Nick Gibb MP, Minister for Schools
John Hayes MP, Minister for Further Education, Skills, and Lifelong Learning
Rt. Hon. David Willetts MP, Minister for Universities and Science

Teaching - Qualifications

1. The White Paper says the Government will:

"2.6 *Continue to raise the quality of new entrants to the teaching profession, by: ceasing to provide Department for Education funding for initial teacher training for those graduates who do not have at least a 2:2 degree; expanding Teach First; offering financial incentives to attract more of the very best graduates in shortage subjects into teaching; and enabling more talented career changers to become teachers."*

2. We are confused by the Government's claim that it will raise the quality of entrants into teaching by offering financial incentives, when the only action on financial incentives so far has been to reduce them by ending the 'golden hello' scheme. **Can the Government clarify its position on financial incentives?**

3. We have further concerns over the restriction of funding for teacher training to candidates with a 2:2 degree or above. We appreciate the logic of the argument that this restriction may improve standards, and therefore esteem, and hopefully attract more high-performing applicants to the profession. However, we have yet to see sufficient evidence that this theory will work in practice in the UK.

4. Shortage subjects tend to have a higher proportion of teaching students with lower-quality degrees. For instance, in 2009, 9.7% of all teacher trainees (1744 out of 18,030) had not gained at least a second class degree. However, the comparable figure is 26% for Physics, 21% for Maths, and 17% for Chemistry.

5. Any worsening shortage in these subjects is a cause for considerable concern. For instance, the Institute of Physics recently described the shortage in that subject as being "like a bath with the plug out and the taps only half on", with 4000 extra physics teachers needed. The result is that many teachers teach subjects in which they do not have a relevant qualification. Our worry is that, while the aims of the change are laudable, the short-term effect may be to exacerbate an existing teacher shortage.

6. To illustrate the potential problem, consider physics teaching. The impact of the reforms may be to replace teachers who have gained a third class degree in physics with teachers who have gained a second class degree in, say, biology. There are currently no data to show which of these two varieties of graduates make better physics teachers. We urge caution in proceeding without the benefit of such analysis.

7. The White Paper also says:

"2.11 Third, we know that highly effective models of teacher training (including those of Finland, Singapore, Teach First and Teach for America) systematically use assessments of aptitude, personality and resilience as part of the candidate selection process. We are trialling such assessments and, subject to evaluation, plan to make them part of the selection process for teacher training."

8. If this aptitude testing is proven to reliably predict teaching quality in the UK, then we would soon have good information on the extent to which degree class correlates with teaching abilities. It may be more reasonable to base funding on a combination of degree class and aptitude test results. However, it may also be found that different types of personalities are systematically drawn into different subjects. In this case, funding decisions should be made on a subject-by-subject basis.

9. Given the importance of alleviating the teaching shortages in particular subjects, and the fact that these changes could either improve or worsen that shortage, **we recommend that the full-scale adoption of the proposals is delayed until the results of the new aptitude tests and further analyses are available.**

10. If such a delay is not possible**, we recommend that the policy is implemented as a pilot scheme for subjects not suffering teaching shortages.** This would show whether raising the academic bar for entry does increase the number of applicants, without endangering the teaching of shortage subjects.

11. **We also recommend that subject-specific recruitment targets exist for all the subjects in which there are shortages.** If a target is set across the sciences, and the bar for application is raised, there is a real risk that the increase in higher-performing applicants might occur in biology to the continuing detriment of physics and chemistry. We welcome the Secretary of State's recent announcement confirming that subject-specific allocations for physics, chemistry, and biology are to be brought in, and hope this can be built on.

12. We would further highlight the shortage of specialist computing teachers. According to the BCS, out of 28,000 newly qualified teachers in 2010 only three possessed a computing degree. At a time when we must improve ICT provision in schools, we ask the Government to consider ways in which more computing graduates can be brought into the teaching profession.

Teaching - free schools and academies

13. The Government's desire to improve teacher quality and quantity for shortage subjects is welcome. However, we would appreciate clarification on how this will co-exist with the Government's agenda for free schools and academies.

14. **Would you be able to clarify (a) what requirements and standards there will be for teachers in free schools and academies, and (b) how these might differ from teachers in other schools?**

15. We believe that all pupils should have access to a good grounding in science and maths at school, and would be concerned if the relevant teachers at free schools or academies were held to a lower standard than those at traditional local authority schools.

Teaching - incentivising applicants

16. The White Paper says:

"2. 16 We wish to provide stronger incentives for the best graduates to come into teaching, especially in shortage subjects. We think that there is scope to provide stronger incentives at the point at which students would start postgraduate initial teacher training, including exploring how we might pay off the student loans of high-performing graduates in shortage subjects who wish to enter teaching. Incentives could be tailored to offer more to graduates with good degrees and to those who would teach shortage subjects."

