IOP Institute of Physics

Institute of Physics response to the BIS green paper 'Higher education: teaching excellence, social mobility and student choice'

Main points:

- We support the aim of the green paper of ensuring the quality of teaching in higher education in England and are keen to work with BIS to develop effective and appropriate measures and frameworks.
- UK higher education and research is world leading with a strong international reputation attracting significant numbers of both overseas students and research collaborations.
- We do not believe that there is a simple metric for comparing teaching excellence across different courses, different institutions or different teaching approaches. Any metrics that are used will necessarily be proxies for teaching excellence at best and there must be an evidence base for any implied relationship between metrics and the quality of the teaching experienced by students.
- We believe that instead of absolute metrics, university information – context and mission – should form the central part of assessment. The teaching excellence framework must focus on an assessment of whether an institution or department is achieving what it sets out to do through its degree programmes, not directly comparing them against other departments or institutions which may have different missions, aims and objectives.
- Teaching excellence should be measured at discipline level, but any future move to apply differential fees at discipline level must both reflect the actual cost of teaching lab-based subjects and be carefully managed – perhaps through an expanded SIVS programme – to ensure that students are not put off by higher fees for such subjects.
- Ensuring that everyone has the opportunity to fulfil their potential should be at the heart of the teaching excellence framework. Any measures of the quality of teaching which will have significant impact on a university's standing and finances should not create incentives for universities to slow widening participation work.
- We would look to the proposed new Research UK organisation and high level governing body to uphold the strengths of UK science: secure and stable funding and a research agenda driven in consultation with the research community itself. Many of the details of the proposed changes have yet to be developed and will need careful consideration over the next few months.
- The dual support system has allowed the UK to maintain and benefit from the world's most efficient research base. The separation of QR funding from grant-based investment has allowed universities the stability to maintain capacity between grant awards and allow researchers the flexibility to pursue new areas of research at its very earliest stage.
- In the outcome that both funding streams are administered through a single organisation, it is essential that a strong division between grants and QR funding is maintained in the short to medium term, particularly during the transition to this new structure. The separate funding pots (for grants and QR) should be set at the beginning of a spending period and protected for the duration of the period.

Introduction

The Institute of Physics (IOP) is a leading scientific society. We are a charitable organisation with a worldwide membership of more than 50,000, working together to advance physics education, research and application. We engage with policymakers and the general public to develop awareness and understanding of the value of physics and, through IOP Publishing, we are world leaders in professional scientific communications.

As a professional body that accredits undergraduate physics degrees in the UK and Ireland and also awards Chartered Physicist and Chartered Engineer status, we would welcome further involvement in teaching assessment in UK higher education.

The IOP welcomes the publication of the BIS green paper[1] 'Higher education: teaching excellence, social mobility and student choice' and Sir Paul Nurse's review[2] 'Ensuring a successful research endeavour: review of the UK research councils' as an opportunity to build on the strength and success of the UK's higher education and research systems. These systems are intrinsically linked and must be treated together if the aims of the green paper are to be met.

In response to the green paper, we have outlined below what we regard as important factors to consider in the introduction of new measures of quality in higher education teaching and the proposed changes to governance and funding structures.

The Teaching Excellence Framework

University physics departments are the main driver of physics research outputs in the UK and are at the heart of producing physics-trained workers. Over recent years the numbers studying physics at undergraduate level have increased significantly and, following a period in which departments were closing their doors, several new physics departments have opened in the last decade. In addition to this, the UK has a world leading research base and UK universities are regarded as among the best in the world, with a strong international reputation that draws significant numbers of overseas students: HESA data shows that 11% of undergraduates who study physics in the UK are domiciled overseas. This strength should be built on, and not compromised by, any changes to quality assessment and governance. A move to a more student-centred approach to funding and quality assessment cannot ignore the economic and societal case for the UK producing graduates in certain subjects, such as those identified as Strategically Important by HEFCE[3] (including physics). Any proposed reforms should not establish a funding structure that creates disincentives to institutions operating more expensive lab-based undergraduate course, or discourages students from studying such courses on the basis of cost. Any new process to measure teaching quality should, wherever possible, avoid duplication and instead incorporate current activities such as QA and degree accreditation so not to create undue additional administrative burden.

