House of Commons

Committee of Public Accounts

Educating the next generation of scientists

Fifteenth Report of session 2010–11

Report, together with formal minutes, oral and written evidence

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The Committee of Public Accounts

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Committee staff

The current staff of the Committee is Philip Aylett (Clerk), Lori Verwaerde (Senior Committee Assistant), Ian Blair and Michelle Garratty (Committee Assistants) and Alex Paterson (Media Officer).

Contacts

All correspondence should be addressed to the Clerk, Committee of Public Accounts, House of Commons, 7 Millbank, London SW1P 3JA. The telephone number for general enquiries is 020 7219 5708; the Committee's email address is pubaccom@parliament.uk.

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Summary

A strong supply of people with science, technology, engineering and maths skills is important for the UK to compete internationally. The starting point is a good education for children and young people in science and maths.

The Department for Education (the Department) has made impressive progress on aspects of science and maths secondary education. The numbers studying separate GCSE biology, chemistry and physics (known as 'Triple Science' when studied together) have risen by almost 150% between 2004-05 and 2009-10. There has been a rapid increase in the number of pupils taking A-level chemistry and maths, though physics has increased more slowly. Attainment has also improved as take-up has increased.

Nevertheless, there is a risk that this progress will not be maintained. Pupils' desire to continue studying science and maths depends on whether they enjoy the subjects and how well they achieve. As emphasised in the Government's White Paper *The Importance of Teaching*,[1] good teaching is key to both enjoyment and achievement. However, there are still not enough teachers with strong subject knowledge in science and maths entering the profession. In 2009-10 there were over 115,000 entries to GCSE biology, 113,000 to chemistry and 112,000 to physics. Another 40,000 pupils entered A-level chemistry, and almost 70,000 A-level maths. If the higher numbers of pupils taking science and maths are to achieve good results, they need to be taught by teachers with the specialist knowledge to teach these subjects well.

Teaching environments are also vitally important in improving take-up and achievement in science, but there is evidence that science facilities in many schools are unsatisfactory and even unsafe. Despite this, the Department does not intend to collect information on the extent of the problem, and has abandoned targets for improving the condition of these facilities.

The Department has made progress in rationalising programmes aimed at increasing numbers of young people coming through the school system with science- and maths-related skills. While there were some 120 Department-led initiatives in 2004, the Department now focuses on funding around 30 major programmes at an annual cost of around £50 million. Evidence of these programmes' effectiveness is broadly positive, although financial pressures will mean less funding for them in future. In deciding which programmes to discontinue and which to pursue, the Department should be sure it understands the impact of different programmes, building on evaluations already carried out, so that it retains a coherent set of the most effective programmes.

In some schools, advice and guidance on science- and maths-related careers is poor.

1 Department for Education, *The Importance of Teaching*, presented to Parliament by the Secretary of State for Education on 24 November 2010, Cm 7980 http://publications.education.gov.uk/eOrderingDownload/CM-7980.pdf

Knowledgeable and enthusiastic teachers can establish links with careers in the outside world, but they need the support of school leaders, as well as good-quality resources and activities, to improve pupils' awareness of the career opportunities that follow from studying science and maths.

The Department must approach the challenge of improving school science and maths through a coherent, system-wide strategy rather than as a number of initiatives operating in isolation. This strategy will need to ensure that key success factors such as GCSE Triple Science, specialist teachers, good-quality science accommodation, quality careers advice and programmes to increase take-up and achievement are made available in a concerted fashion in all areas of the country.

As more autonomy is given to schools, the Department must develop an accountability framework that gives schools strong incentives to put all key elements in place for the benefit of their pupils. While schools will have the main responsibility for tracking their own progress, we see a continuing role for the Department in collecting sufficient information to know that the strategy is working, and to identify clearly where it is not. This will generally be the same information that schools are collecting to monitor and report their performance locally, so the question of extra bureaucracy should not arise. Once underperformance is identified, the Government will need to determine how action can be taken to tackle it, so that no pupil is denied a science and maths education that matches their abilities and ambitions.[2]

On the basis of a Report by the Comptroller and Auditor General, we took evidence from the Department on increasing take-up and achievement, improving teaching staff and facilities, and developing a more coherent strategy for school science and maths.

2 C&AG's Report: *Educating the next generation of scientists*, HC 632, 2010-2011

Conclusions and Recommendations

1. **There has been good progress in take-up and achievement in science and maths by children and young people up to the age of 18, but opportunities are still denied to some.** Studying Triple Science at GCSE gives a better chance of success at A-level. While the numbers studying this option rose by almost 150% between 2004-05 and 2009-10, many pupils who could benefit from it are still missing out. Thirty per cent of schools were still not offering Triple Science in 2010, and National Audit Office analysis of 2009 data showed that it was less widely available in more deprived areas. Reflecting the White Paper's emphasis on narrowing attainment gaps between pupils from different parts of society, the Department should repeat the National Audit Office's analysis on 2010 data to establish whether pupils in disadvantaged communities still have less access to Triple Science.

2. **Good-quality teaching is essential to increasing children's interest, enjoyment and achievement, but progress in increasing the number of specialist physics and maths teachers has been slow.** It is highly unlikely that the Department will meet its targets for numbers of such teachers, and further progress could be undermined as the Department reviews financial incentives for science and maths graduates to become teachers. The Department should evaluate the various means by which it seeks to recruit such teachers, and focus its resources on those which are proving most effective.

3. **The Department needs to reconcile its policy of greater autonomy for schools with its expectation that they will employ appropriately qualified teachers.** As part of its plans for schools to publish details of their teachers' qualifications, it should develop an indicator for schools to report the proportion of their science and maths teachers with specialist knowledge relevant to the subject they teach.

4. **There is evidence that some school science laboratories are poor quality and even unsafe, but the Department has no data on the extent of the problem.** The Department does not collect data on the quality of school laboratories, as it wishes to reduce the administrative burden on schools. Safety of pupils is, however, of paramount importance. The Department should work with Ofsted and others who have looked into the problem, such as the Royal Society of Chemistry, to understand the scale of the challenge faced. It should ensure that all available relevant information is used in its current review of capital spending, so that the review includes a full assessment of the urgency of this requirement alongside other demands on the capital budget.

5. **There are plans for fewer top-down, centrally funded programmes in future, with decisions on participation and access devolved to individual schools.** Currently, the Department funds around 30 such programmes at a cost of around £50 million a year. Some of these programmes have been evaluated and found to have a positive impact on take-up and achievement of science and maths. In deciding which programmes to continue, the Department

should ensure it has properly evaluated all major programmes to identify which are most effective, and which combination of programmes provides a coherent package of support for schools. It should maintain sufficient information to target these programmes at those areas and schools which need the most help.

6. **The quality and availability of careers advice and guidance in schools is variable, and careers work is especially vulnerable to expenditure reductions because its outputs are not directly measured.** Careers advice works best when it involves knowledgeable and enthusiastic teachers who establish good links with the outside world. The Department should take account of the lessons from its Career Awareness Timeline Pilot in developing those career awareness programmes that are currently delivered nationally, and encourage schools to involve science and maths teachers in providing careers advice.

7. **The Department is planning to place greater reliance on public scrutiny of schools' performance to drive further progress in take-up and achievement, and the availability of Triple Science.** While relying on local delivery and local scrutiny, the Department must still obtain the information it needs to monitor progress nationally. It should continue to collect, analyse and publish appropriate information to track take-up and achievement in science and maths. Where pupils do not have access to a good science and maths education, the Department should clearly set out a process for intervention which requires schools to address this disadvantage to their pupils.

8. **For public scrutiny to be effective as a lever for performance, schools need to make available sufficient, relevant information to be held to account.** Users of this information, such as parents and carers, need a clear understanding of what constitutes good performance. The Department should set out the information it expects schools to publish, and provide guidance on what good performance looks like.

1 Part 1: Increasing take-up and achievement

1. A strong supply of people with science, technology, engineering and maths skills is important to promote innovation, exploit new technologies, produce world-class scientists and for the UK to compete internationally. In response to concerns about the future supply of these skills, the 2004 *Science and Innovation Investment Framework*[3] set out a strategy to improve the UK's standing as a centre of research, increase investment in research and development, and support a strong supply of scientists, engineers and technologists. A key aim of the Framework was to increase the skills of young people coming through the school system by improving the quality and quantity of science teachers, improving results for pupils studying maths and science, and increasing the numbers taking related subjects in post-16 and higher education.

2. Good progress has been made against some of these objectives. Attainment at A-level has improved, with the proportion of entrants achieving grades A-C in A-level maths, biology, chemistry and physics increasing between 2001-02 and 2009-10.[4] There has also been a rapid increase in the number of pupils taking A-level chemistry and maths, with 40,000 pupils entering A-level chemistry in 2009-10 (25% higher than in 2001-02) and almost 70,000 A-level maths (44% higher than in 2001-02). By contrast, in 2009-10 there were only 28,000 entries to A-level physics, the same number as in 2001-02.[5]

3. Although the total number of GCSE science entries has not changed significantly over the last five years, the number of children studying separate GCSE biology, chemistry and physics (known as 'Triple Science' when studied together) has risen by almost 150% between 2004-05 and 2009-10. In 2009-10 there were over 115,000 entries to GCSE biology, 113,000 to chemistry and 112,000 to physics.[6] Triple Science is particularly effective in supporting the Government's aim of increasing the supply of scientists, as pupils studying Triple Science at GCSE are more likely than those studying combined science to choose and succeed in science at A-level and degree level.[7]

4. The proportion of state secondary schools offering Triple Science has increased rapidly, from under 30% in 2003-04 to around 70% in 2009-10, according to the latest data from the Department for Education (The Department).[8] However, more remains to be done: despite the increased number of schools now offering this

3 HM Treasury, DTI and Department for Education and Skills, Science & innovation investment framework 2004-2014 (July 2004).

4 C&AG's report, para 2.10

5 C&AG's report, para 2.8 and Figure 6

6 Q 36; C&AG's report, para 2.3 and Figure 3

7 C&AG's report, para 2.5

8 Qq 1, 2, 43, 98; C&AG's report, para 2.6 and Figure 5

option, only 20% of pupils actually took GCSEs in all three sciences in 2009-10,[9] and National Audit Office analysis had shown wide variations in the availability of Triple Science across the country. Pupils from more deprived backgrounds who study Triple Science obtain the greatest benefits in terms of future A-level science and maths outcomes, yet the NAO analysis showed that this option was less widely available in areas of higher deprivation.[10]

5. Schools with a specialism in science, technology, engineering or maths and computing have higher numbers of pupils taking and passing GCSE science and A-level science and maths.[11] Like Triple Science, however, such schools are less widely available in areas of higher deprivation. The Department suggested that it was unclear whether having a related specialism helped to increase schools' take-up and achievement in science and maths, or whether schools which were already strong in such subjects chose a relevant specialism as a result. In future, the Department will no longer designate schools' specialisms centrally, or provide schools with discrete funding for specific specialisms.[12] However, the Department told us it did not anticipate schools abandoning their science-related specialisms as a result.