17. As discussed, encouraging more graduates to teach in shortage subjects is an incredibly important area and we are supportive of the Government's aims. **We are keen to hear how these proposals are developing.**

18. **In particular, we wonder what the impact of higher tuition fee debt will have on our ability to incentivise teaching careers, given that the student loan repayment will now alleviate a much smaller part of the overall graduate debt. What assessment has the Government made with respect to this change?**

19. One alternative option that has been mooted is raising the repayment threshold for those teaching shortage subjects. It will also be necessary to compensate students who have worked through university rather than taken on debt. The tendency to take out loans is influenced by a range of factors, including socio-economic and ethnic background.

20. The White Paper says:

"2.31 We want to see schools making more use of existing pay flexibilities. We also wish to extend these flexibilities, so that schools can attract good graduates into the profession and reward high performance. So early in 2011 we will ask the School Teachers' Review Body (STRB) to make recommendations on introducing greater freedoms and flexibilities that will make the pay and conditions framework less rigid. We will consult on their recommendations, so that new and more flexible pay arrangements can be introduced at the end of the current pay freeze."

21. As you note, the current pay flexibilities for teachers are often not used. We welcome consideration of further flexibilities to enhance recruitment in shortage subjects, and particularly to enable teachers to be targeted to the schools where they are most needed. **We would further recommend, however, that the STRB must consider why existing pay flexibilities are not used and make consequent recommendations, rather than simply extend the flexibilities.**

22. We are particularly concerned by the recent announcement that the 'golden hello' scheme, which saw science and maths teachers receiving a one-off payment of £5,000, is to be ended. The Secretary of State wrote to the TDA explaining that this was being done on a "value for money" basis. **We ask that the Government publish its value-for-money analysis for 'golden hellos', so that the impact of this decision on subjects with teacher shortages can be estimated.**

Teaching - continuing professional development

23. We agree with the Government that teachers must be given "*the opportunity to deepen their subject knowledge and renew the passion which brought them into the classroom*" (para 2.28). We are therefore pleased to see the Government's commitment to continuing professional development (CPD).

24. However, we note that the White Paper argues for the introduction of a competitive national scholarship scheme. Our assumption is that it will only be those teachers who are already the most passionate and enthusiastic who will apply and qualify for this scheme. While the very best teachers should be encouraged to set high standards, all teachers must receive appropriate professional development opportunities.

25. **We strongly recommend that, alongside any competitive scholarship, the Government investigates how to improve take-up of CPD by all teachers, not only the best and most motivated ones.**

26. We believe that there are a range of highly effective teaching CPD and enrichment opportunities already available to teachers across the spectrum of STEM disciplines. The challenge is to increase take-up of these opportunities. **The Government should continue to place a special degree of priority status on investing in measures that deepen and broaden the knowledge and skill-sets of the existing teaching workforce across the sciences, engineering, and mathematics**.

27. It is also important that in a climate of tightened public spending, the Government gives the school sector strong market signals that the training and professional development of teachers should not be interpreted as an optional extra, but rather a core element of every school's improvement agenda.

28. We note that the Government has also placed a strong degree of priority on improving the rigor of the mathematical content in GCSE and A Level science subjects and other key STEM qualifications at pre- and post-16 level. In accordance with this, there need to be strategic hubs of expertise for the teaching of mathematics both as a distinct subject discipline but also as part of other STEM pathways, such as the Engineering Diploma available across all English sub-regions.

Teaching - training and recruitment

29. The White Paper says that;

"2.21 We will provide more opportunities for a larger proportion of trainees to learn on the job by improving and expanding the best of the current school-based routes into teaching – school-centred initial teaching training and the graduate teacher programme. A central application system will make it easier for potential trainees to find a suitable place."

and that;

"2.24 We intend to bring together the Training School and Teaching School models, to create a national network of Teaching Schools. These will be outstanding schools, which will take a leading responsibility for providing and quality assuring initial teacher training in their area. We will also fund them to offer professional development for teachers and leaders. Other schools will choose whether or not to take advantage of these programmes, so Teaching Schools will primarily be accountable to their peers. We intend there to be a national network of such schools and our priority is that they should be of the highest quality – truly amongst the best schools in the country."