The green paper proposes that the new teaching excellence framework (TEF) will initially be based on a successful QA review of each institution, and in its second iteration it is proposed

[1] BIS green paper *Higher education: teaching excellence, social mobility and student choice* (2015) https://www.gov.uk/government/consultations/higher-education-teaching-excellence-social-mobility-and-student-choice

[2] Sir Paul Nurse's review *Ensuring a successful research endeavour: review of the UK research councils* (2015) https://www.gov.uk/government/publications/nurse-review-of-research-councils-recommendations

[3] HEFCE - *Support for strategic subjects* http://www.hefce.ac.uk/kess/subjects/

that a metrics based approach could be used to measure teaching quality at different institutions and, in further iterations, disciplines. We agree with the approach that any measure of teaching excellence must be founded on effective quality assurance, and also that 'bandings' rather than full rankings are the better option for levels of assessment. However, we do not believe that there is a simple metric for comparing teaching excellence across different subjects, different institutions or different teaching approaches. Additionally, it should be understood that any metrics that are used will necessarily be proxies for teaching excellence; there must be an evidence base for any implied relationship between metrics and the quality of the teaching experienced by students.

The green paper suggests graduate employment outcomes as one possible proxy for teaching quality. It is not clear that this is an effective measure of value added within a university degree, as is suggested, and we also have some concerns about the reliability of employment data held by government agencies and other bodies. Our own understanding of physics degree employment outcomes differs from those suggested by other sources such as the sixth-month outcomes data from the HESA Destinations of Leavers of Higher Education (DLHE) survey. The data may be significantly affected by the high proportion of physics graduates that go straight in to further study (~40% of the cohort), which has the effect of removing these graduates from the main set of data. As the typical threshold for achieving a place on a PhD course is a 2:1 or higher, these may be seen to be selectively drawn from the more able students further distorting the data. The destinations of PhD graduates is an even trickier problem as a significant proportion enter the academic career pyramid and are released back into the general workforce over a 10 year period. The research councils have done a lot of work on understanding this over the past few years.[4] The green paper indicates that a future tie-in with HMRC data may provide a longer term dataset with accurate assessment of graduate destinations and earnings post-degree. This would be a valuable dataset in understanding the nature of UK higher education, but unless it incorporates significant assessment of the 'inputs', it will not be a measure of value added within universities and degrees. It will also not be a measure of teaching excellence, and its use as a headline metric would imply that the objective of every degree course is to prepare graduates for employment in specific sectors or within specific wage brackets. Finally, any measure of graduate destinations and medium term earnings would not logically be a measure of the current teaching quality within an institution.

We believe that instead of absolute metrics, university information – context and mission – should form the central a part of assessment. The TEF should focus on assessing whether a institution is achieving what it sets out to do through their degree programmes, not directly comparing them against other providers that may have different missions, aims and objectives. Such a process would need to be carefully structured, with clear guidance of required detail and scope of information, and not create undue workload for staff in institutions. There is a risk here that mission statements may be set as a low bar to ensure success, but publishing such statements, and associating clear targets and proposed 'measurables' would help to guard against this. To support this, institutional strategies and mechanisms to monitor, improve, innovate and incorporate new educational research in teaching could also be assessed. Not mentioned in the green paper is the role of an external examiner; this role is valuable in maintaining standards and promoting good practice in assessment and quality assurance at a subject-specific level, and should form a part of any assessment (taking into account the workload and potential for unconscious bias).

[4] CFE Research - *The impact of doctoral careers* (2014) http://www.rcuk.ac.uk/RCUK-prod/assets/documents/skills/timodcfullreport.pdf

The green paper proposes that in future iterations the TEF may operate at discipline level within universities. We are supportive of this and of the green paper's proposal of wider engagement between providers, employers and Professional, Statutory and Regulatory Bodies (PSRBs), such as the IOP, to ensure that courses and programmes meet the needs of society. Degree accreditation programmes supported by PSRBs should be regarded as a 'necessary but not sufficient' aspect of any discipline-level measurement of teaching quality.

If the proposed student-centred approach is taken to a logical conclusion, then institution-level TEF will make less sense than a discipline level TEF as a source of information for students choosing their courses (though it should be noted that teaching quality will be only one of many factors in such a decision). We believe that subject-level assessment is the preferred option, but in such a model, financial drivers within universities must not be ignored. Departmental funding models are unique to each institution, but it is clear that lab-based subjects such as physics cost more to teach well than many other subjects that have less space and equipment requirements and fewer contact hours. As with medicine and other science subjects, physics courses have specialist, high cost requirements to support effective teaching and enable students to develop the skills and competencies needed to become practising scientists. Proper health and safety procedures cannot be compromised; specific needs for physics courses include well designed and appropriately provisioned laboratory space, specialist practical equipment and consumables, and technical support staff (for both practical classes and providing research experience).

