



House of Commons
Science and Technology
Committee

**Practical experiments
in school science
lessons and science
field trips: Government
and Ofqual Responses
to the Committee's
Ninth Report of
Session 2010–12**

**Eleventh Special Report of
Session 2010–12**

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Science and Technology Committee

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Contacts

All correspondence should be addressed to the Clerk of the Science and Technology Committee, Committee Office, 7 Millbank, London SW1P 3JA. The telephone number for general inquiries is: 020 7219 2793; the Committee's e-mail address is: scitechcom@parliament.uk

Eleventh Special Report

On 14 September 2011 the Science and Technology Committee published its Ninth Report of Session 2010–12, *Practical experiments in school science lessons and science field trips* [HC 1060–I]. On 15 November 2011 the Committee received a memorandum from the Government which contained a response to the Report. The memorandum is published as appendix 1 to the Report, together with a response received from Ofqual (Office of Qualifications and Examinations Regulation), dated 16 November 2011, which is published as appendix 2.

Appendix 1: Government response

The Science and Technology Select Committee published the report of its inquiry into practical experiments in school science lessons and science field trips on 14 September 2011. The report focused on what schools need to do, with encouragement from Government, to overcome the perceived and real barriers to providing high quality practicals, fieldwork and fieldtrips as part of the science education they deliver.

This document sets out the Government's response to the eighteen conclusions and recommendations made in the Committee's report.

Conclusions and recommendations

In the responses below, the Select Committee's conclusions and recommendations are in **bold text** and the Government's responses are in plain text.

1. We conclude that both practical lessons and learning outside the classroom are essential contributors to good quality science education.

The government agrees that practical lessons, field work and field trips are essential contributors to good quality science education. [We share the view expressed by SCORE (Science Community Representing Education) that science is of its nature a practical as well as an academic subject.] It is important that pupils are taught the essential knowledge and theories of science and also the techniques of science. The new National Curriculum for science will reflect the importance we place on both these aspects of science.

It is not, however, the place of the National Curriculum to prescribe the detail of how teachers should teach science.

2. We found no convincing evidence that health and safety legislation itself prevents science practicals or field trips.

The Government welcomes this finding and also acknowledges the Report's conclusion that health and safety concerns and the amount of paperwork can influence the level of practical work and the number of field trips. The Government has taken steps to address these issues.

The Department for Education published in early July 2011 its advice on health and safety law as it affects schools. This is available at <http://www.education.gov.uk/schools/adminandfinance/healthandsafety/f00191759/departmental-advice-on-health-and-safety-for-schools>. The Government is determined to reduce burdens on schools. We want to simplify health and safety requirements and explain them better. The Government is making it easier for schools to take pupils on trips, removing paperwork and taking steps to reduce teachers' concerns about the threat of legal action. Teachers should be confident that they know best how to look after pupils and keep them safe.

This document summarises the existing health and safety law relevant to schools and explains how it affects local authorities, governing bodies, head teachers and other school staff. It covers activities that take place on or off school premises, including school trips.

Furthermore, the Department for Education is also working with the Department for Work and Pensions on its review of health and safety legislation. We will take a view on how the legislation can be removed, amended or at least made simpler to understand—so that over-zealous interpretations, which inhibit school activities and visits, can be offset.

3. We recommend that the Government work to establish a central repository or facility (or network of such facilities with a common interface) which will contain details and guidance on standard experiments. This facility should provide access, for member schools, to any CLEAPSS provided health and safety guidance for those experiments.

The Government believes that teachers should be free to decide which standard experiments they use in the classroom, including the resources they draw upon to help them do so. Support is available from a number of authoritative organisations. The network of science learning centres, which the Government is funding, provides courses on practical experiments such as the CLEAPSS Practical skills and Techniques in Chemistry course for technicians and teachers. Organisations such as the Institute of Physics, the Royal Society of Chemistry, the Society of Biology, SCORE and the National STEM Centre provide details and guidance on practical experiments, including health and safety guidance, that can be used in the classroom and school science laboratories.

5. We have not been convinced of the merits of an accredited course, which was advanced by Professor King of the Earth Science Teachers' Association but we do recommend that all trainee science teachers should be expected to prepare successfully and lead at least one fieldwork session themselves, and to take part in a field trip before acquiring qualified teacher status.