6. A major reason why children and young people give up science and maths is a lack of enjoyment and interest.[13] In this country, children's attitudes towards maths and science have become less positive in recent years, and in some aspects have lost ground against other countries. For example, the proportion of young people with a positive attitude towards maths was around ten percentage points below the international average in 2007.[14] While acknowledging that children's enjoyment is important, the Department did not consider the decline to be a major problem, since English pupils' actual achievement in science and maths had been among the most improved in the *Trends in International Mathematics and Science Study*[15] between 1995 and 2007.[16] The Department stated that countries whose pupils achieved most at science and maths were not necessarily the ones whose children had the most positive attitudes to the subjects.[17]

9 Qq 1, 2, 43

10 C&AG's report, paras 3.26 – 3.27, Q 20

11 Qq 45, 46; C&AG's report, para 3.28

12 Q 47

13 Q 32; C&AG's report, paras 3.18 and 3.19

14 Qq 32, 35, 38; C&AG's report, paras 3.21, 3.22 and 3.25

15 TIMSS 2007: *Findings from IEA's Trends in International Mathematics and Science Study at the Fourth and Eighth Grades* (TIMSS & PIRLS International Study Center, Boston College, 2008) http://timssandpirls.bc.edu/TIMSS2007/index.html

16 Qq 35, 40, 45

17 Qq 35, 39, 40, 41

2 Part 2: Improving teaching staff and facilities

7. Good-quality teaching is essential to increasing children's take-up of, and achievement in, science and maths.[18] The Department has sought to increase the number of specialist maths and science teachers in secondary schools, setting targets that by 2014, 25% of science teachers will have a physics specialism, 31% a chemistry specialism and 95% of maths lessons will be taught by a maths specialist. Progress in meeting these targets has been mixed. The Department anticipates that the chemistry target will be met, but that those for physics and maths will not.[19]

8. The Department has encouraged more people with a physics or chemistry degree to train as teachers in these subjects by providing incentives such as training bursaries and 'golden hellos'.[20] The Department acknowledges that, nevertheless, too few science specialists are entering teacher training, and that there is more it could do to address the shortfall.[21] The Department intends to continue providing incentives for people to train as science and maths teachers, but is reviewing the form these incentives will take in light of the Browne review of Higher Education funding[22] and the Comprehensive Spending Review.[23] It also aims to expand the Graduate Teacher Programme, which currently includes about 20% of all entrants to initial teacher training, and is a particularly attractive option for those with science and maths degrees who are thinking about changing career to become a teacher.[24]

9. The Department suggested that there are fewer science and maths teachers with degrees in these subjects teaching in schools in deprived areas.[25] It intends to double the size of the Teach First programme, which is designed to get high-performing graduates to train as teachers and work in such schools. At the time of the hearing 560 people were training to be teachers under this programme, including over 200 in maths and science.[26] The Department also expects that the introduction of the pupil premium, whereby schools receive additional funding for each child from a disadvantaged background, will allow such schools to attract more high-quality science and maths teachers.[27]

18 Qq 41, 47; C&AG's report, para 3.18

19 Qq 51, 59; C&AG's report, paras 3.12 and 3.13

20 Qq 57, 58, 60; C&AG's report, paras 3.14 and Figure 12

21 Qq 57, 60

22 *Securing a sustainable future for higher education: An independent review of higher education funding & student finance* (12 October 2010) http://hereview.independent.gov.uk/hereview/

23 Qq 61-64

24 Qq 49-50

25 Q 65

26 Qq 49, 50, 65-70

27 Q 68

10. Teaching environments within schools are another key factor in improving take-up and achievement. The Department had set a target in 2004 to bring all school laboratories up to a 'satisfactory' standard by 2005-06, and to 'good' or 'excellent' by 2010. However, it had not collected data to measure progress against this target, partly to reduce administrative burden[28] and partly because it became clear in 2005 that the expected funding to support these improvements was not available.[29] A 2006 study by the Royal Society of Chemistry estimated that, at the then rate of progress, the 2010 target would not be met until at least 2021.[30]

11. Until recently, the Department had relied on the *Building Schools for the Future* programme to improve the condition of science laboratories. However, this programme has been replaced by a new approach to capital, and it is unlikely that there will be specific funds available for laboratories. As a result, the targets for improving the condition of this accommodation no longer apply.[31]

12. In 2004, the Royal Society of Chemistry found that science accommodation was unsafe or unsatisfactory in a quarter of schools, a finding which was reiterated by Ofsted in 2005.[32] According to the Department, responsibility for securing safe facilities rests with schools, and schools have received increased levels of devolved capital funding in recent years to tackle such health and safety issues.[33] Reflecting its policy of reducing central direction and target-setting for schools, the Department does not intend to collect data on the extent to which school laboratories are safe.[34]

28 Q 81

29 Q 73

30 Qq 73, 81; C&AG's report, paras 3.7-3.8, and 3.10

31 Qq 74-75

32 Q 78; C&AG's report, para 3.8-3.9

33 Qq 78, 79, 84, 85

34 Qq 82-83, 85-87

3 Part 3: Developing a more coherent strategy for school science and maths

13. In 2004, a review of activities aimed at encouraging children to take up and enjoy maths and science identified 478 different initiatives, 120 led by the Department and the rest by other government departments or external organisations.[35] To address the risk of duplication and inefficiency arising from so many initiatives, work began in 2006 to rationalise the support given to schools.[36] At the time of the hearing the Department funded around 30 initiatives, at a cost of about £50 million per year.[37] Some of these initiatives have been evaluated and found to be effective.[38] However, take-up has been mixed. For example the Department part-funds a national network (STEMNET), which brokers and delivers activities in schools across England, but in around a fifth of local authority areas, at least 25% of secondary schools do not participate in any of these activities.[39]

14. The Department plans to reduce spending on such central initiatives in future. It intends to take a more strategic approach, carrying out fewer interventions, only undertaking those initiatives which evaluation has shown to be successful, and targeting actions in those areas where they will make a difference.[40]

15. Good careers advice is an important factor in encouraging children and young people to take up science and maths, and is most effective when it involves knowledgeable and enthusiastic teachers who have established good links with the outside world.[41] However, there have been problems in the past with the availability and quality of careers advice in schools.[42] The Department was undertaking a number of programmes to improve advice on science and maths, including the 'Careers awareness timeline pilot' in 30 schools.[43]

16. As part of its policy to reduce the ring-fencing of schools' budgets and devolve more funding to schools, the Department does not intend to fund further pilots or build on those already under way.[44] Instead, schools will be responsible for delivering careers advice and guidance and be held to account for their use of the funding devolved to them.[45] They will be supported by an all-age careers advice service, replacing both *Connexions*, which aimed to give careers advice to 13 to 19

35 Qq 32, 89-91, 93; C&AG's Report, para 3.29

36 Q 92; C&AG's report, para 3.30

37 Qq 32, 89, 93, 96

38 C&AG's report, para 3.31

39 Q 97; C&AG's report, para 3.44

40 Qq 94, 95, 98

41 Qq 27-28

42 Q 19

43 Q 19; C&AG's report, paras 3.2 and 3.4

44 Qq 20-24

45 Qq 24-25

year olds, and the *Next Step* service, which provided a similar service for adults.[46] In this area as in others, the Department will be seeking to encourage schools to learn from each other, with outstanding schools taking the lead in spreading best practice to their peers.[47]

17. The Department made clear that its future strategy would place greater reliance on public scrutiny of schools' performance to drive further progress in take-up and achievement. For example, it was examining how it could use school performance tables and the Ofsted inspection regime to encourage the further spread of the Triple Science offer.[48] It also intends to make much more information available to parents and others so that they can see more clearly which schools are offering Triple Science, how well pupils are doing in science and maths, and where pupils progress to post-16.[49]

18. Such an approach runs the risk that there will be too much information available which will be confusing for parents.[50] There is also a risk that the Department will not collect the information it needs to monitor progress in take-up and achievement. However, the Department told us that it will still be collecting the data it needs to monitor progress,[51] and intends to publish – or require schools to publish – information in a standardised, structured way, allowing parents to easily compare schools' performance.[52]

19. Above all, the Department must reconcile its plans for greater devolution and local accountability with the need for a coherent, system-wide strategy. This strategy will need to ensure that key success factors such as GCSE Triple Science, specialist teachers, good-quality science facilities, quality careers advice, and programmes to increase take-up and achievement are made available in a concerted fashion which both avoids duplication and reaches all parts of the country, including the most disadvantaged communities.[53]

46 Qq 18, 19, 23

47 Qq 29-31

48 Qq 2, 3, 11, 25, 42

49 Q 4

50 Qq 9-11

51 Q 4

52 Q 11

53 Qq 91, 97

Formal Minutes

Wednesday 12 January 2011

Members present:

Rt Hon Margaret Hodge, in the Chair

Mr Richard Bacon
Mr Stephen Barclay
Dr Stella Creasy
Matthew Hancock
Chris Heaton-Harris
Jo Johnson
Ann McGuire
Austin Mitchell
Nick Smith
Ian Swales
James Wharton

Draft Report (*Educating the next generation of scientists)* proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 19 read and agreed to.

Conclusions and recommendations 1 to 8 read and agreed to.

Resolved, That the Report be the Fifteenth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report.

[Adjourned till Tuesday 18 January at 10.00 am

Witnesses

List of printed written evidence

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2010–11

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Oral evidence

Taken before the Committee of Public Accounts

on Tuesday 23 November 2010

Members present:

Margaret Hodge (Chair)

Mr Richard Bacon	Joseph Johnson
Stephen Barclay	Mrs Anne McGuire
Stella Creasy	Austin Mitchell
Chris Heaton-Harris	Ian Swales

Amyas Morse, Comptroller and Auditor General, and **Angela Hands,** Director, NAO gave evidence. **Gabrielle Cohen,** Assistant Auditor General, and **Marius Gallaher,** Alternate Treasury Officer of Accounts, NAO were also present.

Examination of Witnesses

Witnesses: **David Bell**, Permanent Secretary, Department for Education, and **Jon Coles**, Director General, Education Standards Directorate, Department for Education, gave evidence.

Q1 Chair: I welcome you both. I thank David because it is the third time that you have had to mug up on something to give evidence to us. We are grateful to you for doing that. I hope that the reports that are coming out reflect a lot of the good work that's going on in the Department. On the whole, reading the NAO report, I congratulate the Department, schools and teachers, because there are many signs of success in encouraging more children to take science GCSEs, in better grades and in growing the triple science curriculum in schools. A lot has been achieved. As we pursue the questioning today, I hope that you will understand that the tough issues that we want to address are in the context of our recognition that there has been a lot of improvement in this area for which you are to be congratulated.

