OPINION PIECE

What are A-levels for?

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On achieving power, the coalition government was quick to fulfil its election pledge to abolish as many quangos as reasonable in the shortest possible time. Among the first to go was the Qualifications and Curriculum Authority. One of the principal roles of the authority had been to set the criteria which were used by the awarding organisations (AOs) to develop their A-level (and GCSE) specifications. The AOs themselves set the papers, arrange for them to be marked and make the awards. In principle, another quango, Ofqual, polices the system and, in particular, monitors the standard of the papers. However, Ofqual is underfunded and has no subject expertise. As a result, it is generally accepted that in physics standards have fallen, an observation easily verified by comparing current papers with those of two decades ago.

Recent studies, for example the Institute's own *Mind the Gap* report, have also indicated an increasing mismatch between the knowledge and skills of students on entry to degree courses in physics and engineering and what academics expect them to have. Note that the issue here is not one of the content of A-levels, which has not changed much, but of their assessment, specifically, the mathematical sophistication required to answer the questions and the number of steps of reasoning required to emerge with the answer.

Having abolished the body that set the subject criteria for A-levels, the Secretary of State called upon universities in general, and the Russell Group (RG) in particular, to become much more involved in setting A-levels. It was never entirely clear what he meant, but the indications were that he envisaged a market with the most prestigious universities validating certain A-levels, and presumably not others, and possibly even setting themselves up as AOs. However, the major stakeholders pointed out the foolishness of a system in which A-levels did not have common

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NDIR, Vol 9, Issue 1 (October 2013)
doi:10.11120/ndir.2013.00004

currency in all universities – think of the poor schoolteacher trying to decide which specification to teach. Furthermore, the universities made it abundantly clear that they did not see this as their role at all, and had quite enough on their plates. Eventually, the RG did, with apparent reluctance, agree to be involved; more of which below.

The consultation on A-levels did raise two important questions: just exactly what are A-levels for and who should take responsibility for them? One issue, in dealing with the first question, is that the answer depends on which subject one is talking about. A-level English will be, for some, a career choice but others will do it out of a passion for literature and a few because they cannot think of anything else. For physics, the picture is quite different. Essentially everyone who passes A-level physics goes to university, the vast majority (> 90%) of them to study a subject where physics is either central, as in physics or engineering, or useful, as with medicine or another science. Table 1 gives the details of the top 10 subjects for both males and females. All destinations for both genders are at least reinforced by physics. Note that only 10% or so of those taking A-level physics enter a physics programme at university.

The gender differences in Table 1 are fascinating in themselves but, for the moment, the important feature is that A-level physics is a gatekeeper into STEM subjects in higher education; everyone who takes it does so as a positive choice based on their career destination and very few choose it for what might be termed cultural reasons, as they might choose history or biology. That view is reinforced by the recent reduction in the numbers who take physics without also taking mathematics, now only 15% or so. One reason for this state of affairs is undoubtedly the fierce reputation of the subject for being difficult, a reputation partly justified by research that shows the grading of physics A-levels is among the most severe of all subjects (http://www.score-education.org/publications). Despite that, the modal grade is A/A*, reflecting the high quality of the entrants and perhaps the lowering of global standards alluded to above. The overall picture then, though I might choose it to be otherwise, is that physics A-level has a very clearly defined purpose: to prepare students for entry into STEM-based courses in higher education. Inter alia that shows how important it is for the nation to encourage more students, particularly girls, into physics.

Having identified the principal purpose of physics A-level, it is difficult not to agree with Mr Gove that the universities should be involved in setting and monitoring the standard of the courses and their assessments. At this point, it is worth considering why standards have deteriorated over time and to correct a misconception that appears prevalent in government circles. To take the latter first, the misconception is that the standard of a qualification is determined by the level of its content. Naturally, the level must be appropriately demanding and have a certain appeal; however, to bring in very advanced material merely guarantees a superficial treatment. To take an example, some current A-levels contain material on the Higgs Boson. Leaving aside the Higgs part, even to define what a boson is requires the introduction of quantised electron spin and an understanding requires some appreciation of the symmetry properties of

Table 1 The ten most popular university courses for students with A-level physics in 2011 (Source: HESA9.7)

Overall		Males		Females	
Course destination	**%**	**Course destination**	**%**	**Course destination**	**%**
Physics	9.7	Mechanical Engineering	10.9	Mathematics	10.5
Mechanical Engineering	9.1	Physics	10.3	Physics	7.5
Mathematics	9.0	Mathematics	8.5	Preclinical medicine	5.7
Civil Engineering	5.4	Civil Engineering	5.8	Chemistry	4.5
Electronic and Electrical Engineering	4.1	Electronic and Electrical Engineering	4.8	Civil Engineering	3.8
Computer Science	3.8	Computer Science	4.7	Mechanical Engineering	3.4
Chemistry	3.8	Aerospace Engineering	4.2	Combination of three subjects or other general courses	3.3
Aerospace Engineering	3.7	Chemistry	3.6	Architecture	3.3
Preclinical Medicine	3.6	General Engineering	3.4	Others in subjects allied to medicine	2.5
General Engineering	3.1	Preclinical Medicine	3.0	Chemical, process and energy	2.4

quantum mechanical wave functions. Such topics can only be covered at the most trivial level.

