

**Submission to the House of Commons Education and Skills Select Committee Inquiry into Testing and Assessment****May 2007****1 Summary**

- 1.1 The UK needs a better supply of talented and enthusiastic individuals entering science and engineering, yet it is clear that aspects of our current assessment system are holding back students' and teachers' performance and creativity, contributing to a declining popularity in the physical sciences and mathematics and inadequate recruitment and retention of specialist teachers in these subjects.
- 1.2 The English system of testing and assessment is supposed to bring accountability and improved performance to schools, yet also brings significant costs and time burdens to schools' administration and teaching. There is little evidence to suggest that these costs are being outweighed by benefits to individual learners; indeed there is plenty of evidence to suggest that an over-reliance on teaching to the test results in a negative attitude towards science in schools.
- 1.3 It is not clear where responsibility for improving testing and assessment lies. The relationship between the Qualifications and Curriculum Authority (QCA), National Assessment Agency (NAA) and Department for Education and Skills (DfES) should be clarified; the contributions made by charitable trusts, researchers and other independent organisations should be recognised and consolidated; and the role of awarding bodies as barriers to and instruments of constructive change should be further investigated.
- 1.4 The relative lack of timely research, development and implementation of innovative assessment, particularly combinations of formative and summative assessment, threatens to undermine the impact of recent valuable reforms to the science curriculum and improvements in the provision of continuing professional development for science teachers.
- 1.5 England remains the least progressive of the UK nations in its attitudes to assessment. Both Wales and Northern Ireland have turned their back on statutory, external testing at Key Stages 1, 2 and 3, and the 'Assessment is for Learning' programme in Scotland has introduced the Scottish Survey of Achievement which uses only a sample of schools and pupils across Scotland instead of assessing every pupil in every school.

**2 About the Royal Society**

As the UK's independent national academy of science, the Royal Society promotes excellence in science, engineering and technology, both in the UK and internationally. One of the Society's main strategic aims is to invigorate science and mathematics education by working in partnership, drawing on the best available evidence, leading new thinking, and championing science, technology, engineering and mathematics (STEM) education in schools and colleges. For more information please see our website at [www.royalsoc.ac.uk](http://www.royalsoc.ac.uk)

### **3 The assessment of science learning 14-19**

In 2003 the Royal Society commissioned a piece of research into the assessment of science learning among 14-19 year old students from the Science and Technology Education team at King's College London who are experts and leaders in this field. The resulting report made a powerful case for the detrimental effect the English assessment system is having on the teaching and learning of science, and the inextricable links between assessment, curricula and pedagogy. The report was published in June 2004, along with a statement from the Royal Society outlining key principles for assessment, and recommendations for the future. The report and the statement can be accessed and read online here:

<http://www.royalsoc.ac.uk/page.asp?tip=1&id=1989>

### **4 The English system of testing and assessment is not fit for purpose**

The system of testing and assessment in England is failing to fulfil its many purposes and satisfy its many stakeholders: parents dispute its value in helping them choose schools and colleges for their children and are concerned about the stress imposed by the frequency of high-stakes tests; higher education institutions increasingly dismiss it by developing alternatives, such the Cambridge pre-U; employers frequently claim that its results tell them very little about the quality of potential employees; teachers feel it has weakened their practice and undermined their professionalism; young people devalue their own learning as a preparation for tests rather than a preparation for life; and the Government itself has recognised the inadequacies of teaching and learning dominated by national standards and accountability by developing new 'value-added' measures for accountability and opening a debate about options for developing a more formative approach to data and assessment<sup>1</sup>.

### **5 The current assessment regime is stifling creativity in science teaching and learning and does not adequately promote increased scientific understanding among young people**

Creativity in science is stimulated through good quality investigations and inspiring teaching, allowing students to explore and test ideas about the world around them. The current assessment system constrains this creativity by giving a high priority to what is easily measured (namely the recall of scientific concepts rather than the demonstration of scientific thinking and skills), and weakening the ability of teachers to adapt to the needs, aptitudes and motivations of the students in their classroom, the fast-changing world of science, and the complexity of wider social attitudes to science. At worst, research suggests that assessment is responsible for negative attitudes to science among young people, leading to lower motivation and self-esteem, and enhancing the gap between low and high-achievers, and has reduced GCSE science investigations to stereotyped exercises widely recognised to be of little interest or value to students, and vulnerable to plagiarism and cheating.

The Royal Society believes that current assessment procedures assess too narrow a range of skills within investigative work and the wider competences needed by future employers, and that there is an overemphasis on 'teaching to the test' in schools and colleges. We recommend greater use of formative assessment, broadening the range of assessed skills associated with the investigation of scientific ideas, and investing in research into innovative approaches and technologies.