I want to go in on an issue that a number of us talked about in our pre-meeting, which is the issue of what is on offer to young people in schools, because clearly what the report tells us is that the more you get triple science on offer, the more likely you are to have young people going on to A-level and, therefore, developing into the scientists and engineers that we need for the future. You have made good improvement in that you have gone up from 2003 to 2004 from 30% to 50%, and you will probably meet your target, and we accept that as also being good. Then comes the "but". The "but" is that half of local authorities have fewer than half their schools offering triple science. How are you going to tackle that over the coming period, particularly in the context of more devolution and less clout from you as a Department on what happens both within local authorities and within schools?

David Bell: Thank you Madam Chairman, for your welcome. It's always a pleasure to be in front of the Committee, and I mean that. There are a couple of ways in to that question, and perhaps I might ask Jon to add to this. The report, as you rightly point out, highlights that in the year up until the NAO had the data we had 50% of schools offering triple science. The data that was just validated last week suggests that that figure has now gone to 70% for the most recent academic year. But there's a "but"' from us, too, which is that that still only represents around 20% of pupils.

Q2 Chair: How much?

David Bell: Twenty per cent. of the pupils do triple science, although 70% of the schools make the offer. That's our "but" on the back of that, so there's a lot more to be done to encourage more students to take the offer. I think you're right, however, that there's a range of things you have to do to ensure that it becomes an attractive offer. You have to incentivise schools to see the value of doing triple science. You have to make sure that students understand the benefits for them in doing triple science, if they're going to pursue A-level courses in any of the single sciences. You also have to make science more generally attractive to students. One of the attractions for individual students in going for triple science is that they see it as something worth doing, as a good career option, something that's going to lead to interesting opportunities in the future. I don't think there's any single factor. While we've moved forward with more and more schools taking up the opportunity to offer triple science, we do recognise that there are still not enough students doing it.

Q3 Chair: I think the issue is not the "what", but the "how".

Jon Coles: I think that we would recognise that there are some problems with how schools are incentivised and rewarded for what they do, and particularly for which qualifications they offer to children and young people. We do know, for example, that there are schools that have turned over their entire science timetable to doing BTECs in science, rather than doing GCSEs, let alone triple science GCSEs. We think that is problematic and does not provide a good enough basis for progression to A-level. Indeed, the evidence on progression from BTECs into A-level is

very clear: almost nobody does make that progression. One of the things that we need to look at is how schools are rewarded for what they offer and, in particular, whether the accountability system, performance tables, Ofsted and so on should do more to incentivise people to offer qualifications that have a good basis for progression, rather than ones that offer a less good basis.

Q4 Chair: We're moving away from targets. Presumably, if we have you back in a couple of years' time, you won't even be able to tell us how many schools offer triple science—or will you? We're moving away from specific funding, so quite a lot of the incentive structures that we've had in place are going to disappear. Given the current climate, how are you going to make sure that the improvement is continued and that we tackle some of these very tough issues?
Jon Coles: On the first point, we will still be collecting the data; we will still know what is happening. That's quite important, because the biggest way in which, over the coming period, we're going to be incentivising schools to behave differently is by making much more data and information available to parents and others, making it much clearer what schools are offering and how well children are doing—not just in the headline measures that we've got at the moment, but in all subjects across the board—so that parents will be able to see, in a way that they can't at the moment from the performance tables, which schools are offering triple science, how well children are doing in triple science and where they are progressing to post-16—what their destinations are. Making all of that transparent, we know, does incentivise schools and does change behaviour.

Q5 Chair: You'll be publishing comparative tables, will you?
Jon Coles: We will publish data on performance.

Q6 Chair: My feeling of the data that was published last week was it's all very well and good, but somebody's got to make sense of it. Are you going to be publishing as a Department, or is Ofsted going to be publishing reports that say, "This is what is happening on take-up of science GCSEs and A-levels, and particularly triple science, in our schools—where it's gone up, where it's not gone up, where it's on offer." Is there going to be somewhere where we can pick that out? Are you going to do it?
Jon Coles: Yes, all of that.

Q7 Chair: You will publish reports, open to the public, saying, "This is where we are on science." You will publish as a Department?
Jon Coles: We will publish data on that.

Q8 Chair: Will you publish reports that allow us to monitor, in a year's time, what's happening to science take-up?
Jon Coles: I'm not sure we'll publish reports, but the data will definitely be put in the public domain.

Q9 Chair: Yes, but who's going to make sense of that data?
Jon Coles: It will all be intelligible, transparent and perfectly easy to understand.

Q10 Chair: I don't think that's the point. The stuff that came out last week on financial information is perfectly intelligible, but making sense of a mass of data like that requires NAO interpretation or whatever.

Q11 Stella Creasy: What is the comparable example? You said that you've used data before to incentivise changing schools' behaviour. What's the comparable example where you would say, "This is what we're aiming to do around science"? Because you're saying it's going to be up to the parents to say, "Is this school doing *x*, *y* or *z*?" What's the comparable example?
David Bell: If you want an example of where we used that in the past, moving the performance tables at age 16 from five-plus A to C grades to five-plus A to C grades including English and maths clearly acted as a very powerful lever to behaviour in schools, because schools recognised that actually the much more powerful measure was going to be the English and maths measure, not just the five-plus A to Cs where you could do without it. We have some evidence of being able to use the incentives, or performance tables, so as to change behaviour.
Can I just come back to the Chairman's point on this specific issue of performance? I don't think it's a like-for-like comparison. I agree with you about last week's data. In some ways, while we all tried to do that as well as we could, it felt a bit like a kind of data dump. There was just so much of it. That's not quite the same when you're talking about school performance information, where you do have like-for-like comparisons, structures and ways of presenting data.
One issue I should perhaps touch on is that the timing is slightly awkward today because the White Paper on schools reform will be published tomorrow, so some of the things you might want to ask us about we can't necessarily comment on today for the future, but we'll certainly write to you about that. There's a set of questions for us about how—to pick up Jon's point—you use the tables, the performance data, to make information available. If you're publishing information or requiring schools to publish information in a standardised format, which would include the data regarding triple science, you will be able to make those sorts of comparisons, and it will be much easier than just dumping data out in a rather random way, which I think is perhaps what happened last week, given the nature of what was being produced.

Q12 Austin Mitchell: I think it's a difficult task—it's s a bit like turning around an oil tanker—but on the whole, the report indicates that things are going reasonably well. I did some research using the massive sample of one—my grandson, who was brilliant at maths up to GCSE and enjoyed it. I asked why didn't he go on to do it at A-level? He gave two reasons that aren't included in figure 13 on page 26:

first, that it became impossibly difficult and specialised—he thought the A-level course was much tougher and more difficult than the GCSE—and, secondly, that it didn't lead anywhere. Those seem powerful reasons to me.
David Bell: The second explanation I'm slightly surprised about, given that most of the data we have about destinations for those who study A-level maths and take it into higher education and beyond suggests that it is a very good route into a wide range of different careers. There may be an issue, then, which the report does touch on a bit, about the quality of advice given to students about how applicable their knowledge in maths, physics, chemistry and whatever will be.

Q13 Austin Mitchell: How about the first reason—that it's intimidatingly tough?
David Bell: There are two ways of coming at that. Frankly, maths is a harder subject; that's true. Secondly, then, the question arises whether the content of the GCSE courses that were being followed was a sufficiently good preparation for making the jump from GCSE to A-level. There have been some changes to the content pre-16 to try to ensure that it is a better preparation, but I don't think you can get away from the fact that some students, perhaps including your grandson, do find maths, physics and other subjects quite hard.

Q14 Austin Mitchell: He decided to do law instead. I just wanted to go to a second point. We've always been good at pure science in this country, and pure science is the essence of what's being taught here. I wonder if we don't need a bigger admixture of technology, which has always been an area of weakness, ever since the Labour party set out to mobilise the white heat of technology in 1964. Shouldn't we be mixing science much more with technology, as a more practical subject that leads on to jobs and to making a real impact, rather than just concentrating on the pure science of these three science subjects?
David Bell: I may just ask Jon to come in on this. I think there's an important balance to strike here. It could be argued that some of the moves to make science more relevant have been at the expense of the hard content, because there is absolutely no doubt that, by the time you get to A-level, you need to be focusing on the hard content of those subjects, particularly if you are seeing the A-level study as a route into higher education. Some of the criticism from universities has been that the content is not rigorous enough to act as a good starting point into university.

Q15 Austin Mitchell: Perhaps they would say that, wouldn't they?
David Bell: They are an important constituent, and if they are saying that, I don't think we can just dismiss it, and I think that's one of the reasons why there's a concern to improve the rigour of what's being taught. Technology is a slightly separate issue because there are routes through qualifications to study technology in a more general sense. But going back to the point about applicability or the guidance or advice that students are given, if you are studying any of those science subjects, or if you are studying maths, there are lots of ways in which they can be seen to be useful and relevant. That doesn't need to be at the expense of the rigour of what's being taught. It just seems to me it's back to the students' understanding of how what at times can seem very theoretical learning actually does have very practical consequences in the real world.

Q16 Chair: I just want to get a yes or no to this before Stephen comes in. At the moment we have targets. In the new world, which I understand you're going to publish tomorrow, is there going to be a mechanism that will ensure that triple science becomes available to 100% of students in 100% of schools? Is there going to be a mechanism—apart from publishing information? It's almost a yes or no, because clearly the mechanism, if there is one, will come tomorrow.
Jon Coles: It probably can't be answered quite with a yes or no. It depends what you mean by mechanism really.

Q17 Chair: Have you got a lever?
Jon Coles: I don't think we have, but then, to be honest, I don't think we ever have had a lever in that way, that forces people to offer triple science in practice.
David Bell: I think that's right.

Q18 Stephen Barclay: Mr Bell, you mentioned the forthcoming White Paper. Will it include the phrase "improve careers education and guidance". If we look at figure 2 on page 12, that phrase appears in the paper that was produced in 2004; it appears in the paper in 2006, in the paper in 2008 and in the paper in 2009 and yet, in 2008, the Sutton Trust, said in their report, "Poor guidance is preventing large numbers of able pupils from disadvantaged backgrounds going on to higher education." You're now running a pilot, that isn't going to report until March 2011, covering 30 schools. I'm just trying to understand why it takes the Department seven years to work out what careers advice should be covering.
David Bell: I think there's a general question about careers guidance. You'll probably be aware that the Minister for Further Education, Skills and Lifelong Learning announced the establishment of an all-age careers service in an announcement at the beginning of November. To be frank, I think that illustrates—

Q19 Chair: What's "all age"? From when to when—five to 50?
David Bell: All ages, Madam Chairman, rather than separating out, as we have previously, careers guidance for young people as opposed to careers guidance for adults. I'm long enough in the tooth now to remember various iterations of the careers service, from the 1990s onward. The reality is that we've never quite cracked this. The Connexions service was an attempt to combine targeted advice to young people in difficulty with an all-age generic careers service. I don't think that quite happened in the way we wanted

it to happen and, therefore, we're going to have another go at this. I don't think I can dispute what you've said—that we've tried this in a number of ways in the past. Within that, STEM careers advice, if I can put it that way, is a small but important sub-set. We've tried through a number of pilot programmes to think whether there may well be specific advice that students can get regarding STEM, but I think, to be frank—and I suspect this is what underpins your question—this is a general question regarding the quality of careers advice, rather than a specific question about STEM. We hope this time, with the announcement of an all-age careers service—more details to follow—that we will finally crack this one, but I accept we've been at this for quite a while.

