Students and Universities

Institute of Physics response to a House of Commons Innovation, Universities, Science and Skills Committee inquiry

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

10 December 2008
Dear Sir/Madam

Students and Universities

The Institute of Physics is a scientific membership organisation devoted to increasing the understanding and application of physics. It has an extensive worldwide membership and is a leading communicator of physics with all audiences from specialists through government to the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics.

The Institute welcomes the opportunity to respond to the House of Commons Innovation, Universities, Science and Skills Committee’s inquiry into ‘Students and Universities’.

The attached annex highlights the key points of concern to the Institute which have been linked to the issues raised in the call for evidence.

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

Yours faithfully

Professor Peter Main
Director, Education and Science
Students and Universities

Summary of key points

Admissions:
• A major issue for admissions to STEM subjects is that there is now strong evidence that A-levels and equivalent qualifications show enormous variation in relative difficulty. It is necessary for the government to accept that these differences exist and develop mechanisms by which students who take harder A-levels, such as physics, receive appropriate recognition in the admissions process.
• The diplomas represent a significant challenge to university admissions tutors. The problem is most acute in physics, which traditionally requires two specific A-levels for entrance: physics and mathematics. The Advanced Science Diploma’s principal learning will be required to cover all the sciences, i.e. material equivalent to a little less than the AS content of current A-levels. It is difficult to see how it will be seen as a sensible route into pure science at university.

The balance between teaching and research:
• Financial studies have shown that teaching in physics and chemistry has been underfunded by around 20% over a long period of time. HEFCE provided short-term, extra funding at this level for some vulnerable subjects, including physics and chemistry. However, the extra funding is not permanent and its eventual withdrawal would be a retrograde step that could lead to further closures of physics departments.
• There is a tension between teaching and research that has been compounded by the advent of fEC, which has introduced the possibility of researchers claiming part of their salary on research contracts, and potentially using this as a means to buy themselves out of teaching.

Degree classification:
• There appears to be no coherent reason for the current system of degree classification. In particular, the distinction between an upper and lower second, which occurs near the peak in the distribution of marks and which can be important for future careers, is arbitrary and unfair.
• Europeans do not consider our Masters’ programmes to be at a comparable level to their own. In the continued absence of any sort of UK leadership on the Bologna Process, there will be no analysis of the potential issues. By the time the problems of employability and, possibly, the reduced attractiveness of our programmes to international students are realised, it will be too late.

Student support and engagement:
• Non-completion of university programmes is a complex area. If universities are being encouraged, by the widening participation agenda, to sweep their net wider to allow more access, it is likely that they will be taking more risks. They should not subsequently be penalised if their completion rate falls.
• It appears that the introduction of top-up fees has not inhibited students from entering university, although the long-term effect of the debts on postgraduate
recruitment has yet to be revealed. It could be sensible, for example, for physics graduates who enter teaching to have their debt repayments made on their behalf so long as they remained in the profession.

Admissions

1. The process for admission to universities can vary enormously, not only between universities but also within a given university between different subjects. For example, it is common for, say, a Russell Group university to be selecting heavily in English while struggling to fill its quota in engineering. It follows that the processes for admission will be quite different in these different areas.

2. A major issue for admissions to STEM subjects is that there is now strong evidence that A-levels and equivalent qualifications show enormous variation in relative difficulty. A report commissioned by the SCORE partnership and undertaken by the CEM Centre at the University of Durham demonstrated that the sciences and mathematics are amongst the most difficult of all. Currently, the government, in public at least, insists that all A-levels are of equal difficulty. The majority of university subjects do not require specific A-levels for entry but instead rely on the UCAS points tariff. However, this tariff implicitly assumes equal difficulty of all assessments; it follows that students who are unsure are likely to be drawn to the A-levels where it is easier to achieve higher grades. Given that school, A-level league tables do not distinguish between subjects either, there are clearly strong forces militating against the take up of science and mathematics A-levels. It is necessary first for the government to accept that these differences exist and second, to develop some mechanism by which students who take the harder A-levels have some sort of recognition of the fact in the admissions process; by doing so, this will demonstrate the government’s commitment to increase numbers studying STEM subjects.