Tuition fees do not currently cover the full cost of teaching 'high-cost' subjects. In a recent survey[5], average teaching costs per student in 2012/13 in the eight English departments sampled were £9,839 for physics. This is significantly more than the average fee paid by undergraduate students after waivers and bursaries. The shortfall in teaching income per FTE student would be even larger without the separate additional public funding, available since 2007/08, for strategically important and vulnerable subjects (SIVS) like chemistry and physics. However, with the SIVS funding currently capped and the numbers of physics undergraduates growing, the value of this additional SIVS funding has fallen in cash terms by around £370 per FTE taught student in physics, since it was introduced. The relative expense of teaching lab-based subjects implies that it would also be more expensive to improve the teaching of such subjects relative to improving teaching in disciplines with lower space and equipment requirements and fewer contact hours. In the proposed model of assessment at discipline level but overall TEF grade and fee setting at institution level, how will universities be incentivised not to close underperforming 'expensive' departments, such as physics, choosing instead to improve underperforming 'less expensive' departments in order to achieve a higher overall TEF level at lower cost? A discipline-level TEF would address this problem by ensuring greater visibility of strengths and weaknesses within an institution.

Any move towards the introduction of differential fees at discipline level must both reflect the actual cost of teaching lab-based subjects and be carefully managed – perhaps through an expanded SIVS programme – to ensure that students are not put off by higher fees for such subjects. There must be a clear evidence base for teaching cost and impact assessment on student choice before such a policy is pursued.

[5] IOP and RSC - *The Finances of Chemistry and Physics Departments in UK Universities: Third Review* (2015) http://www.iop.org/publications/iop/2015/page_66517.html

Social mobility and widening participation

Ensuring that everyone has the opportunity to fulfil their potential should be at the heart of the teaching excellence framework, and we welcome the prominence given to the topic in the green paper. Within science, technology, engineering and maths (STEM), particularly engineering and the physical sciences, there are significant challenges and underrepresentation of certain groups which many organisations and initiatives are working to address. The teaching excellence framework should aim to build on these programmes.

We agree that access agreements must be an essential and significant prerequisite for any TEF grading. In any future discipline level assessment, discipline-level access agreements must be applied and programmes such as the IOP's Project Juno[6] should be a 'necessary but not sufficient' aspect of such assessments. However this will not achieve the desired outcomes if the methods employed in the TEF itself work against such agendas; ill-chosen measures or perverse incentives placed on university admissions have the potential to unpick much of this work. If for example 'employment outcomes' were used as a headline metric, then it could be possible that if students from higher socioeconomic backgrounds are seen to have better employment outcomes then university recruitment practices may increase their focus on recruiting them. Similarly, if student retention over the course of a degree is used, this has been seen to be inversely correlated with socioeconomic background.[7] Carefully managed assessment against aims and mission would avoid some of these problems.

It is not yet clear what, if any, long term effects on student choice will come from the new model fees regime. And while there is currently little evidence to show an adverse effect of increased fees (after only a few years), it is a complex landscape and a system that creates a feedback loop – better teaching, better outcomes, higher fees – may act to gradually exclude those from lower socioeconomic backgrounds from the best courses and universities. There is also the possibility that those from lower socioeconomic backgrounds will choose to study at lower TEF scoring universities because of the lower fees charged to reduce their post-graduation debt. Without proper mitigation, a process that rewards better teaching by allowing universities to charge higher fees may serve to widen rather than narrow inequality. Any measures of the quality of teaching, such as those proposed in the green paper, which will have significant impact on a university's standing and finances should have a strong evidence base and not create incentives for universities to slow WP work. As such we welcome the proposal to disaggregate TEF metrics at the level of underrepresented groups, but this should be done, where possible, on retrospective data to inform choices of future measures.

Opening up the sector to new providers

We welcome the intention to open up the HE sector to new providers. From the point of view of physics provision there is currently significant capacity to increase the number of courses and departments without increasing the number of institutions; several new physics programmes have opened in the last decade in pre-existing universities. The relative expense of lab-based subjects such as physics may mean that new providers will not choose to operate such courses; however it could be that existing providers that currently operate physics departments and which choose to open new campuses in different parts of

[6] IOP *Project Juno* http://www.iop.org/policy/diversity/initiatives/juno/index.html
[7] IFS - *Socio-economic differences in university outcomes in the UK: drop-out, degree completion and degree class* (2014) http://www.ifs.org.uk/uploads/publications/wps/WP201431.pdf

the UK will be better placed to operate such courses. The opportunities for new providers should be equally applied to existing providers choosing to expand.