Q20 Stephen Barclay: Are the pilots particularly targeted at deprived areas? What concerned me, looking at the report, were the 29 local authorities where there are no interventions whatsoever. I think paragraph 15 refers to triple science being less widely available in highly deprived areas, and I suspect—I don't know what assessment the Department has done—there's a correlation between that and those deprived areas also not giving careers information and guidance to those bright children. Could you at least reassure us, after seven years, that those pilots are targeted on deprived areas?
Jon Coles: Yes, they are, but I should emphasise that that is the last Administration's policy, so the announcement of the all-age careers service and the next steps on that will move beyond those pilots. Those pilots are in a range of areas, but there is some targeting on areas of deprivation.

Q21 Stephen Barclay: Are the 30 targeted on deprived, or are they just across the full spectrum?
Jon Coles: They cover a range of areas. They are disproportionately in deprived areas. Again, I must emphasise that that those are the previous Administration's policy and pilots, and that's not the way we're now planning to go.

Q22 Chair: What do they test? What have you got out of that?
Jon Coles: It's extremely early days, as you know, for those pilots. I do not know that we have got information out of those pilots.

Q23 Chair: But you're going to not use it anyway, really.
Jon Coles: That isn't really the approach any more because, as the Committee will know, this Government has decided not to pursue the previous Government's policy on careers education and guidance based on Connexions for young people, but instead to move to an all-age service, so it's a very different model of delivering implementation.

Q24 Stephen Barclay: I guess that brings me on to the forward-looking part, and particularly what funding is going to happen around careers information and guidance. This objective of your study in 2004 has been renewed at pretty much every opportunity. Can you just give us visibility as to what is happening on funding for careers information and guidance moving forward, and to what extent that might be squeezed if head teachers decide that's not an essential compared to other things within a school budget?
Jon Coles: Consistent again with this Administration's policy, funding will overwhelmingly be devolved to schools and it will be for schools to decide what is the best set of things to do and they will be accountable for the consequences of that, including in relation to the destinations of pupils. So that is the model of reform—moving away from the sense that there are discrete ring-fenced budgets for which schools are held to account separately on to rather a different model.

Q25 Stella Creasy: Do you think that's more or less likely to pick up on the things that we're talking about? It feels like you have quite a few different models there for how you might crack this nut of how you give the careers advice that you want to, which deals with the point Stephen's raising about how we particularly target some of those areas. You're contrasting that with perhaps a very different approach to how funding or advice might be given.
David Bell: If you left it entirely to devolved funding and said, "That's it. Get on with it," without having a wide set of transparency measures, you are in difficulty. In other words, you can devolve funding, absolutely consistently with what the Administration wants to do, but alongside that, it's really important to have the right kind of data out of there. As Jon implied earlier, that's going to be part of what's coming out over the next few months—the nature of the data that will be published. You might come back on that and say, "That's all very interesting that you publish data. What are your hard levers?" The reality is we are moving away from those very hard levers being imposed from the centre, but there are other kinds of levers that you can put in. "Levers" might not be the right word, but of course you can look at the nature of the qualifications on offer—which is obviously something we'll be saying more about in the next day or so. You can ensure that the league tables properly reflect the right kind of performance. You can use the Ofsted mechanism to target in particular areas. There are lots of ways that you can influence the system to behave in particular ways. To be very clear, that is quite different from a model that has lots of hard levers and targets to bring about.

Q26 Mr Bacon: One more point specifically on careers. You've worked in education for 25 years or more at every level, from primary school to being a local authority director, and now your present job. You must have thought about this issue of careers guidance and why it's so difficult. There's one obvious answer, which is that the people who are giving the guidance aren't people who've worked in enough different areas, and they don't have direct experience of the law, or running a large factory, or being an accountant or whatever it is. But, equally, there are careers guidance services that are more successful, and others that are less successful. In your view, what is the X-factor that makes for a highly effective careers service?

David Bell: I would draw a distinction between what the school offers and then what's offered from outside. I think you're right to say that in schools and in careers services generally you probably won't have people who have the widest range of work experience to be able to properly advise students, in a very well-informed way.

Q27 Mr Bacon: So what's the X-factor?
David Bell: In schools, it is teachers who have gone out of their way to find out as much as they can about all kinds of opportunities that are available to young people, and who really have a close relationship with the students concerned and can properly advise them.

Q28 Mr Bacon: When you were distinguishing between the inside of the school and outside, I thought for a minute you meant—but I don't think you did, on reflection—the schools that bring in people from outside to inside the school. Is that what you were saying?
David Bell: That is exactly what the best teachers in schools will do, because you will not assume that, in providing the most informed advice, you are the only person who can do it. I should say one really positive side benefit of attracting people from so many different walks of life into teaching these days, including lots of people who've come in from outside through the graduate teacher programme and so on, is that you have a much better experience in many schools now of the wider world. You're right: the best teacher, providing the best advice, will draw upon all the best information. I would have thought this is also connected to the kind of local employment partnerships that you have—are you a school that goes out there and has lots of relationships with local businesses—because those folks coming in will be able to give students good role models. I think it's about having as much connection in the school to the world of work as you can. That's probably, if there is such a thing as the X-factor in this, the most significant factor.

Q29 Stella Creasy: That's quite a good model. I'm sure we'd all agree with bringing people in from outside. What tools will you have to spread that as a model for careers guidance, given that you've just said that this is going to be devolved to the schools? You're saying you won't be able to set a strategy from the centre that says, "This is the kind of careers guidance that we want to see happening." That X-factor that you've identified, how are we going to make sure that that happens under the new model—or is that just something we'll have to hope the schools do?
David Bell: However imperfectly this is done at school level, I think the vast majority of schools really do want to provide the best-informed careers advice to students. With the funding devolved, it is going to be part of their responsibility to do so. There will be some unevenness there, but I think one of the transparency measures that's going to make a difference is to be harder on destination outcomes—in other words, providing information to parents and more generally to say where the students have gone as a result of what's happened in the school. There are a number of ways that you do it, but we won't have a single prescribed blueprint that all 3,500 secondary schools in the country must follow when it comes to careers advice.
Jon Coles: In this model of improving the system, the fundamental thing is that schools learn better from other schools than they necessarily will from a central direction. One of the things that we will be trying to do is to identify outstanding schools with very good practices in a whole range of areas, which will be able to lead professional development for other schools and teachers, so that, in an area, you would expect that schools that are struggling with particular issues will have access to other schools that are tackling the same issue very effectively, and so peer-to-peer learning will become much more a part of the system.

Q30 Chair: You'll do that? DfE will do that?
Stella Creasy: You won't, will you, because that doesn't answer Stephen's question.
Jon Coles: What I'm saying is that we will make sure that, nationally, there are opportunities for schools to learn from other schools and, as David said, that there are clear incentives for schools to improve destinations and outcomes for children.

Q31 Chair: What does that mean, you'll "make sure"? I'm sorry, but that sounds like gobbledegook to me.
Jon Coles: We have a whole range of models at the moment—for example, national leaders of education, who are outstanding heads of outstanding schools who commit themselves to supporting other schools in their area through a whole range of different forms of support. It may be about their own personal support as a head to other heads; it may be about providing expertise from their maths department or their careers systems, and so on. In other words, in every area, you would expect that there are people of that sort—national leaders of education and similar—who have committed themselves to supporting other schools to improve.

Q32 Mrs McGuire: The careers element is important, but I want to reflect on paragraphs 3.18, 3.19 and 3.25. It strikes me as a bit confusing that in the modern environment, when so much of our life is predicated on science and technology, we have some major difficulties in encouraging children to take up science-based subjects. In many respects, the NAO report identifies that the rot sets in long before we're at the career choice. Paragraph 3.18 says all the reasons for "disliking maths at primary school… related to enjoyment" and "quality of teaching". Paragraph 3.19 says that "Seventy-seven per cent of respondents to our survey…said that lack of enjoyment and interest was their main barrier to continuing with science". Then, according to the OECD average, we are "eight percentage points behind" other countries on whether or not "pupils 'generally have fun when learning about science topics'." Do we have a crowd of boring science and maths teachers out there?

David Bell: You are into a really interesting cultural question about why these attitudes prevail so widely, and particularly oddly, I think, in our country, if you think of the amount of technological development, the amount of scientific research at the highest end, the calibre of the universities when it comes to research in the sciences. It's very interesting that, against that, we have the picture that you describe. I don't think we've got a generation of boring science and maths teachers. One of the things we've tried to do—to pick up the particular points that you have raised—is to encourage students and children to see science in a more interesting and enjoyable way. The NAO report talks about 470 initiatives. It's just worth pointing out that only 30 of them are directly funded by the Department.

Q33 Chair: We're going to come to those at the end, because I think we're all a bit gobsmacked by that figure.
David Bell: It is important to say that many of those initiatives promoted by companies—

Q34 Chair: Let's bring those in at the end.
David Bell: Okay. I just want to make the point that many of those initiatives are focused on trying to provide greater enthusiasm or enjoyment.
Jon Coles: Could I add just one really important point, which isn't made?

Q35 Mrs McGuire: All your points I'm sure are really important.
Jon Coles: Between 1995 and 2007, where the NAO correctly reports a decline in positive effect, TIMSS found an extremely big increase in English performance in science and maths. England was one of the most improved areas. That is actually consistent with what they found in other countries—there wasn't in fact a positive correlation between people feeling good at science and people doing well at science. In point of fact, I think it is more important that we do well at science than that people feel good about it. I don't mean to say that I don't want people to feel good about it; of course I do. But our performance improved, and that is consistent with what has happened in other countries internationally. The best-performing don't have the most positive attitude.

Q36 Mrs McGuire: Could I just stick with this a minute? I think science has always had a bit of an image problem, certainly physics. Even when I was at school, really brainy people did physics, the good people did chemistry and the rest did botany. Biology hadn't been invented then.
Mr Bacon: Drawing flowers.
Mrs McGuire: Don't even go there. David went to west of Scotland schools—a few years after me, I should say—so he might understand. Physics has always had that image. I should say, just for the record, that I did do science at school, but I did it alongside other subjects, arts subjects effectively. I was going into arts. You were allowed the opportunity to still do science, and you were encouraged to do science as part of a wider approach to education. Is there an issue in schools in England about the narrowness of the curriculum, rather than expansiveness?
Jon Coles: There probably is an issue about that. In practice, the issue is much more about people having dropped languages and humanities. There aren't really schools that have dropped science in any significant way. As you can see from the exams entry data, it's held pretty stable. What the exams entry data doesn't include are all the people doing non-GCSE science courses, which have grown very significantly. In fact, more people are doing science qualifications. I think there is an issue about breadth. Again—this isn't quite prejudging the White Paper because this is an announcement that's already been made—this concept of the English baccalaureate, which is to reward breadth in study post-16, is important.