30. We are keen to see how the Government's proposals on school-centred training develop. **What is the Government's estimate of the number of schools (a) required to form this national network, and (b) currently of the required standard to become training schools?**

31. We are concerned that training teachers only in outstanding schools may leave newly qualified teachers unprepared for the reality of teaching in less optimal school environments. A further concern is that the school-centred reservoir of skills across the existing workforce in areas such as practical science and fieldwork are insufficient to support the enhanced levels of training needed in experimental and practical work. **What plans does the Government have to ensure that teachers are exposed to the full range of types of approaches to learning and teaching, including experimental work in laboratories and in the field, during their training?**

32. We note the Government's plan for a centralised applications process for potential trainees. **Has the Government considered what scope there is for using a centralised applications system in order to prioritise the recruitment of teachers into shortage subjects, particularly physics, maths, and chemistry?**

Curriculum

33. We are concerned at the relative lack of attention given to practical subjects such as ICT, engineering, design and technology in the White Paper. Universities and employers both report that

school-leavers often lack important practical skills, and there is a well-established concern over the sometimes negative perception of engineering as a subject and career.

34. Due to the nature of these subjects, including space and equipment requirements, they often have a high cost-per-pupil. There is therefore a real risk that such subjects may, despite their importance, be first in line for cutbacks within schools. **What measures can the Government take to ensure that the teaching of practical skills – specifically engineering, design, and technology – is both protected and promoted within schools? Particularly given its universal importance, what scope is there for the mandatory inclusion of ICT in the English Baccalaureate?**

35. There has been some confusion in the media over the new English Baccalaureate. It has been commonly described as 'five subjects. However, our understanding is that students do need six GCSE grades to qualify, as either double-award science or two science GCSEs are required. **Can the importance of science be clarified?**

36. The new focus on the English Baccalaureate may cause schools to move away from high quality vocational or practical qualifications. We support the plans for a "Tech Bacc", to suit the curriculum needs of schools such as UTCs, to sit alongside the English Baccalaureate. **Can the Government clarify its plans for vocational qualifications?**

37. We believe that the Engineering Diploma lines for 14-19 year olds have done much to address the longstanding weakness of the education system in England in preparing young people for careers in engineering. However, the current climate of uncertainty about the future support the Government will provide for Diplomas may adversely affect the willingness of parents and employers to support the Engineering Diploma pathway.

38. **What are the Government's plans for the Engineering Diploma? If the Government believes that the Engineering Diploma is adding to the quality of technical and applied education available to young people we would recommend that this is made unambiguously clear to pupils, parents, schools, colleges and employers.**

39. We hope that new Free Schools and Academies succeed in improving educational attainment for their pupils. However, given that such schools will be exempt from following the National Curriculum, we want to ensure that minimum standards of science and maths education in such schools are maintained.

40. **What consideration has the Government given to ensuring standards in Academies and Free Schools? We would welcome the opportunity to discuss appropriate automatic triggers for Ofsted to inspect a school or request an explanation for the change that has occurred.** This is especially important given the reduced level of Ofsted inspections planned.

41. **The Government has made clear that it has bound Free Schools and Academies, by law, to teach 'a broad and balanced curriculum'. What is the Government's definition of that term?**

42. **We welcome the Government's commitment to universal post-16 education. What consideration has it given to making maths teaching a core part of such provision?**

Modules and re-sits

43. The White Paper says:

"4.48 The current GCSE and A level system allows for re-sits of modules, which can be seen as undermining the qualifications and educationally inappropriate. In 2008, QCDA collected information from a sample of A levels and found that between two thirds and three quarters of students re-sat at least one unit. It is our view that this is a cause for concern. We will ask Ofqual to change the rules on re-sits to prevent students from re-sitting large numbers of units. We will consider with Ofqual in the light of evaluation evidence whether this and other recent changes are sufficient to address concerns with A levels."

44. We agree with the Government that repeated re-sits of exams can potentially devalue qualifications and that this issue deserves proper evidence-based evaluation by Ofqual. **We look forward to the publication of such analysis in due course.**

45. The White Paper says:

"4.49 We believe that it was a mistake to allow GCSEs to be fully modularised, because GCSEs are too small as qualifications to be taken sensibly in small chunks across two years. We also believe that it is creating too much examination entry in secondary schools – with many schools entering pupils for units in years 9 and 10 as well as years 11, 12 and 13. We will therefore ask Ofqual to consider how best to reform GCSEs so that exams are typically taken only at the end of the course."

46. We agree with the Government that excessive modularisation may be a cause for concern. However, there are also potential benefits associated with modules as opposed to having one set of exams, particularly in allowing certain types of pupils to reach their full potential. For example, end-of-course exams may diminish the value of extended and innovative practical work which is difficult to replicate under examination conditions. **We would urge the Government to modify its request to Ofqual to consider how best to reform GCSEs to serve pupil need, without specifying the end-point of that reform.**

Further Education

47. We are concerned that increased financial pressures on Further Education will discourage FE colleges from offering the more expensive science and engineering courses. The numbers of students on these courses tend to be smaller than in school sixth forms, making the cost-per-student higher for FE colleges. **What evaluation has the Government made on the viability of science and engineering courses in FE colleges in light of the funding changes?**

Harmonisation

48. As a general point, we note that there are a number of different reviews and reforms taking place, the collective end-result of which could be a substantial overhaul of the education system. For instance, as well as the White Paper, we must consider the Browne Review, the Initial Teacher Training review, the Wolf Review, the National Curriculum Review, and changes to A levels. **What structures**

does the Government have in place to ensure expert oversight of how these reviews and the recommendations thereof interact with each other?

