IOP Institute of Physics

Postgraduate Education Inquiry

Institute of Physics response to a call for evidence from the Higher Education Commission

A full list of the IOP's submissions to consultations and inquiries can be viewed at www.iop.org

30 March 2012

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Joel Mullan
Senior Research to the Commission
Policy Connect
CAN Mezzanine
32-36 Loman Street
London SE1 0EH

IOP Institute of Physics

Dear Mr Mullan,

Postgraduate Education Inquiry

The Institute of Physics is a leading scientific society promoting physics and bringing physicists together for the benefit of all. It has a worldwide membership of around 40,000 comprising physicists from all sectors, as well as those with an interest in physics. It works to advance physics research, application and education; and engages with policy makers and the public to develop awareness and understanding of physics. Its publishing company, IOP Publishing, is a world leader in professional scientific communications.

The IOP welcomes the opportunity to respond to the Higher Education Commission's inquiry into postgraduate education. The attached annex details our response to the questions listed in the call for evidence.

If you need any further information on the points raised, please do not hesitate to contact me.

Yours sincerely,

Professor Peter Main
Director, Education and Science

IOP Institute of Physics

Postgraduate Education Inquiry

Meeting the needs of an innovation-led economy

Q1: How well does the current postgraduate system meet the needs of businesses? How can the system become more responsive?

Postgraduates are highly valued by the business sector which needs a constant flow of highly skilled and motivated individuals capable of thinking outside their original subject area. This is especially the case for physics-trained postgraduates since they are highly-numerate, and acquire analytical and problem solving skills during their training.

Demand for, and utilisation of, postgraduate skills

Generally, postgraduate skills are now becoming a useful differentiator for recruiters as so many applicants for posts in businesses will have similar undergraduate training. However, some businesses do not understand the skills that postgraduate study brings and are confused by the various levels. Specifically, there is a need to differentiate PGT (typically masters) from PGR and PhDs, as these courses are very different in purpose, direction and standing. Many recruiters will see the specific subject of applicants and then dismiss them as inappropriate without considering the additional depth and breadth of learning that the additional training offers. In addition, careers advisers often do not provide specialised support for postgraduates seeking employment. This issue is especially severe in STEM subjects where many careers advisers have scant knowledge of the fields. To help address these issues, there is a need to demonstrate to postgraduates seeking employment that they have skills beyond their additional specific training, and for them to be able to communicate that effectively to potential employers.

The response of Higher Education Institutions to emerging industries

Traditional patterns of teaching and assessment are not always compatible with the ways of work being developed in such ‘new industries’. Emerging industries typically do not have ‘normal’ ways of working so even greater flexibility is required: a challenge for higher education. Many universities are attempting to offer part-time and distance-learning formal qualifications, aided by technology developments; however, these cannot be customised to meet all the demands of individual industries while maintaining the standards set by existing curriculum and other regulatory authorities.

International competitiveness

Q2a: What is required for the UK to maintain its ability to attract and retain high-quality international students and international researchers?

To attract international students we need to explain the value added by a UK postgraduate education. At the moment we have higher ‘headline’ fees than many of our international competitor nations (e.g. Germany, France, USA, etc.) although this may be offset by scholarships, etc. However, the scholarship schemes that exist are incredibly competitive, indicating that there is a large cohort of very high quality students who are unsuccessful in sourcing funding for their courses. In the US, many universities offer a large number of fully funded bursaries, which attract the very best international students, and a number of European countries offer free tuition making them more competitive than the UK.

What makes the UK even less competitive are research council rules which do not allow the maintenance element of studentships to be paid to international students which effectively rules out a large proportion of the best applicants. To compound this problem, EPSRC has implemented a policy to discontinue the provision of project studentships on its research grants and fellowships from January 2011. As well as the impact this policy will have on UK PhD students, there is considerable concern that the recruitment of high-quality European students will be severely disadvantaged, as project studentships were the principal means of funding such students. The average fraction of departmental PhD students from project studentships was around 20% and, of those, around 60% were hired from Europe and/or other overseas nations. However, EPSRC will permit 10% of doctoral training account (DTA) funded studentships to be used for EU and/or other overseas students, but this is a rather small number.

The UK also needs a visa system that is sensitive to the specific needs of postgraduate students. The recently imposed immigration restrictions make it significantly more difficult for outstanding researchers and the most promising graduates from outside the EEA to enter the UK.

Q2b: What are the long-term implications of the postgraduate sector's dependence on international students?

As one would expect, there are both positive and negative connotations associated with such dependence, which is often driven by financial constraints. The positive side is that we continue to have excellent students working in the UK on research projects. These students develop into alumni in international communities and often maintain excellent links with the original UK research group. On the negative side, this means that in terms of training, it is becoming more common that the skills passed on leave the UK.