Q37 Austin Mitchell: Confirming maths is duty and history and English are pure pleasure—
Jon Coles: Maths is pleasure.

Q38 Austin Mitchell: I speak from my experience. Figures 14 and 15 show that positive feelings towards science are declining, despite all this effort. Why are they declining here and increasing in other countries?
Jon Coles: I don't think that is the case; that isn't the case.

Q39 Austin Mitchell: That's what it says.
Jon Coles: The highest-performing countries in TIMSS are not the ones where people feel most positive about science. For example, Singapore, which is extremely high-performing in science, does not have particularly positive feelings among its pupils about science. The correlation between achievement and effect is not there.

Q40 Austin Mitchell: The international average for maths was up in 2007 and down here. The same is true of positive effect for science: down here and up or constant elsewhere. What are they doing that we are not?
Jon Coles: Meanwhile, our performance in TIMSS was the most improved between 1995 and 2007 of every country that took part in TIMSS over that period. That's actually quite consistent with the international picture, that higher-performing nations are not the ones with the most positive attitudes to science.

Q41 Chair: Bluntly, the international data is all over the place; you can read all sorts of things into it. But are you saying that we should ignore the correlation between people liking the subject and doing well at it?
Jon Coles: I don't think we should ignore it. I think it's a really important thing and I think we should investigate it, but I don't think you should necessarily conclude that a decline in enjoyment matched with a rise in achievement is a major problem. Engaging, informative science teaching is hugely important. Sometimes engaging well with the difficult cognitive content of science, which challenges students, makes their feelings about it go down, despite the great benefits that they may be getting from it.

Amyas Morse: I just want to understand the future of how the Department's going to position itself. If there's going to be a lot of public information, apart from parents looking at it, I guess there are going to be think-tanks and other people putting it together and drawing conclusions about the education population. Is the Department going to take part in that debate or give its own comments? How are you going to interact? If all that information's out there, people are going to use it, draw conclusions and comment on your environment. Are you going to engage in that debate or not?

David Bell: I would have thought there would be no change. Ministers always engage. I think Ministers would suggest that they try to lead debate in these subjects. There's a sharp distinction to be drawn between engaging and leading a debate, and then deciding, on the other hand, to directly intervene and try to use directive measures or targets to bring about change. Ministers will continue to engage in the debate, but the tools that they will use are going to be very different from what was the case.

Q42 Chair: What are they going to be, or is it too early to ask you? It does worry me a little, this sort of thing of, sticking to this one. We know that triple science is important. We know you've done well, but we know that half of schools don't have it and half of LEAs don't do enough of it. You've going to shove out the information that tells us next year maybe we've done a little bit better but, in some of the more deprived LEAs, as Stephen said, it's still very, very poor. What's going to happen? You're just assuming that the pressure by the publication of data will be sufficient?

Jon Coles: In practice Ministers will, as they always have, want to lead that debate and give very clear messages about that.

Q43 Chair: That doesn't answer the question. We can all natter; we can pronounce until the cows come home.

Jon Coles: As David has just said, this latest data that we've just got shows that the proportion of schools has gone up to 70%. Now, if that started to stall, I'm sure that Ministers would want to take steps. I think it probably is too early to know exactly how they would respond to that.

Q44 Chair: The policy intent would be not to respond beyond publishing the data.

David Bell: I don't think you can say that, because I think it will always be open to Government to determine where it does feel national intervention is appropriate. For example, the Government has made it very clear that there will continue to be very significant intervention in the lowest-performing schools, and in some ways, it's going to get tougher for those schools. You do have to make some judgments centrally—nationally—about where you are going to intervene. The contrast is not intervening on every aspect of the education system. That's the contrast between what this Government's trying to do and the previous Administration's approach.

Q45 Chris Heaton-Harris: I'm slightly concerned with what Mr Coles said about the importance the Department's putting on enjoying a subject. I studied chemistry and zoology at A-level. I very much enjoyed studying them. They were great fun. I had disastrous results in them because I was enjoying them too much. At the end of the day, we want to get people with good results out of this system. I've read the report and I've tried to do some research and I keep coming back in my mind to the fact that, a while back, the Department on a political initiative started this specialist schools programme. I'm just wondering whether, if you go to a specialist science school, you are more likely to take triple science. If you go to a specialist arts school or sports school, are you less likely? Have we, just by putting the word in the title, taken away the incentive for people to do triple science?

David Bell: For the avoidance of doubt, Mr Heaton-Harris, these are not the Gradgrind brothers you've got in front of you. We do think it matters that students enjoy what they're doing. I think Jon was just making the very obvious point that that doesn't necessarily mean that results—

Q46 Chris Heaton-Harris: I just wanted to underline that.

David Bell: It's an important point. On the specialist schools, there are about 670 schools that broadly are in the programme that have science, maths, computers, engineering and so on. The NAO report points out that the results in those schools have been better, and I don't think that should come as a great surprise, because students are obviously, within the curriculum, more likely to be directed to following triple science courses. I think that has been an important initiative. Even though the discrete funding for that will go next year, I would be very, very surprised if many of those schools dropped the emphasis that they've given to science, maths, computer sciences and whatever.

Q47 Chris Heaton-Harris: I'm not so worried, to be quite honest, about looking forward. I'm just thinking, are we, just by sticking "science" in the title of the school that a pupil is choosing to go to, subconsciously saying to them, "You really should be doing triple science because you're going to a science school," and does that actually happen? Are there stats to back that up? Are we saying that if you're going to an arts school or a sports school, you're already choosing to go down that particular line, so that you're less likely to take triple science in those schools?

Jon Coles: If you looked at the data you would definitely find that there's a big difference between specialist schools in the extent to which they offer courses in their specialism. The extent to which that's causation is much harder to determine, because obviously schools that have a strength in languages would tend to choose to be a language college and schools that have a strength in science would tend to choose to be science colleges, so I don't think we can say for sure that there's causation. That is part of the reason why this set of Ministers have said, "We're not

going to run the specialist schools programme in the way that it has been run in the past. Schools may wish to continue to be designated, but we won't have a designation and re-designation process run centrally." The point about enjoyment that I wanted to make was not that enjoyment doesn't matter. Of course enjoyment does matter greatly, but it was really on the point that you made at the end: that achievement and enjoyment matter. What we need is great teaching that engages people with the difficult concepts, enables them to understand them and achieve so that people are enjoying it because they're succeeding, not enjoying it because they're avoiding engaging with the difficult concepts.

Chris Heaton-Harris: I had great teachers; it was just me.

Q48 Ian Swales: Clearly we've got a shortage of science and maths teachers. By the way, I should say I did a chemical engineering degree and didn't enjoy it at all.

Chair: I gave up biology because I hated the biology teacher. There you are.

Ian Swales: Clearly there's a shortage of science and maths teachers. One initiative that's mentioned in the report on pages 25 and 26 is the "Transition to Teaching" programme, which was aimed at bringing people in with relevant degrees who've perhaps gone off and done other things. Based on the statistics in paragraph 3.16, it looks like it's been a failure: against an investment of £5 million, in the first year of the programme only four teachers were trained through this route. Nationally, that's nothing. What's gone wrong with that programme and how could it be improved, from the point of view both of increasing the supply of teachers and of bringing in careers advice via a subtly different route, because people will have done other careers? How can we make that programme more successful?

David Bell: This is not a programme of initial teacher education. This is a programme to encourage people to think about the possibilities of coming in and then following a course of initial teacher training. To that extent, if you look at the rest of paragraph 3.16, you get a better explanation. You've got some who are now into initial teacher training, and then you've got 174 further students who are going to secure a place on an initial teacher training course. Then you've got others, the 39 who have deferred entry. To that extent, it's not just the four who happen to be trained as of now. The point was to encourage people to think about the programme and then get them into an initial teacher training course. Having said that, I think it would be the case—we shouldn't really be too surprised about it—that some people might do a "Transition to Teaching" course and think, "You know, this isn't really for me." This has been a fairly modest programme, but it has encouraged people to think about teaching as a career option, and I think the data is a bit better than that rather stark headline of four.

Q49 Ian Swales: What do you plan to do to attract people who've already done other careers into teaching? What more can you do and what are you planning to do?

Jon Coles: In a way, the bigger programme that's been running is the graduate teacher programme, which has been designed for graduates to come and train on the job, and particularly targeted at people who are career changers. Career changers now are approaching half of people starting initial teacher training, so the balance here has shifted very much over the last decade from people who've just come straight from a first degree to drawing in a much wider range of people, so it's now very significant. Not all of those are on the graduate teacher programme by any means. The graduate teacher programme is about 20% of all entrants to initial teacher training. The aim is to expand that quite significantly, because we think that is a programme that's particularly attractive to career changers, who often don't feel they want to start at the bottom, as it were, and want to feel they're still working and training on the job. That's the model.

Q50 Ian Swales: What are you actually going to do to expand that?

Jon Coles: There are three or four things that I think we can do quite quickly. The first is we're working with Teach First to provide a Teach First similar route, which will be attractive to very high-achieving graduates who've done a few years somewhere else and then come into initial training. The second is about making it very much easier for people to get on to that route. At the moment, unlike the PGCE route, where everybody goes through a central registry as their way into teaching, it's quite fragmented. We're going to produce, we think, a single front end that people can go through and it will be much easier to get places. We're going to try to cut away some of the difficulties for schools in GTP places and make that simpler for them, which should expand the supply, and we're going to go out and market this new route in a slightly different way.

Q51 Chair: Can I just say that the figures on teachers are very depressing? If you look at figure 9 on page 23, against your target you're going in the wrong direction. If you look at figure 12, which is graduate entrants into ITT, while accepting that there are fewer of those coming along, in both physics and chemistry you're not getting enough people with either a physics or chemistry specialism to get anywhere near your target. You should be above target to achieve the target over time, so these look bad. The question is: what on earth are you going to do about that, particularly when you've stopped collecting the data?

Jon Coles: I don't think we have stopped collecting the data.

Q52 Chair: It says somewhere there's no robust data since 2007—page 24, paragraph 3.13.

Jon Coles: We haven't published the data, but TDA still does have information about —

Q53 Chair: No robust data.

Jon Coles: Well it hasn't been published, that's true.

Q54 Chair: What does that mean?

Mr Bacon: It says it's not available, doesn't it?
Jon Coles: TDA keep an internal figure.