The reason for standards falling is undoubtedly due to an unholy combination of school league tables, pupil and parental expectations and the commercial competition between AOs. I am not saying that anyone at an AO purposely sits down to make the papers easier; it is just that there is no one in the whole system without a vested interest in grade inflation, with the exception of Ofqual, which does not have the capacity to do the policing job properly. Evidently, schools, students and parents all delight in higher grades. The AOs themselves rarely sell a specification to schools on the basis that students will achieve lower grades and even the universities, obsessed as they are with their own league tables, are proud of the UCAS point tariffs of their entrants.

It is unlikely in the extreme that a government with the ideological background of the current one would take the logical step and move England (and Wales and Northern Ireland, but they are very complicated) into line with the majority of other European countries and have a single AO. Given that constraint, it seems essential that the responsibility for maintaining the standard of the A-levels should be taken away from the AOs and given to a financially disinterested organisation. Indeed, the AOs themselves would not baulk at such a suggestion; all they require is a level playing field – its altitude is irrelevant. The position of the Institute, along with our sister bodies representing chemistry and biology, as well as the Royal Society, the Association for Science Education, and many professional bodies in other major A-level subjects, such as mathematics, geography and history, is that we would want to establish National Subject Committees (NSCs).

The prime virtue of NSCs would be their independence, both from government and from any commercial constraints. Although they would necessarily be in the hands of Ofqual, both for reasons of consistency and to ensure a route to the Secretary of State who, whatever his desire to be removed from the process, must carry the ultimate responsibility, the NSCs would allow a broad range of users of the relevant A-level to be involved. The list in Table 1 indicates who these might be in the case of physics; clearly, the engineers would want a big say. Similar remarks would apply for, say, chemistry where the medics, pharmacists and biologists would need to be involved. Where possible, it would also make sense for the NSCs to be convened by the relevant professional body; for physics, the Institute could draw upon its most abundant resource, its members, and bring together academics, teachers, employers and students. The professional bodies, with their charitable status and relative longevity, would supply a stable context to set the criteria for public examinations and monitor standards. There would be no reason why such bodies could not play a role also at GCSE.

At the time of writing, the future of A-levels is unclear. Mr Gove has publicly stated that the RG will play a role in developing the new specifications. However, the RG itself has been much more reticent and has made no public statement about what its role will be. My hunch is that, largely for political reasons and out of fear of being seen as elitist, the RG will want to keep its involvement to a minimum. Crucially, the indications are that it will not want to get involved in assessment and will probably restrict its contribution to advice about content. Whether that is true and how it will work at the subject level remain to be seen.

One factor that does appear fixed is the Secretary of State's timetable. He has an election to worry about and is insisting that the new qualifications are being taught in schools from September 2015, which requires them to be approved by Ofqual by spring 2014. This schedule is demanding, to say the least, and in order to stand any chance of meeting it, the AOs have been beavering away on their own, despite the lack of criteria either in general terms, as has been promised by Ofqual, or at the subject level, presumably to be supplied by the RG. To their credit, the AOs have been making every attempt to recruit academics to advise them in their specifications. But this process has been totally ad hoc – the views they will elicit through this route will be uncoordinated and unrepresentative, despite the undoubted integrity of the advisors. More important, perhaps, is that this sort of process will not deliver the consensus on content and the assurance on assessment that are required to mend the system. I have no confidence that the new system will be any sort of improvement on the existing one; it may even be worse.

There is a golden opportunity that is slipping away. A-level physics could be made fit for purpose, with appropriate use of mathematics and assessments that test logical reasoning and go beyond the insertion of numbers into equations. Even at the more mundane level of ensuring consistency of definitions and coherence with other subjects, notably mathematics, the NSCs could play a major role. But with the timetable set by government, these improvements seem increasingly unlikely.

In the waiting room of the DfE in Westminster, there are photographs of successive Secretaries of State for Education; the average tenure is between two and three years. It takes young people 13 years to complete their formal school education, during

doi:10.11120/ndir.2013.00004

which time they are lucky if there have not been three or four major changes to the system, as successive ministers introduce their own particular revolutions, often driven by ideology rather than evidence. Given that a child's progress through education spans at least three administrations, there seems to be a strong argument for taking education out of the political hurly burly and creating an arm's length body that is relatively resistant to political change. Undoubtedly, the government of the day must take executive responsibility for public education but the system is screaming out for stability, coherence and evidence-based policy. The current rearrangement of A-levels and the apparently independent parallel review of GCSEs merely illustrate just how far we are from that ideal.

doi:10.11120/ndir.2013.00004