Science Examinations – Ofqual reports

Ofqual published five reports today, including one on science GCSE 2007 to 2008 and another on physics examinations 2001 to 2007. The GCSE science report raises significant concerns and Ofqual is requiring awarding bodies to make improvements for 2009, including improving the quality of questions, tightening marking criteria and providing further training for senior examiners.

The physics report identifies a decline in the standards of performance at GCSE and variations in the standards of performance across awarding bodies in both GCSE and A level. The physics GCSE specifications operative in 2007 have since been replaced. Ofqual will be working with the awarding bodies to ensure that inter-board discrepancies are resolved.

For more detail, including the full reports follow the link to Ofqual website:

http://www.ofqual.gov.uk/2219.aspx (opens a new browser window)

Commenting on the reports School's Minister Jim Knight said that he is concerned about the issues highlighted and he welcomes the immediate actions on science being taken by Ofqual. He also reiterated that there were issues with a limited number of exams and that this was not a reflection of the exam system overall. Please visit the link below for the full press release from DCSF:

http://www.stemforum.org.uk/?page_id=126 (opens a new browser window)

You can also listen to Chair of Ofqual Kathleen Tattersall, and School's Minister Jim Knight on the Today programme:

http://news.bbc.co.uk/today/hi/today/newsid_7967000/7967254.stm (opens a new browser window)

What more could be done to ensure that GCSE science assessments are valid and reliable and have a positive impact on teaching and learning?

Dr K Carey 27/03/2009 at 18:00

Maybe we need to be a bit more honest with the kids.... I don't think core science should really be termed 'science' if it is to remain in its current format. It's better to call it GCSE scientific literacy and stop kidding them. Less tick boxes and more writing in continuous prose would help for a start. It undermines the cross curricular emphasis on literacy when they think they can come to science and sentences and spelling etc don't matter. My top chemistry students get frustrated that the exams are too closed and don't allow them to show what they know.

mark gooding 28/03/2009 at 22:03

When one exam board is taking the majority the students and they have a lower pass rate, it would seem prudent to make them raise their pass rate, rather than get the other boards to lower theirs, or I am living in cloud cuckoo land?

So the recent OfQual report into science hasn't come as a shock to me

mark gooding 29/03/2009 at 11:02

A little clarification to my last post

One board had a large number of students taking science; other boards played the supermarket game and lowered their pass rate to attract more customers. Rather than making them raise their, now lowered, pass levels, the larger board was asked to lower theirs to make it "fair"

Gren Ireson 30/03/2009 at 12:45

Is this issue simply a case of GCSE never being able to assess the wide range of students under one examination? I am a great supporter of science for all but not that it is the same science for all. I feel we have over sold science for the 14-16 age group and find ourselves with something some now argue is not 'science'. I think is a moot point since we could level the same argument at, for example, history or english literature these GCSEs don't make you an historian or expert in literary criticism but we don't say lets call them historic literacy ....

If we had a system which allowed informed decissions to be made at age 14, which should include some science, then students could opt into a more appropriate course of study with a matched assessment structure. Unfortunately we had such a system which included things like Control Technology [O-level], Engineering Science (applied electronics or automotive engineering)and Rural science [both CSE courses] but then National Curriculum Science, one size fits all, came and took away such courses - shame.

Kevin Watson 30/03/2009 at 17:27

Mike Cresswell, of the AQA exams board, summarised the problem faced by Science GCSEs when he said "he was disappointed that the regulator did not address the inevitable conflict between the need to create a scientifically literate population at the same time as training world-class scientists." What I understand

by this is that as a result of the increased focus over the past few years towards "creating a scientifically literate population" the education system has become less focused on "training world-class scientists". This has been reflected in a general decline in examination standards.

I believe it should be possible to do both, and I welcome the long-awaited tightening of standards which should help to give the most able students the challenge and recognition they deserve.

Brian Follett 12/05/2009 at 10:48

When the PISA science results emerged (later to be added to by the TIMMS) data I had the temerity to put up documents on this STEM Forum. This was my personal response to the PISA data dn it bears upon the issue of what is STEM being taught for at school. Despite being a scientist all my life I think we ought to change things...

"(a) England does very well at the upper end, especially at Level 6. This reinforces the fact that there is a supply of young people in English schools who have the interest and potential to undertake STEM careers and to do so at a high level. Indeed this cannot be a new phenomenon since the UK universities produce well above average numbers of STEM graduates compared with other countries. I find this entirely encouraging and the trick is to convert this interest into taking STEM degrees at university.

(b) In the middle ground (Levels 3 and 4) England performs much as the OECD average and other competitor countries.

(c) We do much less well at the lower end and the figures speak for themselves. Again this is not unexpected because we are all aware that England has far too long a tail in pupil attainment. Hence the governments new initiatives on the 638 challenge schools. However, the figures do mean that a great number of pupils are not being well taught in science and leave school ill-equipped for a century when science and its products remain critical.

(d) For many of the average and below average pupils the issues, of course, relate more to scientific literacy and it was this which the new science GCSEs are attempting to address. How can one have a rational debate about nuclear power, stem cells, GM crops, biodiversity, evolution or climate change if the general public is not equipped to evaluate the arguments?

(e) It all rests upon an odd feature of how science is introduced and taught at school. As Osborne & Dillon emphasise once again (Science Education in Europe: Critical reflections, January 2008, report to the Nuffield Foundation) the

subject is unique in its curricula are still dominated by the needs of the nation to produce the next generation of scientists and not by scientific literacy as the first step. Contrast this with what happens in, say, English.