Q55 Mr Bacon: They didn't tell the NAO about it, you mean. The NAO has written here, in 3.13, "Robust trend data is not available for years later than 2007".
David Bell: That's because the school workforce survey isn't done in that detailed way annually. As the report goes on to say, we'll get the full version of the school workforce survey in 2011, and it will give us that kind of data that we need.
Jon Coles: We have seen increases in science take-up, and this last year we've done—

Q56 Chair: Look at figure 9 and then figure 12 for me.
Jon Coles: On figure 12, which is recruitment into initial teacher training, we have had increases in chemistry and physics.

Q57 Chair: I'm sorry to interrupt you but, if you look at figure 12, chemistry, you're at about 18% doing chemistry. You want 31% of chemistry teachers to have a chemistry specialisation. For physics, you're at 11%, and you want 25%. If you want 25%, you ought to be at 30% or 40% in physics and the same, if not more, in chemistry. The data demonstrates you're going in the wrong direction rather than the right direction.
Jon Coles: Can we start at the other end then? Clearly, we want to do much better than this. What has happened over the last decade is that we have succeeded in getting more chemists and physicists into teacher training, but clearly it's not enough and I don't think any of us would think it was.

Q58 Chair: It's not just that it's not enough; it's that it's moving in the wrong direction and, therefore, what are you doing about it? We all know it's not enough. We would want 100% of people teaching chemistry to have a chemistry specialism, so it's not enough, but all the data here demonstrate it's going downwards, not upwards.
Jon Coles: Sorry, I must correct that; it isn't going downwards. The proportion coming into teacher training is going up, not down, and the graph in figure 12 does illustrate that.

Q59 Mr Bacon: Figure 9 says the opposite, doesn't it?
Jon Coles: Sorry, we're talking about two different things.

Q60 Chair: Two figures. I've got figure 9 and then figure 12.
Jon Coles: All I would say on figure 12 is just simply that more people are coming in to do physics now than was the case in the last however many years. You can see back in 2002–03, we were at 8% and now we're at 11%. All I'm saying is, while nobody suggests that's as much as we would want to be doing, by any means, it is better than it was. The big things that we are doing at the moment are obviously marketing to those people, providing training bursaries and golden hellos, so providing serious incentives to people to train and come into the profession.

Q61 Chair: Will you keep that on in this CSR or will that be cut?
Jon Coles: I'm sure that we will, over this CSR period, want to have incentives for physics and maths.

Q62 Chair: You will keep existing incentives to encourage teachers to come into science there?
Jon Coles: We must, in the light of the Browne review of HE and the Government's response to that, change the way that we do incentives. The underpinning finances of higher education will change so much, that we are going to have to have a different approach to incentives. It will change, but we will still want to incentivise for physics and maths.

Q63 Stephen Barclay: Just on that specifically, the *Times Education Supplement* was reporting in the summer that the bursaries for postgraduate certificates in education, the golden hellos, were under review. I think it flows from the Chair's question: can you give the Committee reassurance today that those golden hellos are going to continue at the current rates?
Jon Coles: No, I can't. I can say to the Committee that, certainly over the spending review period, there will be incentives for people to train in physics and maths, no question about that. As to their current level or to the form that that takes, decisions haven't yet been taken on that and that is simply a consequence of the fact that the review of student finance in higher education overall means that we are having to rethink the way we support students through teacher training.

Q64 Stephen Barclay: You must appreciate that risks making a mockery of your own targets, because paragraph 10 says, in what must be a fairly obvious statement, "Teaching is of better quality where teachers hold qualifications in the subjects they teach." It acknowledges that, for physics and maths, you will not reach your target. It doesn't actually give a revised date as to when you may reach your target or any interim milestones to give a sense of the where the direction of travel is on that. Engineering and maths degrees tend to have a good commercial value, student fees are going to go up and at the same time, you can't even guarantee that the current level of golden hellos are going to be given to those entering the profession.
Jon Coles: I can't, simply because that's where we are in the policy process. What I can say for sure is that of course we understand that providing financial support to those people is a very important part of continuing to attract them into the profession. Of course we'll want to make it more attractive, not less attractive, to people coming in. I'm sure that we will, though, make changes to the way in which that's done and to the nature of incentives, which I think is the right thing to do given that the whole of student finance will be changing.

Q65 Stephen Barclay: Related to that, we had an interesting hearing on health inequalities, which found

that there were fewer GPs in the areas with the worst health. You may expect the opposite—that the areas with the worst health would have more GPs—but GPs not surprisingly want to live in nice areas, and so there tended to be more GPs in the nice areas where the health was better, and fewer GPs in the deprived areas. What assessment has the Department made as to the level of teachers with subject qualifications in these areas—for example, maths teachers with maths qualifications—in the most deprived areas, and to what extent will you ensure that the resources are targeted to facilitating that looking forward?
Jon Coles: All my experience tells me that that is the case—that there is more of a problem in more deprived schools. There are two major things that we're doing about that. One is very direct, which is Teach First, which is designed to get some of the very best graduates, particularly in shortage subjects, to train as teachers and to work in the most deprived schools. That's grown quite substantially over recent years. We're going to double it over the next few years.

Q66 Stephen Barclay: How many teachers will that be?
Jon Coles: At the moment it has about 560 teachers in a full year. We're going to double that over this period.

Q67 Chair: How many of those are science teachers?
Jon Coles: Sorry, I don't know off the top of my head. We'll have to write to you on that.
David Bell: We'll send you with a note with a breakdown of the subjects.

Q68 Stephen Barclay: We're perhaps going from 150 maths teachers to 300, so it's pretty small beer really, isn't it?
Jon Coles: I think it's significant that they are being put in the most challenging deprived schools in the country. These are very good graduates in their subjects being put into some of the most challenging schools. The second thing, just to mention it, is the pupil premium, which will mean that there is more money following deprived children into school and, therefore, giving those schools more capacity to use the flexibilities they have in pay and in other ways to attract in teachers.
Amyas Morse: Perhaps I could help a little bit. We have some information on this subject. We think that you have on Teach First trainees, at the start of ITT year, as a percentage of the total, the ones doing science-related subjects seem to be about 38%.
Jon Coles: That would sound right.

Q69 Chair: That's maths and science?
David Bell: That's maths and science, is it?
Jon Coles: Yes.
Angela Hands: Yes, that's from the TDA.
Jon Coles: 38% of 560 would be more than 200.
Angela Hands: It's around 38%.

Q70 Mrs McGuire: You must be a maths graduate.
Jon Coles: Well, I am a maths graduate, yes: 38% is just over 200.

Q71 Stephen Barclay: The regional centres, which are there to raise standards, are a good idea. How many teachers go through the nine regional centres a year? Could you just take us through the funding of that? Is the funding coming from the schools themselves to pay for their places, and will that be under pressure?
Jon Coles: On the numbers, I'm not sure if I know the numbers.
David Bell: We'll get that for you.
Jon Coles: Funding is at the moment mixed between some central funding and some school funding.

Q72 Chair: Write to us on the numbers, will you, please?
Jon Coles: We will do, yes.

Q73 Austin Mitchell: I want to commend Teach First. Now it's coming to Grimsby, it's a marvellous institution. I wanted to ask about school laboratories, because a lot depends on their quality. You set a target in 2004, I think it was, of making them excellent by 2010. It seems daft that you're not monitoring performance on that target. It just seems like another of the crazy targets we sprayed all over the place. Why aren't you monitoring performance? Secondly, the Royal Society of Chemistry said in 2006 that it didn't think you'd achieve that excellent target until 2020.
David Bell: There's a bit of a story to tell about this one. You're right there was a target set in 2004 in the science and innovation investment framework. There was then a promise made during the 2005 General Election by the then Prime Minister that £75,000 per school would be provided for laboratories to bring about this improvement. It was also made clear that most of this money would come from the then DTI's Office of Science and Technology. It transpired after the election that most of that money had already been allocated, and there was no money for the school laboratories. Frankly, therefore, it was an undeliverable commitment made, because the assumption in 2004 was that there would be money to make it happen. There was no money that made it happen. Looking back on this, having had to explore where this all came from, I think we should probably just be clearer that actually that target was therefore not deliverable, because the money wasn't there to do it.

Q74 Austin Mitchell: Which is a shame. Is there nothing you can do about it?
David Bell: Then you're into the wider question of what you do about laboratories. One of the reasons why it was concluded that we should be a bit more relaxed about not having this money targeted on laboratories was that there was then going to be the BSF programme, which over a great number of years was going to refurbish or rebuild all secondary schools and, as part of that, the laboratories would be refurbished. Now of course that's not going to be the case, because obviously there's a new approach to capital to follow. At the moment we do not have a specific target and I can't see us having a specific target.

Q75 Chair: Do you have any money? Even if you don't have a target, is there any money going to be available?
David Bell: To be absolutely clear about this, there is not going to be the money that I suppose was anticipated in 2004. It was all very well anticipating it, but the money was never available at all anyway to do it. There will be, as part of the general approach to capital—the capital review team will report on this, I'm sure—they will have to establish criteria for how you would allocate what capital money there is. I doubt there'll be laboratories money.
Austin Mitchell: I thought that was a good question. Now I'm sorry I asked it.

Q76 Mr Bacon: I want to pursue this. I'm shocked that a Prime Minister, during a general election should make a promise that should turn out to be undeliverable. It really is very shocking. What is the world coming to? In paragraph 3.10 on page 23, it says that, even where money was spent—this was the Royal Society of Chemistry survey—"28% of new or refurbished laboratories were not of an excellent or good standard". It may be the reason is there was so little money that the refurbishment was very basic—a bit of Dulux and some new linoleum or something. But that's more than a quarter that turned out, even after they had spent money on them, not to be really up to the mark. Why is that?
David Bell: I don't know the answer to that. I don't know if Jon knows. I can find out for you. The only explanation I might have or I could speculate is that they had a particularly high standard in mind in relation to what they thought constituted good or excellent facilities. I genuinely don't know, but I can find out for you.

Q77 Chair: I think we need a note on that.
Jon Coles: I don't know the definitive answer so we will write, but I think there will be cases, for example, where a school has had an unexpected expansion in numbers and has had to do something on a temporary basis. There will be those sorts of situations, as well as possibly the way that the criteria are defined.

Q78 Ian Swales: Just on the same topic, there's a sentence in the report at 3.9 that says that "In 2005, Ofsted confirmed that science accommodation was either unsafe or unsatisfactory in around a quarter of secondary schools." Have you dealt with the unsafe issue, to your knowledge?
David Bell: Let's be very clear. The responsibility for securing safe science facilities, as with all other facilities in a school, rests with the head teacher and the governing body. It is not the job of central Government to micro-manage the health and safety arrangements in each individual school in the country.

Q79 Ian Swales: It's to do with the funding allocation. Has the funding allocation dealt with that problem, as far as you know?
Jon Coles: On funding, of course, what schools should do in any issue of basic health and safety is use their devolved capital funding, and there has been vastly more devolved capital funding over the last few years than has ever been the case in the education system before. Schools have had resources for dealing with those sorts of issues, and it shouldn't have required a central Government intervention.