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<sup>1</sup> *Making Good Progress* (2007) Consultation document from the Department for Education and Skills.

## **6 The assessment system entails significant costs in terms of teacher time and school/college finances**

A study conducted by PriceWaterhouseCoopers (PWC) for the Qualifications and Curriculum Authority examined the costs of administering the English exam system in 2003-04<sup>2</sup>. The scope of the study included Key Stage tests (primary and secondary), GCSEs, AS and A-Levels, as well as vocational qualifications. The overall cost of administration was found to be £610m, broken down into direct costs of £370m (the cash costs to the relevant organisations, such as QCA, awarding bodies, schools and exam centres) and £240m in time costs for staff delivering examination-related activities. The report did not include the significant cost of the work of teachers and lecturers undertaking assessment activities, as this was found to be very difficult to quantify robustly.

An preliminary investigation into the time costs of assessment in English schools, prepared for the Royal Society in 2003 by the Centre for Science Education at Sheffield Hallam University, goes some way towards answering this question. Focusing on science subjects in five primary and nine secondary schools, the study found that pupil and teacher time spent on statutory assessment processes varied significantly at different levels, peaking at Key Stage 4. These processes included teacher assessment, dealing with data, end of key stage tests, moderation, report writing and parents' evenings. It was found that teachers spent little of their time on assessment in earlier schooling years, but this increased significantly at Key Stage 3 and onwards. At Key Stage 3 approximately 26 percent of teachers' total available working time was estimated to have been spent in assessment activities (based on teaching two groups in each of Y7, Y8 and Y9) and at Key Stage 4 10 percent of time was spent on assessment activities, based on teaching three Key Stage 4 groups. Pupils spent approximately 17.5 percent of lesson time undertaking assessment activities at Key Stage 3 and year 10, rising to 28 percent in year 11. At A-level the amount of time spent on assessment as a proportion of workload reduced for both teachers and students to 10 percent of teacher time and 19.5 percent of lesson time for students.

Two Scottish primary schools and two secondary schools were included in the study for the purpose of comparison. The difference at secondary level was marked. English teachers dedicated more than twice the amount of time each year, on average, to assessment activities than Scottish teachers at the equivalent of Key Stages 3 and 4, and almost seven times as many hours at the equivalent of AS/A2. Even allowing for underestimation of marking time by Scottish schools these differences are significant.

Given the potential impact on teaching and learning outcomes, the extent of student and teacher time dedicated to assessment is an area that warrants further investigation, particularly in light of the proposals contained in the DfES' *Making Good Progress* report. It is not only the time involved in actual implementation that needs to be taken into account, but also the significant costs involved in piloting changes and retraining teachers and examiners.

## **7 The role of the Qualifications and Curriculum Authority, and its relationship with the Department for Education and Skills, needs clarification**

The Qualifications and Curriculum Authority is a non-departmental public body (NDPB) whose purpose is given in the Public Bodies Directory 2006 as 'To work with and assist the Secretary of State for Education and Skills to ensure that the curriculum and qualifications available to young people and adults are high quality,

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<sup>2</sup> *Financial Modelling of the English Exams System 2003-04* (2005) A report prepared for the Qualifications and Curriculum Authority by PriceWaterhouseCoopers.

coherent and flexible'. As an NDPB the QCA is enabled to operate at arm's length from DfES Ministers and Civil Servants and with some independence, but Ministers are ultimately responsible to Parliament for a NDPB's independence, its effectiveness and efficiency<sup>3</sup>.

The QCA gives its three main functions in its 2002 Quinquennial Review<sup>4</sup> as:

- advising ministers on qualifications, curriculum, and assessment;
- regulating the quality of qualifications and standards; and
- delivering the national tests.

The review acknowledged tensions between the first two of these roles, being drivers of change as well as 'guardian of standards', and stated QCA's belief that the third was outside their core business. In April 2004, the National Assessment Agency (NAA) was launched by the DfES as a subsidiary of QCA to separate the delivery of tests and assessments from QCA's regulatory activities.

We suggest that the deep, widespread, and sustained dissatisfaction with the current assessment system therefore represents a significant weakness in the relationship between the QCA, NAA and DfES. This may be good reason to undertake a more detailed review of this issue.

Organisations throughout the science education community have done much over the years to research, develop and pilot new qualifications and assessment, and assist QCA in their regulatory role. Constructive relationships with QCA should be built upon, and greater consideration given to the development of structures and processes for drawing on the scientific community's expertise and commitment to ensure that, where appropriate, curriculum content and assessment is truly contemporary and informed by modern research.

Equally important, the role of awarding bodies as both barriers to and instruments of constructive change to our assessment system may benefit from urgent, independent inquiry.