6. The Government should require that, in order to advance over pay thresholds, a science teacher should demonstrate he or she has maintained the practical classroom skills, fieldwork and associated risk assessment skills necessary to be a good science teacher.

The professional standards which underpin the assessment of those teachers wishing to advance over the pay threshold to the upper pay scale are currently being reviewed by an independent Teachers' Standards Review Group. It is important to note, however, that pay

is outside its remit, as it remains a matter for the School Teachers' Review Body (STRB) to advise us on.

The Review was launched on 11 March this year, and looked initially at the existing standards for Qualified Teacher Status (QTS) and Core (the standard that teachers are currently required to meet at the end of their statutory induction period). Ministers accepted the recommendation from the Review's first report, published on 14 July 2011, that a single set of standards should replace those for QTS and Core. The new Teachers' Standards, which will come into effect on 1 September 2012, have a tighter focus on the key elements of teaching and set the minimum level of practice and conduct required of all teachers, including trainees.

We agree that it is important that all teachers should be able to prepare or take part in activities, such as leading or taking part in science field trips. The new Teachers' Standards will require all teachers to demonstrate good subject and curriculum knowledge, and demonstrate they plan and teach well-structured lessons. This includes planning activities and trips to consolidate and extend the knowledge and understanding pupils have acquired. However, it is not for the Government to prescribe the content of initial teacher training (ITT) courses. It will be the responsibility of individual providers to ensure that the content of their courses enables trainees to demonstrate that they meet the new Teachers' Standards.

Establishing a clear set of standards for teachers is just one of a number of steps the Government is taking to improve teacher quality. The Review Group is expected to submit its final report and recommendations in the autumn after it has considered the existing standards for Threshold, Excellent Teacher and Advanced Skills Teacher.

8. We reiterate the recommendation of our predecessor committee for action to be taken to “address the appalling pay and conditions of science technicians and to create a career structure that will attract skilled and dedicated people to work as technicians”.

The Government recognises and fully appreciates the important and valuable contribution that science technicians make in schools. We know that head teachers and school governors value the role of support staff and that those staff can have a very big impact on science teaching.

We want every member of staff, regardless of their role in the school, to be able to give their best in supporting the success of children and young people and to feel valued for the work that they do. We believe that this is best achieved by allowing schools the freedom to organise themselves without undue or unnecessary influence from Government, including allowing them increased flexibility over pay and conditions and the freedom to manage staff and resources in a way that reflects local priorities and needs.

4. We strongly recommend that Ofsted report on how effectively schools provide opportunities for their science teachers to stay up to date with their science specialism, specifically in attendance of externally provided subject training, as part of Schedule 5 inspections under the current heading of “The effectiveness of leadership and management in embedding ambition and driving improvement”.

7. A school providing science courses at GCSE and A level should be required to demonstrate, during Ofsted inspection, it has ready access to a basic suite of facilities such as fume cupboards to facilitate rigorous examination of science skills. It would be incumbent on the Government to identify what a basic suite of facilities would be for the benefit of both senior management teams and examination boards.

9. We recommend that, when carrying out a Schedule 5 inspection, Ofsted should explicitly report on the management of science laboratories and, during a specialist science visit, the relationship between teachers and technical staff in the planning and delivery of practical lessons should be a key part of that inspection.

With regard to recommendations 4, 7 and 9, Section 5 inspection is not a suitable vehicle for investigating the specialist areas identified by the Committee. It is intended that from January 2012, these inspections will focus on the core areas of teaching, pupil achievement, behaviour and safety, and leadership.

Ofsted's programme of science survey visits, carried out by specialists, does, however, enable it to investigate the issues raised by the Committee. Subject training and ongoing professional development are, and have been for some time, a focus of all science visits, and figured prominently in the last science report. Ofsted has not reported recently on science practical facilities or the work of science technicians but can do so in future reports. Ofsted can also, within its current methodology, ensure that science inspectors report on these areas more systematically in future.

With regard to Government identifying a basic suite of facilities, the Review of Education Capital, carried out by Sebastian James, recommended that there should be a clear, consistent Departmental position on what fit-for-purpose facilities entail, and that standardised drawings and specifications should be developed. The Department accepted this recommendation in July. Ministers have committed to consulting as designs are developed, and we will encourage the involvement of the science education community in this process. The designs would apply to new or refurbished facilities.