Q80 Ian Swales: That was 2005. Are you sensing what the figures will be now for "unsafe" and "unsatisfactory" in secondary schools? A quarter is a heck of a lot of schools.
David Bell: Ofsted are due to publish their next science review report in 2011. I'm not sure if it covers the accommodation. I suspect it probably will, because these subject reports tend to look at facilities, as well as teaching and learning, but I don't know what Ofsted are going to say in 2011.

Q81 Stephen Barclay: Flowing from Ian's point, paragraph 8 says, "The Department has not collected routine data to measure progress against" your target "in 2004 to bring all school laboratories up to a satisfactory standard." That goes to the heart of Ian's point, which is you don't have visibility as to how many schools have unsafe labs. You had a target in 2004, but you've not been collecting data against your own target.
David Bell: I have to say that at the same time as we were being set targets of this sort, there was also a very strong political push to reduce bureaucracy and this is not the only occasion when I've been in front of this Committee when the same point has been raised. On the one hand, we are perhaps criticised for not having data, yet on the other hand, there was a very clear political imperative to reduce bureaucracy and not collect the kind of data that was considered to be intrusive.

Q82 Chair:> In the new world, following on from this magical White Paper that's arriving tomorrow, will there be data that will enable somebody out there—DfE, Ofsted or whoever—to judge whether or not lab facilities are safe?
David Bell: I don't think there will be, no.

Q83 Chair: So what are you dependent on?
David Bell: If I could push back on this, is it our responsibility sitting in the centre of government to know in detail the state of the science facilities? Why wouldn't we ask the same question about the state of the language laboratory facilities or library facilities?

Q84 Chair: If there's an unsafe situation and a child gets hurt, are you saying that the chair of the governing body and the head teacher are responsible, and yet they have no money to do it?
David Bell: One can never know the particular circumstances, but it's very clear, under health and safety legislation that the responsibility for ensuring a safe working environment for adults and children rests with the people running the school.

Q85 Chair: If you say that, to be fair, then I'm doubly shocked that in 2004 we found a quarter weren't.
Ian Swales: To be fair, it does say "unsafe or unsatisfactory".

Chair: That's a shocking figure. It's all very well to say, "The buck doesn't stop with me; it stops down the line." But I cannot believe, from what you've told us this morning, that that figure has shifted a lot since 2004 and therefore, there is a worrying issue out there.
Ian Swales: The point is it must have an impact on the very thing we're talking about, if a quarter of children are having that experience.
David Bell: In some ways, the report highlights that attitudes to science are partly covered by the accommodation for the children. I absolutely accept that but, to be very clear, we're moving away from a world where we sought, if we ever were able to do it, to try to micro-manage this kind of detail right down to the individual school level. When it comes to the quality of accommodation and its safety, that is the point of devolved management.

Q86 Ian Swales: Isn't this a macro issue? The data might be micro, but we're talking about a macro issue here, aren't we?
David Bell: I think there is an important issue about what you do need to know and what you don't need to know. I'm sure one of the reasons the NAO undertook this survey was not just that it happened to be an interesting educational issue, although it is, but that these subjects are of important strategic significance to the country, so we need to know about that. The danger is that we then think the answer to everything we're doing is to collect endless reams of data or to have 101 interventions and I'm sure, Madam Chairman, you haven't yet got to the initiatives point.

Q87 Chair: We are going to come to that. I would just make two points. One is that there's a difference between 'intervention' and 'data'. I thought the whole thrust of policy was to provide the data that enables then judgments to be made, be it by parents, be it by local education authorities, be it by Ofsted or indeed be it by the Department. In an area of strategic importance, because we care about science teaching and we know labs count, if we know that up to a quarter are unsafe or unsatisfactory, it is odd that you're not collecting the data.
David Bell: I do not want to promise something that I do not think that our Ministers are inclined to deliver. My sense is—and it's very clear—they want to put out a lot of data about performance in schools, but I cannot sit here and say, "And, yes, added to that list of performance data will be—

Q88 Chair: Finally, I want to get to initiatives. Will you give us data on teachers who have a science qualification?
Jon Coles: Yes.
David Bell: We will.

Q89 Chair: Moving to these wonderful initiatives, which is the final area of questioning. I didn't believe the figure of 478. I'm told it's yours.
David Bell: Yes, but I think, for the sake of clarity, around 30 of those are nationally funded by the Department.

Q90 Chair: I'm told the figure 478 comes out of your—
David Bell: That's fine, because the figure is a collation of all the initiatives undertaken by very many partners, which we would not necessarily be funding or necessarily value.

Q91 Chair: But 478?
David Bell: Lots of people want to be involved in this. There is a serious point behind this and, again, this is perhaps reflected in where we've been and where we might be in the future—and I think this morning's session has demonstrated that—which is that even though we might agree that we want to attack this problem across many different fronts, and we do, there is a question about whether having 30, never mind 470, nationally funded initiatives is the right way to do it.
Chair: It's completely potty.
David Bell: Let's be very clear about this, Madam Chair. This was the policy of an administration—

Q92 Mr Bacon: What you're saying is Ministers have breakfast, come into the Department with a good idea, then you have to try to implement it.
David Bell: You're putting words in my mouth. There is a serious point about at what point do the number of initiatives or interventions just create a fog.

Q93 Chair: Were these all funded? Did all these 478 things have money behind them?
David Bell: No, for the avoidance of doubt, 30 of them were directly funded and evaluated by the Department. A range of other initiatives were encompassed under our STEM governance programme, which involved lots of people from industry, from the science community, from all those other places, who frankly wanted to be involved and spend their money—and that's great.

Q94 Chair: Are you going to carry on spending money on this in the future?
David Bell: I think the answer to that is probably not, because we won't have the money to spend on that wide range of initiatives. Secondly, and more importantly, the Administration is very clear that this is not the way to do it, by having far too many nationally driven initiatives so it's both funding than quality.

Q95 Chair: We can all accept we think it's potty to have 478 initiatives. However, if you look at figure 30 on page 43, it shows that, if you spend money encouraging people to take up science, it works.
David Bell: That is the point, isn't it? We shouldn't just dismiss initiatives for the sake of dismissing initiatives. What we need to be clear about is where some kind of targeted support is going to make a difference. For example, as we were saying in the conversation with Mr Barclay, there is an important role for incentives to entry to the profession. You might say that's an initiative; it's an initiative that's outside the individual school. I think we would say that that has been of value. There may be other

initiatives, and our evaluation will tell us which initiatives are better than others.

Q96 Stephen Barclay: Could I just ask what was the total? You mentioned the 30 initiatives from central Government, but what was the quantum of that as a whole?
Jon Coles: I think the report includes that, doesn't it? We were spending around £40 million or so out of a total of about £100 million being spent across government on STEM.
David Bell: The totals, I can give you an exact figure on this. On STEM programme spend, all the spending that was outside individual schools spending for 2010–11, the year we're in, is £50,124,000.

Q97 Stephen Barclay: So you're spending over £50 million and, yet, some of our most deprived schools—in these 29 areas—at least a quarter of the schools (in figure 33)— were not having any initiatives or interventions at all.
David Bell: In relation to any kind of impact of an initiative, in some ways, as Jon said earlier, there will be, for example through the national science centres, connections into individual schools. It would be the case that not every school in the country would necessarily benefit from one of the initiatives. I think that would be true.

Q98 Stephen Barclay: In terms of the 2014 target you've got for all pupils to have access to triple science, are we on track? At the moment I think it's just over 50%, so what interim measures are there between now and 2014?
Jon Coles: The latest data we've just got is that the answer to that is now 70% for this year, so that has moved forward again very strongly since this report was finalised. Again, the trajectory for that is very, very strong and we are ahead of the trajectory that we thought we would be on at this point, on the way to 2014. That is very positive. I think, with these initiatives and programmes, we have some which are really strongly evaluated and which are very successful. For example, the further maths support programme is a programme which has had a very significant impact on the uptake of further maths, which was on the point of dying out and is now one of the fastest-growing A-levels. I think what we will do, as your questioning implies, is to be more strategic and more targeted, more focused on which of these really do work, and have a small and limited number of those and make sure that they're directed at the places that have the greatest need.

Q99 Mr Bacon: This is a much more generic and general question, Mr Bell. Last week I met Sir Ken Robinson, who came to speak in Norwich. The first sentence of this report says, "A strong supply of people with science, technology, engineering and maths skills is important to promote innovation." Sir Ken would say—he's been saying for some years; he's written several books about it—that the central problem is that our education system systematically destroys creativity, even though innovation of course depends on creativity. He goes on to say that every education system in the world puts maths and physics at the top, the other sciences underneath, and then humanities and then the arts. Even within the arts, there's a hierarchy with music and art at the top and things like drama lower and dance at the bottom. He then gave an example of Gillian Lynne, who was taken to a doctor when she was quite young because she was underperforming at school, fidgeted the whole time and couldn't focus. The doctor spent some time with her and then talked to her mother outside and, as he left the room, turned the radio on and asked Gillian Lynne's mother to watch her. She couldn't keep still; she started moving to the music. He pointed out that this mother's daughter, Gillian Lynne, was a dancer. Instead of giving her drugs, he said, "You should take her to a dance school." There are certain people, he said, who can only function and think properly when they're moving. This is, I know, at the risk of being thought some veggie dangerous pinko—and he does live in California now—but what he's basically saying is that the way in which we privilege certain disciplines, like maths, science and physics at the top, leaves things like dance right at the bottom. Why don't we, he says, teach dance every day just in the same way that we teach literacy and numeracy every day? He's not saying it's not important; in fact, I'm sure he would say it is important. To give that extreme example, he said there are people like Gillian Lynne who can't think unless they are moving.
The thing that's interesting about this, which is why I think he's potentially on to something, is innovation is at the heart of all this. It's in the first sentence of this report, and yet our system is systematically destroying it. He gives another example. He has methods of measuring creativity. He measures it among three-to-five-year-olds and he measures it among 18-year-olds and then among adults. He shows that the creativity levels that are achieved by three-to-five-year-olds are at what for adults would be regarded as genius level. What he's basically saying is that most of us are innately creative, but our education system manages to destroy it. Discuss.
Jon Coles: I think the answer to the question as to why we teach maths and English every day but not dance is that it is extremely difficult to function in society without decent literacy and numeracy, and it is perfectly possible to function in society with two left feet.

Q100 Mr Bacon: Not if you're Gillian Lynne. By the way, I forgot to finish. The other point was that having not been pumped full of drugs but told she must be taken to a dance school, she became one of the world's most successful ballerinas. She became the choreographer of *Cats* and became a world-renowned figure in her field.
Jon Coles: You could argue, therefore, that she is a success story.

Q101 Mr Bacon: And created a lot of economic value, by the way.
Jon Coles: Taking a success story and then saying that that is an example of the system failing her I don't think works as an argument. That's an example of the system working rather well.