Q2c: How might UK-domiciled students be encouraged to engage in doctoral study?

By the continuation of full non-means-tested funding for the brightest students; excellent facilities in the universities; and a UK business sector that really values doctoral study as an important pathway to career development. There is also a need to provide more information on the career advantages that accrue from doctoral study. On this note, STFC has in the past published various reports which have reported on the impact of the postgraduate training that it has funded, covering career destinations, earnings, skills, relevance to careers, etc. (see http://www.stfc.ac.uk/resources/pdf/StudSumRep.pdf). It is important that all major funders of postgraduate training publish similar, up-to-date, information, on a regular basis.

In addition, once the new higher education funding system is implemented, it may be worth considering whether some incentives with regards to undergraduate student debt would encourage UK students to remain in higher education for another three/four years. A key issue here is the provision of more funded places. As already mentioned, a major change that will impact on the future number of trained PhD students in the physical sciences is the decision taken by EPSRC to discontinue the provision of project studentships on its research grants and fellowships; this policy is expected to reduce the number of student places available in physics. This is exacerbated further by the squeeze on DTA funding by EPSRC and increased targeting of that funding by universities (with encouragement from EPSRC) on large strategic initiatives making it difficult to allocate studentships to the small-scale projects, which are often the generators of research breakthroughs and new ideas. The discontinuation of project studentships, at a time of reduced DTA awards (which are now in

university control, thus a further step removed from researchers), is a major threat, particularly, as we understand that DTA studentships are not costed on an fEC basis, which creates uncertainty relating to the support of students using equipment and facilities that have significant costs; project studentships allowed for the true costs of PhD level research to be recognised and properly supported. The EPSRC policy will impact on research within the UK (particularly that which takes place in smaller departments), its global reach (via those PhD students going abroad to do postdoctoral research), and on employers.

In addition, experience of working in a research laboratory at the undergraduate stage will help UK-domiciled students to make better informed decisions whilst they are considering doctoral study. The IOP is now offering undergraduate research bursaries to undergraduate physics students to undertake 6–8 week research placements within a university department, working on actual research projects. Bursaries are aimed at students who may be considering a research career, to provide some hands-on experience in a real-life research environment (see http://www.iop.org/about/grants/urb/page_53203.html).

Q2d: In what areas can UK postgraduate provision be considered outstanding internationally?

In terms of quality, the UK's best postgraduate students are on a par with their counterparts from the UK's competitor nations, and go on to compete with relative ease for postdoctoral positions or jobs in industry. However, we are well aware of the general view that UK physics PhD students are well trained in their narrow sub-fields, but can lag behind their counterparts in countries like Germany in their level of maturity and the range of their skills. This is basically due to the length of study associated with the UK's system, particularly the absence of a proper two year Masters and the length of the UK PhD being traditionally been shorter than in most other EU countries. In comparison, the US produces highly qualified students with a system of 4+5 years or more.

A four-year PhD, preceded by a four-year integrated masters (which is a first degree qualification that provides a significant element of research-led education and a highly cost-effective preparation for doctoral study) would provide the eight years of study that could help to address such criticisms. The generic training associated with research degrees, which was introduced as a result of the Roberts' Review, is widely regarded as a positive innovation. This aspect of a UK doctorate is being considered by other countries in Europe.

Some welcome developments have also been made by the research councils on this front. For instance, EPSRC has supported the provision of collaborative postgraduate teaching and allowed universities to spend their doctoral training grant flexibly to offer longer studentships – typically an extra six months; but the latter has been at the expense of supporting fewer students.

Indeed, due to financial constraints we are aware that some research councils that went through a phase of funding four-year PhDs are now cutting them back to 3.5 years, which is a retrograde step in terms of the UK producing doctoral graduates with the requisite skills needed to compete with their international counterparts for positions in both academia and industry.

Progression

Q3: How well does current practice support smooth transitions from postgraduate education into industry and academia?

The transition to academia works well. However, more attention could and should be paid to the transition to industry. Schemes which facilitate industrial placements such as industrial CASE or secondments have significant benefits. However, physics doctoral graduates enter such a wide variety of sectors that it is not always straightforward to find appropriate placements.

Ensuring fair access to postgraduate education

Q4: How can postgraduate provision in the UK be made more accessible for students from less advantaged backgrounds?

The recent reduction of research council support for postgraduate provision and the imminent high level of debt among graduating first degree students will certainly not aid the access agenda.

As mentioned earlier, it may be worth considering whether some incentives with regards to undergraduate student debt would encourage UK students to consider postgraduate study.

Impact of the planned HE reforms

Q5: What impact will the changes to undergraduate provision outlined in the recent Higher Education White Paper have on the postgraduate sector?