11. We recommend that, in its response to this report, the Government set out in detail how its “exhortation and facilitation” policy will work and what ministers will do that is distinct from their predecessors.

From the outset the Government has clearly set out its firm commitment to transform radically this country's education system so that it provides all children with a rigorous and challenging education which stands up to the best internationally. Ensuring children master the essential knowledge in science is at the heart of this. Our vision is for standards to be raised in all schools through increasing the rigour and challenge of the curriculum taught and the qualifications taken.

A leading example of the approach is the English Baccalaureate (EBacc). Through the EBacc we are using the levers of transparency of information and accountability to the public to exhort schools to offer more pupils a broad core of academically rigorous education. The evidence we have is that schools have responded strongly to this, and that many more students are now opting to take the subjects within the EBacc, even though it has introduced no new obligation or compulsion. This is a fundamental departure from our predecessors' approach of regulation, guidance, direction and top-down centralised

programmes. A further example is our removal of less appropriate vocational qualifications from performance tables, removing perverse incentives on headteachers and so freeing them to offer rigorous, high quality qualifications (vocational and academic) of the greatest value to their students, rather than those which boosted school league table performance but gave little or no benefit to pupils.

The Secretary of State for Education in recent speeches, such as that to the Royal Society in June this year, has made clear the fundamental importance of science education and the need to improve it.

We are continuing to work with universities and learned societies such as the Institute of Physics, the Royal Society of Chemistry and the Society of Biology to use their expertise to take forward reforms of curriculum and qualifications and teaching. The network of Teaching Schools, many of which will lead on science, is about enabling the best schools to support other schools around them, drawing on the expertise of experienced and successful teachers to enable other teachers to teach in a way that inspires and engages their pupils.

We are funding specific programmes that enable and encourage more students from a broader ability range to study GCSE triple science which provides a more challenging science programme and will ensure more go on to study these subjects at A level. The Stimulating Physics Network is very much about inspiring more students to study physics, and the network of science learning centres is central to our aim to improve the quality of science teaching, providing professional development opportunities including how to teach good practical experiments.

12. We conclude that the Government has to ensure that students appreciate that the practical side of the sciences, as well as the theoretical, can lead to employment opportunities and that the qualifications which are offered facilitate students from among a wider ability range to study triple science at school.

The Government signalled its commitment to engage more pupils in GCSE triple science in the Schools White Paper. Triple science should not be the preserve of the brightest pupils and we intend to make triple science more accessible to more pupils in more schools. The inclusion of triple science in the English Baccalaureate will help achieve this aim. We are also funding the Triple Science Support Programme (TSSP) to focus on widening participation in triple science, especially in those schools not currently offering this option and making sure more pupils eligible for free school meals are able to study it. An important part of the TSSP's work will be to demonstrate to pupils the advantages of studying triple science including future education and employment opportunities.

13. We recommend that the Government seek to change this narrow perception of how schools should be measured against each other by promoting, for example in league tables, the various measures of science success such as the number of teachers in the school to achieve chartered status and participation by pupils in, for instance, the Crest awards.

We are making changes to school accountability to ensure that schools are properly recognised for giving pupils the opportunity to take and pass high quality qualifications that give them the best opportunity to go on to further education and work. The inclusion of an EBacc measure in the Key Stage 4 tables will encourage schools to offer a broad set of

academic subjects to age 16. The EBacc will cover achievement in science as well as English, mathematics, languages and humanities.

In addition to EBacc science results, we aim to publish results for individual subjects/qualifications including individual sciences (all GCSEs and equivalents). Our objective is to create a fully flexible dataset that will: allow parents, inspectors, governors, and the public to challenge schools on their performance; support school improvement; and open up underlying data to allow users to create and compare the information of most importance to them.

10. We recommend that Ofqual direct examination boards to require a fieldwork component to science courses in which students must collect data as part of fieldwork outside the classroom and prove a level of competence in its analysis and that the Government give clear guidance to schools on how the pupil premium might be used to meet this requirement.

14. We welcome the Department's commitment to assessment of practical skills in and out of the laboratory within the formal examination system. We recommend that the Department implement this within a five year timescale.