Mr Bacon: Are you talking about the health system or the education system? It was the doctor who identified the problem, not the school.
Mrs McGuire: It is an argument for child-centred learning.
Mr Bacon: This is why I said I was worried about being thought of as some sort of dangerous pinko.
Mrs McGuire: Dovetailing into what Jon Coles has said, it's about how an educational system responds to the individual child, and not just the educational system, but the individual teacher, the school, the whole infrastructure around the child. It is very, very difficult to make our system sensitive in the way that you described, but I think that should be the aim of an educational system—that it is about the child first, not about the jobs, not about the schools. It's about the child and how you support them. This is turning into a philosophical educational discussion.

Q102 Chair: And I'm going to stop it.
Jon Coles: I just want to say one thing, which is that education has a huge power to inspire, enthuse, create opportunity, break down barriers, enable people to discover potential and talents that they didn't know they had, and of course it should do that across the whole range of valuable human experience and across the whole range of subjects, but that doesn't make it wrong to say that there are some things that it is particularly important that everybody should be able to do. My own view is that it's extremely hard not to think that the most important thing that everybody must be able to do to function at all in society is to be literate and numerate. I don't myself see it as an either/or; I don't think there's a choice between narrow Gradgrindian filling up of empty vessels on the one hand and creativity on the other. On the contrary, I think that creativity comes from an effective exploration of cognitive development in all its forms and in giving people the wealth of experience, understanding and education that draws out of them all that they have and all that they can offer. Through doing that, through learning across a broad curriculum, you enable people to succeed. You don't become literate by never reading a book; you become literate by reading more and more books of all sorts. I want to just say that great education doesn't stifle creativity. It should draw it out. Of course that's a counsel of perfection, isn't it? We don't have perfect schools in the country. There probably isn't a school in the country that offers every single child everything that they could possibly want or need, but that's what we should be trying to create in this country.
Chair: Thank you very much indeed. That's a good end.

Written evidence from the Department for Education

Question 11 (Stella Creasy*): A summary of the main White Paper proposals*

1. *The Importance of Teaching—The Schools White Paper 2010* was published on Wednesday 24 November. It sets out the Government's comprehensive plans for reform of the school system in England.

2. The White Paper confirms that the Government will focus central support on strategic curriculum subjects, particularly mathematics and science. This will include support to:

— increase the number of specialist chemistry, physics and mathematics teachers;

— develop the specialist subject knowledge and teaching skills of existing teachers;

— improve the availability and take-up of GCSE triple science; and

— help schools meet the demands of teaching in-depth physics and A level Further mathematics.

3. In addition, the wider proposals for schools improvement in the White Paper will support science and mathematics education, including:

— reforming the National Curriculum to focus on the essential knowledge and concepts that every pupil should gain at each stage of their education, while reducing prescription and allowing schools to decide how to teach;

— benchmarking our qualifications against the best in the world;

— raising the quality of entrants to the teaching profession, 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; and

— increasing the number of National and Local Leaders of Education who can support improvement in other schools, and developing Teaching Schools to make sure that every part of the country has access to highly effective professional development support.

Question 67–68 (Stephen Barclay*): The number of Teach First trainees who are training to be maths and science teachers*

This information is shown below:

TEACH FIRST PARTICIPANTS BY YEAR

Subject	*2008 Cohort*	*2009 Cohort*	*2010 Cohort*
Science	54	103	84
Maths	51	90	129
Total	*105*	*193*	*213*

TEACH FIRST PARTICIPANTS GAINING QUALIFIED TEACHER STATUS

Subject	*2008 Cohort*	*2009 Cohort*
Science	49	85
Maths	46	81
Total	95	166

Question 71–72 (Stephen Barclay and Chair): How many teachers a year go through the nine regional centres

In the 2009–10 academic year there were 10,844 unique attendances from teachers from maintained schools in England. Some teachers will have attended more than one course.

Question 76–77 (Mr Bacon and Chair): *Why were so many refurbished laboratories inadequate?*

1. The information in the NAO report was based on a survey of schools conducted independently on behalf of the Royal Society of Chemistry. The Department does not hold any of the data from this survey other than those which were provided in the published report. The main reasons why 28% of schools with refurbished laboratories rated the quality of building works, furniture and fittings as "unsatisfactory" or "poor" are cited in the report as being:

> "… poor-quality furniture and fittings, especially of cupboards, their doors and locks. …. Poor standards of workmanship and design were also mentioned, along with other concerns including services, flooring, bench surfaces and fume cupboards." [1]

2. The Royal Society of Chemistry report was published in 2006. At that date, the last Government's main strategic programme for renewing the secondary estate, the Building Schools for the Future programme, had not completed any schools. Other streams of capital investment were also on an upward trend, but they had not had time to have a significant impact on the school estate.

3. It is also worth noting that much of the responsibility for capital investment is devolved, since those closer to the delivery of services are better placed than central government to decide expenditure priorities. So there was capital available that enabled schools and local authorities to invest in new laboratories but it was up to them to decide whether to spend capital on laboratories or on other capital needs.

4. To support the development of school science laboratories, the Department sponsored the design and construction of a series of exemplar laboratories across the country. These laboratories are all now built and are receiving visits from people engaged in developing school laboratories.

Question 88 (Chair): *Information on teachers who have a science qualification*

1. Data from the 2007 Secondary School Curriculum and Staffing Survey (SSCSS) are set out below. More recent information will be available when the results of the new School Workforce Survey are published next year.

2. Information on the qualifications of secondary school teachers and the subjects taught is collected in the SSCSS. The most recent survey was carried out in February 2007 by the National Foundation for Educational Research (NFER).

3. On pages 30–32 of the SSCSS report, NFER use the information collected in the Survey to replicate an earlier study on the Deployment of Mathematics and Science Teachers (DMS) analysing the proportions of teachers with particular science specialisms. The analysis in this note differs slightly from that in the main SSCSS report as Molecular Biology, Biophysics and Biochemistry have been re-classified as a Biology specialism only.

A list of the subjects which are classified as biology, chemistry, physics and other science specialisms is shown in paragraph 11.

[1] CLEAPSS School Science Survey, *Improving school laboratories? A Report for the Royal Society of Chemistry on the number and quality of new and re-furbished laboratories in schools,* October 2006, p 3.

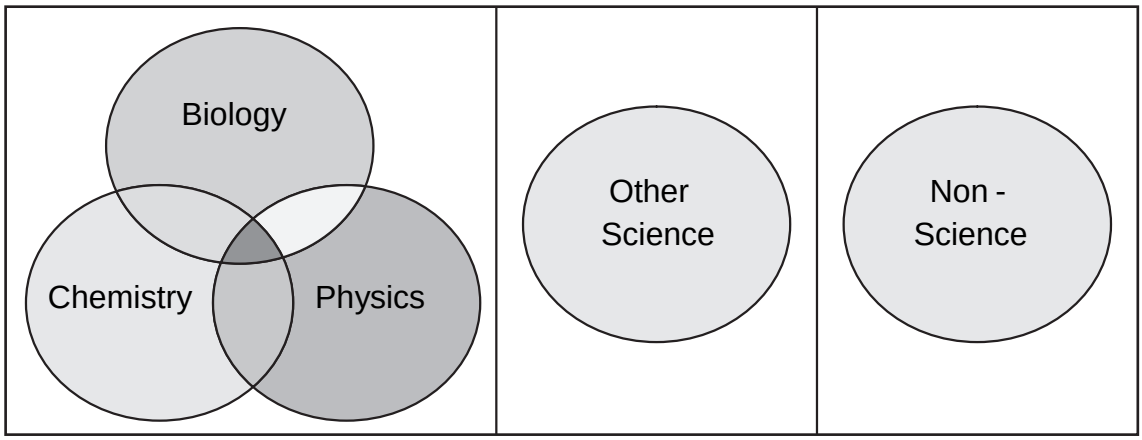
Proportion of science teachers who are specialists in Biology, Chemistry and/or Physics.

4. A science teacher is defined as any teacher delivering at least on period of science in a timetable rotation.

5. The pool of science teachers can be split into 3 categories, and sub-analysed within these categories as follows:

— those with a Biology, Chemistry or Physics specialism;
— those with an Other Science specialism; and
— those with a Non-Science specialism.

6. These three categories are mutually exclusive (a teacher cannot be counted in two of the categories), and can be depicted pictorially as:



7. The following table contains the figures from the diagram:

Subject	*Count of teachers*	*Per cent of teachers (Note 1)*
Biology (Note 2)	14,240	40%
Chemistry (Note 2)	7,360	21%
Physics (Note 2)	6,760	19%
Other Science	7,060	20%
Non-Science	3,560	10%
Total	38,980	109%

Base: 35,720 science teachers (weighted)

Note 1: The sum of the percentages does not equal 100 since the number of teachers with biology, chemistry and physics specialisms includes some double counting.

Note 2: Includes teachers with specialisms in more than one of the Biology, Physics and Chemistry specialisms

8. 40% of science teachers hold a Biology specialism, followed by 21 per cent holding a Chemistry specialism and 19 per cent holding a Physics specialism. Ten per cent of science teachers do not hold a science specialism. The table sums to more than 100% because of the double counting within the Biology, Chemistry and physics specialisms—with some teachers being specialists in more than one field.

Levels of qualification

9. The levels of qualifications are:

	Biology	*Chemistry*	*Physics*	*Other Science*
Degree or higher	88%	81%	75%	25%
Bed	6%	5%	6%	2%
PGCE	4%	11%	8%	66%
Cert Ed	1%	1%	2%	-
Other	1%	3%	8%	7%
Total	14,240	7,360	6,760	13,620

Totals may not sum to 100% due to rounding

10. In the three specialisms of Biology, Chemistry and Physics a high proportion of teachers hold degrees (or higher) in the subject. In Biology, 88% of qualifications held are at degree level or higher. The

corresponding figures for Chemistry and Physics are 81% and 75%. 'Other Science' qualifications tend to be PGCEs rather than degrees—this is mainly due to the high number of teachers with PGCEs in 'Science (including combined science)'.

11. The subjects which are classified as biology, chemistry, physics and other science specialisms are:

Subjects included as Biology

Anatomy, physiology and pathology/osteopathy
Biology
Botany
Ecology/entomology
Genetics
Medicine
Microbiology
Molecular biology, biophysics and biochemistry
Neuroscience
Nursing
Nutrition
Zoology

Subjects included as Chemistry

Chemistry
Medicine

Subjects included as Physics

Electronic and electrical engineering
Materials science
Mechanical engineering
Other engineering
Physics
Production and manufacturing engineering

Subjects included as Other Science

Applied science
Environmental science
Food and beverage studies
Forensic and archaeological science/ pathology /criminology
Health
Industrial studies
Medical technology
Opthalmics
Pharmacology, toxicology and pharmacy
Podiatry
Psychology
Radiography
Science (including combined science)
Veterinary Medicine and Dentistry and Physiology

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