Exam boards

49. The White paper states:

"*4.40 We will legislate in the forthcoming Education Bill so that Ofqual's objectives include securing international comparability of qualification standards. And we will strengthen Ofqual's governance by establishing the Chief Executive as the Chief Regulator. This will create a single figurehead within Ofqual who is able to act as the guardian of qualification and examination standards."*

50. We welcome the Government's commitment to ensuring that our qualification standards are internationally excellent. However, we are concerned that the work of Ofqual will continue to be made more difficult by the perverse incentive structure which currently exists in the qualifications market.

51. Examination boards currently compete against each other to offer examinations to schools. They are therefore incentivised to offer schools attractive packages. Schools, via league tables and other mechanisms, are incentivised to achieve the best examination results for their pupils. If one way for schools to achieve this is to choose a more attractive examination package, then they may well do so. Over time this may lead to degradation in standards.

52. Ofqual's work could be made more efficient by removing this perverse incentive structure, while maintaining healthy competition among exam boards**. What consideration has the Government given to reforming exam board regulations?** One suggestion, for instance, is for Ofqual to award different exam boards multi-year contracts to set the exams in specific subjects. This would mean that all pupils in a given year group sit the same exam for a certain subject, improving comparability of qualifications, whilst ensuring that exam boards are kept efficient through competing against each other for contracts.

53. We further note that the current examination structure is loaded against ensuring the provision of high quality practical work, for reasons which include cost, the need for specialist facilities and support and inflexible approaches to assessment. The cheapest and least demanding solution is often adopted and this can exclude opportunities for practising and learning higher-order experimental skills which are currently lacking in STEM teaching.

Careers Advice

54. Although not mentioned in the White Paper, we welcome the Government's plans for an All Age Careers Service. We believe that one of the main reasons for lack of progression from school to science and engineering courses at university is poor careers advice. Inevitably this afflicts pupils from non-traditional backgrounds in poorer schools the most. Furthermore, the continuing characterisation of engineering as "not a woman's career" by many teachers not suitably trained in careers advice is often cited as one of the reasons that only one in ten graduate engineers are female.

55. We therefore support the AACS in principle, but are concerned the system may be inadequately funded. **Can the Government clarify whether funds will be (a) channelled directly into the AACS, (b) through schools who will pay for its services, or (c) a mixture?**

56. **If the proposed funding model for the AACS is (b) or (c), above, then are schools provided with additional funding to pay for careers guidance? If not, what safeguards does the Government propose to ensure that all pupils receive appropriate careers guidance, and how will schools be evaluated?**

57. **In announcing the Careers Service, the Department for Business, Innovation and Skills said that "*Schools will be under a legal duty to secure independent, impartial careers guidance for their students*". We would welcome clarity from the Department for Education on (a) the specifics of that legal duty, and (b) how that duty will be evaluated.**

58. **We would further welcome clarity on whether and how the legal requirement on schools to offer independent careers guidance extends to Free Schools and Academies.**

59. The White Paper says:

"6.18 Ofsted will consult on a new framework with a clear focus on just four things – pupil achievement, the quality of teaching, leadership and management, and the behaviour and safety of pupils."

60. The four aspects of pupil experience highlighted are important, but do not give Ofsted a remit to judge how well schools prepare pupils for later life, and particularly with regard to progression to careers or further/higher education. **We suggest that a school's performance in careers advice should be an explicit part of Ofsted inspections, as it is one of the most important elements of how schools serve pupils and parents alike.**

Specialist schools

61. Specialist schools are not covered in the White Paper but have been recently revised with possibly significant repercussions. The National Audit Office report of November 2009 noted that overall progression and performance in science A levels is better for students taking separate GCSEs in chemistry, physics and biology ('triple science').

62. The 1,300 schools and colleges that specialise in science, technology, engineering and maths were all required to offer triple science until October 2010 and accounted for many of the recent rises in provision. These schools will no longer have to offer triple science or any other specific enrichment; nor will they have direct funding or incentives to do so. It seems likely some will stop.

63. We are seriously concerned that one of the incentives for schools to offer triple science has been removed without any analysis of the likely consequences. Similarly, specialist engineering schools no longer need to offer the engineering diploma, and support for it is therefore uncertain. The term 'specialist school' could become meaningless. **What evaluation has the Government made of the role of specialist schools, and the effects of recent changes on them and take-up of science subjects by their pupils?**