15. To ensure the best possible use of these facilities, we recommend that Ofqual direct examination boards, within five years, to require an examination that properly assesses both students' laboratory skills and their technique and understanding of the experimental process.

With regard to recommendations 10, 14 and 15, as indicated in the Schools White Paper, the Government intends to reflect the outcomes of the National Curriculum review and the new Programmes of Study for science when considering the long term reform of GCSEs. As part of this process we will assess and take further advice on the extent to which the ability to undertake practical experiments in laboratory, field and other environments should and can be effectively assessed through formal examinations.

We will also look to universities to advise on the extent to which practical experiments and field study should be part of A level specifications in science subjects in the future in order to provide appropriate preparation for degree level study of science subjects.

The Pupil Premium is specifically designed to boost the attainment of pupils from low-income families—those currently known to be eligible for Free School Meals—and children looked after continuously for more than 6 months. The Government believes that these additional resources are the best way to address the current inequalities by ensuring that funding to tackle deprivation reaches the pupils who need it most.

While we recognise the importance of a fieldwork component to science courses, it is not the Government's intention to tell schools how they should use the Pupil Premium. The Government believes it is for schools to decide how the Premium is spent since they are best placed to assess what additional provision should be made for pupils.

16. We welcome the Government's intention to slim down the science curriculum. The Government should seek to ensure that the time gained through the slimming down of the curriculum is used to broaden the teaching of science and its practical aspects rather than more time to revise courses for examinations.

The commitment to slim down the National Curriculum is not specific to science but covers the whole of the National Curriculum. As the National Curriculum has developed overall, it has come to cover more subjects and topics, prescribe more, and take up more school time than originally intended. The Government believes the main purpose of the National Curriculum should be to set out the essential knowledge that every child should learn—including in science. We therefore intend to set out a new National Curriculum that is much clearer about the science that pupils should be taught, including the practical aspects of science.

17. The Government should seek to secure the long term future of the STEM Directories as a tool to encourage good quality enhancement and enrichment activity, reduce gaps in provision and facilitate more providers and schools to participate. The relatively small amount of money involved should be found directly by Government or by encouraging sponsorship within the science community and providers of enhancement and enrichment activities.

The Government has committed to funding the STEM Directories over the current spending review period so that they continue to provide all schools with access to good quality resources and activities that can be used in the classroom to support science teaching.

18. We recommend that science organisations build on the STEM Directories and the similar Getting Practical website as useful starting points in providing gateways through which teachers might more easily engage with enrichment and enhancement activities.

The Government supports this recommendation and welcomes the range of resources already provided by organisations such as the learned societies, SCORE, the Association of Science Education and the National STEM Centre.

Appendix 2: Ofqual (Office of Qualifications and Examinations Regulation) Response

Further to the recent publication of the above named report, I should like to put on record with the Select Committee, the details of the actions which Ofqual is planning to undertake as a result of the recommendations suggested in the report.

Ofqual has two direct recommendations which are detailed below together with our response.

Report Recommendation 10

We recommend that Ofqual direct examination boards to require a fieldwork component to science courses in which students must collect data as part of fieldwork outside the classroom and prove a level of competence in its analysis and that the Government give clear guidance to schools on how the pupil premium might be used to meet this requirement.

Report Recommendation 15

To ensure the best possible use of these facilities, we recommend that Ofqual direct examination boards, within five years, to require an examination that properly assesses both students' laboratory skills and their technique and understanding of the experimental process.

Ofqual response to both recommendations

The findings of the Select Committee will be important inputs as new criteria are developed for qualifications and we will ensure that both recommendations are carefully considered. As noted in the written submission from the DfE, new GCSE qualifications will be produced to accompany the implementation of the revised Key Stage 4 Programme of Study. We are also presently reviewing how Higher Education can be more involved in the development of A level qualifications. We expect relevant development work at both GCSE and A level to begin next year.

In summary, Ofqual is pleased to receive the helpful information and recommendations contained in the Select Committee Report. We recognise the importance of practical experience in GCE and GCSE science qualifications and the wish of the Committee that all students are given opportunities to develop their practical skills. Requirements for GCSE and A level qualifications are embedded in the subject criteria published by Ofqual. We will work with the DfE to ensure that when the criteria are next revised, the findings and recommendations of the Committee are given full attention.