A challenge will be the long-term effect of the higher education reforms on the uptake of STEM subjects at the postgraduate level. Anecdotally, one of the biggest disincentives to postgraduate study is the level of debt accumulated from undergraduate study; under the new fees regime, it will take even longer to start to pay off the loans and that could put some off from considering postgraduate study, even though in the long run they are likely to increase earnings as a result. This will impact most on students who come from lower socio-economic groups, and potentially women. Currently, it is too early to tell and the downturn in the economy has obscured any possible decline but this is an area where it will be necessary to carefully monitor the situation. What we are aware of is that MSc courses without studentships will be a risky option for graduates with debts – particularly as funding is only available via Professional and Career Development Loans.

In addition, the duration of a PhD course can vary between three and four years and, while studying a PhD may not cause students to accrue much further debt, it does not allow loans to be paid off either. As certain industrial and academic sectors require specific skills and the experience that only PhD study can provide, this may lead to negative repercussions for the research base in the future and on the long-term health of the economy.

Cross-cutting issues

(i) Funding

Q6: How should postgraduate education be funded?

Any system that attempts to transfer some, let alone all, of the costs of postgraduate education to UK students (as in the case of undergraduate education) would have implications for the participation levels of UK-domiciled students and for UK science in general.

With regards to Masters degrees, there is a need for the research councils to support and expand the provision for taught courses for postgraduate training, especially in areas that are of national importance. There are only a small number of stand-alone Masters degrees being offered by physics departments primarily due to the fact that the four-year integrated Masters qualifications are increasing in popularity, but also as it is difficult to get sufficient funding to cover the costs, due to changes in funding adopted by the research councils.

As an example, there is a need for the research councils to support and expand the provision for taught courses for postgraduates training for employment in the energy sector, especially in light of the UK's potential new nuclear build programme. The research councils stopped funding for all nuclear MSc programmes a few years ago, jeopardising many previously viable courses related to nuclear technology, which will have implications in terms of skills shortages in the future.

In addition, we are concerned with the impact recent policy changes implemented by EPSRC will have on the recruitment of PhD students. As discussed in response to previous questions, EPSRC has implemented a policy to discontinue the provision of project studentships on its research grants and fellowships, meaning that it will be harder to allocate studentships to small-scale projects. Furthermore, EPSRC is moving to concentrate training in centres for doctoral training (CDT), a move which threatens to distort the distribution of PhD provision as well as costing more *per capita* than a student supported through EPSRC's doctoral training grant to HEIs.

The general perception is that CDTs have focused studentships in too small a number of places, resulting in a landscape that is extremely patchy both geographically and across research fields, with smaller STEM departments, many undertaking excellent research, being disproportionately affected. CDTs do allow good training in a few highly targeted areas, but many other areas that are key to the UK economy are completely unrepresented. The CDT model adopted by EPSRC was created to tackle the very specific issue of building up strength at the life sciences interface, but is wholly inappropriate in support of doctoral training across the whole EPSRC portfolio. This is particularly the case for sub-fields that rely upon small and flexible research teams that work independently and primarily through one-on-one PhD supervision, such as mathematical physics.

Despite our various concerns, CDTs have shown that it can be more efficient to provide training to PhD students in larger cohorts. This economy of scale is particularly valuable in providing training in generic skills. However, as mentioned, CDTs also have the less than welcome aspect of channelling studentships into a relatively small number of subject areas, thus squeezing other areas which might be more popular with students. Consequently, it makes sense to find other ways of achieving economies of scale in postgraduate training. Among the most successful ways of achieving this critical mass have been the regional alliances, such as SUPA, SEPNet, MPA, etc., all of which offer joint training to graduate students without the concomitant narrowing of the subject base.

(ii) Institutional structures

Q7: Are you aware of any distinctive models of delivering postgraduate education which have been deployed with success in other countries?

No comment.

(iii) Quality assurance and student satisfaction

Q8: How effective are quality assurance and student feedback mechanisms for postgraduate provision?

Student feedback and quality assurance inspections are ubiquitous in the UK university system, but most of the emphasis historically has been on undergraduate courses. However, the revision of the sections of the QAA Code of Practice on research degrees programmes in 2004 stimulated a greater focus on postgraduate programmes. It is generally recognised that the oversight of postgraduate programmes at institutional level has improved as a result. HEIs are regularly reviewed by the QAA; these reviews provide a body of evidence which confirms that the quality assurance mechanisms for postgraduate provision are broadly appropriate and effective.

The IOP has an established scheme in place to accredit the content and standard of undergraduate physics degrees in the UK and the Republic of Ireland (see http://www.iop.org/education/higher_education/accreditation/page_43310.html). Building on this, the IOP is now in the process of developing a scheme to accredit Masters programmes.

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76 Portland Place
London W1B 1NT

Tel: +44 (0) 20 7470 4800
Fax: +44 (0) 20 7470 4848
Email: physics@iop.org
Website: www.iop.org
Registered Charity No. 293851