(f) The new GCSE curriculum is recognises this and attempts to serve two roles: a core of scientific literacy with optional additions to cater for those with particular interests in science. But the pressures from those primarily interested in the numbers of professional scientists (this includes, of course, everything from engineering through the core sciences to medicine) continue to contest this view and promulgate triple sciences at GCSE as the preferred option.

(g) The advantages of this as a solution are evident from the table and it will ensure a steady flow of professional scientists. But we shall certainly divide the subject because it will become obvious to pupils, their families and schools that opting for single or double award general science will make it more difficult to read a STEM subject at university. Quite how the new Diploma in Science fits into this mix will become evident in coming months.

(h) What do you think? As a lifelong scientist I am torn but I think that if I had a magic wand then I would keep science education at school broader than the triple science/ advanced levels allow, so raising the emphasis on scientific literacy. But for potential professional scientists I would insert a much stronger first year at university which tackles (in the individual subjects) what is needed to take a proper four-year science degree."

Matt Edwards 07/06/2009 at 15:12

I think that Brian makes some interesting points concerning the future of STEM. However, in response to your suggestion that students should have a tough first year at university, I think there may be a few problems. Firstly, are we not just moving the goalposts, where students who thought they were competent and interested in science, now get the 'real' science at university, where they are 'lock in' to its study. Secondly, science is 'hard' but then so is any other subject if it is taught properly. I think this comes down to the perception of STEM in the UK - the fear of the 'geek' factor. However, personally, I have attempted to engender a sense of 'geek-chic' in its study. In fact, in study of anything! Thirdly, I think school is meant to be challenging and it is students that are meant to be challenged, and shown how to overcome these challenges, rather than removing the 'difficult' stuff. So, if I had a magic wand, I think I would focus on changing the perception of STEM and study and show how relevant it is and how brilliant it is. Then, students would be up for the challenge...naive perhaps, but I believe we need to be willing to teach our students courage. Thoughts?

mark gooding 08/06/2009 at 10:05

We seem to have lost the broader range of subjects as mentioned by Gren.

I have said it before, but you can't sell anything unless the customer comes into the shop. All STEM subjects are fun and attainable, but on different levels and with different sugar coatings.

Once we grab the students enthusiasm we can steer them to a higher level

The "one size fits all" is outdated now, just keep chanting the "Every child matters" mantra, well it does until budgets, staffing, rooming & other students gets in the way!

What are your views on physics A level examinations? What improvements could be made?

Alice Onion 28/03/2009 at 06:03

I would like to see changes to the way we organise GCSEs and A levels nationally. We currently have five different awarding bodies providing GCSEs and A levels. I am not surprised that Ofqual find there are differing standards across the different physics examinations. For there not to be, mark schemes for each examination would need to be consistent and there would need to be close working across awarding bodies at the stage of setting grade boundaries. As an alternative, I would like to see awarding bodies compete to run each subject. We would then have only one physics GCSE and one physics A level. This could also push up quality.

Clive Neal-Sturgess 30/03/2009 at 10:36

For a long time now the physics A level syllabus has been largely irrelevant to most engineering subjects at University. This combined with the small number of candidates taking the examination, are the reasons why so few engineering departments require it for admission. Either the syllabus needs a drastic overhaul, to include much more emphasis on analytical techniques such as calculus, or as Alan Wilson suggests in last week THE, a new Further Physics A Level is required to parallel Further Mathematics.

Gren Ireson 30/03/2009 at 12:45

Regarding physics A-level I cannot agree with Alice's comment which seems to be heading towards a single examination for each subject. I do not see how this will increase uptake at a time when, if you speak to enough students, you find young people are not 'anti-physics' but simple more 'pro-other' subjects. Driving choice out of physics is not, in my view, the way ahead. We need rather to be showing, within a coherent core, the rich tapestry of physics which will excite young learners and offer rigour.

Whilst not being a fan of rushing too quickly into mathematics, evidence suggests this often leads to mechanistic approaches without understanding, I do see some merit in Clive's suggestion of Further Physics to mirror Further Mathematics. Medics and chemists etc could still offer physics whilst those wishing to read physics or engineering could offer Further Physics; indeed, I am sure, a number of universities would see it as a preferred option as most Cambridge colleges do with Further mathematics for their engineering programmes.

It is interesting that with the recent reduction of A-level specifications that we have lost A-level engineering science and more recently physics B from JMB/AQA which was in essence engineering science.

Anu Ojha 30/03/2009 at 18:17

It's interesting to note that for Cambridge Natural Science applications with the desire to specialise in physics, A2 Level physics is no longer a requirement as long as Further Mathematics A2 has been pursued. I have heard this anecdotally for several years and at least once in a formal presentation within the last twelve months by a senior admissions person from the University.

Peter Main 01/04/2009 at 14:54

The basic problem with admissions to university to do physics or physics-based engineering is that the current A-level contains very little of the mathematics that becomes essential at university. I liken it to studying French literature without being able to speak French. The problem is not easily solved however. A new qualification in Further Physics, with the maths in, is being considered by the Institute of Physics at the moment. But could this ever be a realistic entrance requirement for all engineering and physics courses? Should we be looking for dual A-level qualifications, one for those who want to pursue physical sciences or engineering and one for those who do not? Would universities really want to restrict themselves to the former? This is a classic "don't start from here" situation. If there was the possibility of real flexibility in the Science Diploma, not currently in the plans admittedly, one could imagine a mathematics based

physics course emerging there. Also, remember that physics is already actually and regarded as the hardest A-level.

Finally, we in the professional bodies tell government that physics without maths is not what admissions tutors want. I think it would be helpful if universities could reinforce that message.