Simplifying the Higher Education architecture

UK science is world-leading; from 0.9% of the world's population the UK contributes 15.9% of the world's most highly-cited papers,[8] and has maintained this position in the face of growing challenges from emerging economies such as China and Brazil.[9] This overall strength is reflected in UK physics research[10]: for example, a recent study noted that 35% of the top cited papers in astrophysics had a UK author[11] and in the recent Research Excellence Framework 88% of the assessed physics research was ranked as either "internationally excellent" or "world-leading".[12] This strength has allowed the UK science base to attract and engage the world's best researchers and to leverage external funding: the US National Science Foundation reported that 55% of UK authored science and engineering papers in 2012 had international co- authors[13]; the UK receives a higher proportion of funding for science projects compared to the level of funding it provides to the EU, winning over 16% of funding from the most recent EU Framework Programme compared with its overall contribution of 11.5% of the EU budget.[14]

This strength is a result of sustained and secure investment over previous decades through the dual support system – both quality-related (QR) funding and grant funding through the research councils. The 2015 Spending Review settlement, protecting the science budget in real terms, represented a strong commitment to UK science from the government. However the protection of the science budget, and the additional funding for the Global Challenges Fund, will not resolve some of the tensions that have resulted from the five years of 'flat cash' funding since 2010 and the fact that the overall level of investment in research and development in the UK remains low in comparison with internal comparator nations.

We welcome the analysis of the Nurse review of the strengths and opportunities for improvement within the UK research governance structures, and we agree that there is a clear opportunity to enhance support for interdisciplinary research and to build on a strong record of successful cross-research council (bi, tri, multilateral) projects. We also support the aims of the Nurse review to create closer connections between research communities, industry and government research organisations and for clearer and more accountable decision making within publically funded research structures. However, many of the details

[8] Elsevier - *Performance of the UK research base: International comparison* (2013): https://www.gov.uk/government/publications/performance-of-the-uk-research-base-international-comparison-2013

[9] King's College London and Digital Science - *The nature, scale and beneficiaries of research impact* (2015): http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/Independentresearch/2015/Analysis,of,REF,impact/Analysis_of_REF_impact.pdf

[10] IOP – *The UK's performance in physics research: national and international perspectives* (2014): http://www.iop.org/publications/iop/2014/file_63082.pdf

[11] Thomson Reuters – *The Research and Innovation Performance of the G20* (2014): http://sciencewatch.com/sites/sw/files/images/basic/research-innovation-g20.pdf

[12] HEFCE - *REF 2014: Unit of assessment summary data – Physics* (2014): http://www.ref.ac.uk/media/ref/results/AverageProfile_9_Physics.pdf

[13] National Science Board – *Science and Engineering Indicators* (2014): http://www.nsf.gov/statistics/seind14/content/chapter-5/chapter-5.pdf

[14] Russell Group response to the Government Review of the Balance of Competences between the UK and EU: Research and Development http://www.russellgroup.ac.uk/uploads/Russell-Group-response-to-Balance-of-competences-Research-and-Development-consultation.pdf

of the proposed changes have yet to be developed and will need careful consideration over the next few months.

For the changes in governance and structures proposed in the green paper and the Nurse review – the creation of an Office for Students and an overarching Research UK body which would have responsibility for both the current research councils and what is currently the QR funding stream – to be for the benefit of UK science the strengths of the research councils, their interaction and relationships with their respective communities and research grouping, must be preserved and built on. We would look to the proposed overarching Research UK and high level governing body to uphold the strengths of UK science: secure and stable funding and a research agenda driven in consultation with the research community itself – particularly during the transition to the new structures. Teaching and research are intrinsically linked, and if the current teaching and research functions of HEFCE are reallocated, then there must be a high-level mechanism for ensuring continued strategic interaction of the two interrelated areas of work.

We welcome the commitment to preserving the 'dual support' system which has allowed the UK to maintain and benefit from the world's most efficient research base.[15] The separation of QR funding from grant-based investment has allowed departments the stability to maintain capacity between grant awards and allow researchers the flexibility to pursue new areas of research at its very earliest stage. In the outcome that both funding streams are administered through a single organisation then each part of the system must retain its own identity and governance (similarly with any integration of InnovateUK). It is essential that a strong divide between grants and QR funding is maintained in the short to medium term, particularly during the transition to this new structure. The separate funding pots (for grants and QR) should be set at the beginning of a spending period and protected for the duration of the period. The governance arrangement proposed also presents some challenges to science in the devolved nations, particularly if there is not a strong barrier between RC and QR funding. The cross-UK focus of the research councils system contrasts with the remits of the national funding councils. If HEFCE's England-only responsibilities are subsumed into a UK-wide research body without a strong internal ringfence and internal governance, then there is a clear opportunity for a damaging conflict of interest.

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[15] Department of Business, Innovation and Skills - *International Comparative Performance of the UK Research Base – 2013*
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263729/bis-13-1297-international-comparative-performance-of-the-UK-research-base-2013.pdf