## **8 Investment in and timing of assessment reform suggests it is either an afterthought or considered too difficult by Government**

While the content and structure of curricula for 11-19 year olds are rightly being developed to better accommodate the needs of all learners, less care has been taken to ensure that the assessment regime is similarly developed to be widely relevant and engaging, and a fundamental part of the training, support and professional development of science teachers. Given the way assessment frequently drives teaching and learning in the classroom, it is disappointing that it is often the last aspect of teaching and learning to be reviewed. For most examples of curriculum change, assessment has essentially been an afterthought. In particular we note with concern that while a new Key Stage 3 science programme of study has been drafted and consulted on ready for teaching from September 2008, the statutory assessment materials may not be available until 2011. Coming during a period of significant change across secondary school science, this lag could seriously undermine the impacts of Key Stage 3 curriculum reform and we recommend that the new

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<sup>3</sup> *Public Bodies: A Guide for Departments* (2006)

[http://www.civilservice.gov.uk/other/agencies/guidance\\_for\\_departments/pb\\_guidance/index.asp](http://www.civilservice.gov.uk/other/agencies/guidance_for_departments/pb_guidance/index.asp)

<sup>4</sup> Quinquennial Review 2002, Qualifications and Curriculum Authority.

[http://www.qca.org.uk/downloads/quinquennial\\_review.pdf](http://www.qca.org.uk/downloads/quinquennial_review.pdf)

Key Stage 3 science curriculum undergoes a pilot stage from 2008 to enable teaching, learning and assessment to undergo some formative evaluation before being made statutory.

Furthermore, we strongly recommend that any reformed system of assessment should be adopted as policy only after thorough trial and evaluation with the involvement of practitioners and with due regard to the time needed for associated professional development and dialogue with stakeholders. We cannot risk any new system merely changing the nature of the burden on teachers, rather than reducing it.

## **9 Research and development in the UK and elsewhere shows more successful alternatives are possible**

Other systems of assessment merit closer investigation. In Australia, where 80% of students stay on at school until age 18 and approximately 65% go on to some form of higher education, there is no national assessment system; each state-based examination board offers its own form of assessment<sup>5</sup>. Teacher assessment is widespread, though is not always consistent across schools.

The Scottish Survey of Achievement (SSA) was introduced in 2005 as part of the 'Assessment is for Learning' (AifL) programme in order to find out how well pupils are learning in primary and first two years of secondary schooling in Scotland. Since then, the SSA has surveyed English language (2005) and social subjects (2006). The 2007 survey will focus on science, science literacy and core skills. The survey is designed to report on pupils' overall performance at both the national and local authority levels. It will not report separately on either schools or individual pupils. The SSA is a sample survey: it uses only a sample of schools and pupils across Scotland instead of assessing every pupil in every school.

Indeed England remains the least progressive of the UK nations in its attitudes to assessment. In response to the Daugherty report, the Welsh Assembly have abolished statutory external testing at the end of Key Stages 1, 2 and 3 and replaced it with teacher assessment, and the Department for Education in Northern Ireland has also legislated to abandon statutory testing at the end of these Key Stages. There will clearly be much for England to learn from the experience of these forward-thinking nations.

Some new qualifications available in English schools have embraced innovations in assessment, including the 21<sup>st</sup> Century Science GCSE, the Perspectives on Science AS level, the GCSE and GCE A level in Applied Science, and the GCSE in Environmental and Land-Based Science. It will be important for the wider community to have sight of the monitoring and evaluation of these changes and to discuss them in the context of science education policy and research.

The overall burden of assessment may be reduced by assessing skills and competences which cross curriculum subject areas. This was an ideal fully embraced by Mike Tomlinson in his report on 14-19 education, but has so far failed to satisfactorily materialise in the Government's plans for reform; for example, research into, as opposed to piloting of, the Extended Project appears to have been rather muted.

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<sup>5</sup> Brown, R. (2003) *Assessment in Science Education in Australia*. Paper included in *Assessment of science 14-19* (2004) King's College London.

In 2005 the OECD published a report on formative assessment based on the study of exemplary practice in secondary schools in Australia, Canada, Denmark, England, Finland, Italy, New Zealand and Scotland<sup>6</sup>. The report acknowledged that despite promoting formative assessment within their education systems, there remained major barriers to wider practice. The report outlined policy principles for formative assessment to promote wider, deeper and more sustained practice:

- keep the focus on teaching and learning;
- align summative and formative assessment approaches;
- ensure that data gathered at classroom, school and system levels are linked and are used formatively;
- invest in training and support for formative assessment;
- encourage innovation;
- build stronger bridges between research, policy and practice.

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<sup>6</sup> Formative assessment: improving learning in secondary classrooms (2005) Centre for Educational Research and Innovation, Organisation for Economic Co-operation and Development (OECD).