3. The diplomas represent a significant challenge to university admissions tutors, particularly the phase 4 science diplomas, which have not yet emerged as having a clear purpose and constituency. The problem is most acute in physics, which traditionally requires two specific A-levels for entrance: physics and mathematics. The Advanced Science Diploma’s principal learning will be required to cover all the sciences, which means that, at best, it will cover material equivalent to a little less than the AS content of current A-levels. Therefore, students wishing to follow physics programmes would need both to top up their physics with a stand-alone A2 course, and a full A-level in mathematics, both to be taken in parallel with the Science Diploma. In addition, the workplace emphasis of the principal learning would lead to some problems in teaching basic science. Given the very tight timescale for the Science Diploma and the insistence that it has the same structure as the vocational diplomas, it is very hard to see how it will be seen as a sensible route into pure science at university.

4. In principle, aptitude tests could be a sensible means of distinguishing between students who are talented and those that are merely well-prepared, which could be an effective tool for widening participation (WP). However, the

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2 www.iop.org/Media/Press Releases/press_30373.html
main motivation appears to come from the most popular universities, who would want to use the tests to distinguish between the large numbers of candidates with top grades at A-level.

5. The government sets targets for HE participation regardless of the strategic needs of the country. As a consequence, university finances have been driven by the choices of often ill-informed students who have not acquired a coherent set of post-16 qualifications. The outcome has been massive student growth in certain areas, for example drama and media studies, while, as a proportion of all students, science and engineering have fallen. The notion of a ‘HE market’, in which students make decisions based on employment opportunity, is deeply flawed. There is almost no means for any students to obtain neutral and reliable data about career and salary expectations in different subject areas and there is an urgent need for such data. Given that the Student Loan Company carries salary information for all graduates for many years, it should be possible for such data to be generated quickly and reliably for the first few years of employment.

6. It is unfair to put the burden of WP on universities and such pressures, coupled with penalties for high drop-out rates, are almost inevitably going to lead to the lowering of standards. We note also, however, that many universities impose conditions on their departments only to take people with good A-levels.

7. It is difficult to see how a fair access and admissions system can operate with the present arrangements whereby universities make offers before A-level results are known. Currently, university departments tend to make offers above the true level they are prepared to accept because they cannot afford to have students registering insurance offers. Consequently, prospective students are faced with a barrage of high offers, which may well deter those nervous of their ability. The system also makes the predicted grades of teachers more important than they should be and, in the more popular courses, can place an undue emphasis on interviews, which may work against those students from lower socio-economic backgrounds.

8. A truly fair admissions system would select on the basis of ability to complete the course and not only on how well one has performed in public examinations. However, there is a particular problem in some subjects, including sciences and languages, where prior knowledge is essential. Here ability alone is not enough, some knowledge is required, and this is a substantial barrier to WP.

The balance between teaching and research

9. Detailed financial studies undertaken by the Institute and the Royal Society of Chemistry have shown that teaching in physics and chemistry has been underfunded by around 20% over a long period of time. Following a spate of departmental closures, HEFCE provided short-term, extra funding at this level for some vulnerable subjects, including physics and chemistry. As a result, departments are now breaking even, many of them for the first time in decades, and it is clear that the current level of funding is a better match to the real cost of teaching these subjects. However, the extra funding is not

permanent and, although HEFCE has indicated that it will continue for the
next few years, its withdrawal would be a retrograde step that could lead to
further closures of physics departments.

10. The tension between teaching and research is apparent to anyone with
experience of HE. The majority of, although by no means all, academics
consider research to be more important to them and their careers than
teaching. The plethora of various research fellowships (such as those offered
by the Royal Society, among others, which have been of great benefit to the
UK in helping to retain its leading researchers) and the paucity of teaching
fellowships is testament to that situation. A recent addition to the tension, as a
consequence of the introduction of fEC, has been the possibility of
researchers claiming part of their salary on research contracts, and potentially
using this as a means to buy themselves out of teaching. The advent of fEC,
therefore, is likely to lead to the most prolific researchers spending less of
their time teaching. While this might arguably improve research outputs, it is
probably better to leave the balance between teaching and research to be
decided by the internal management structures within the universities rather
than have it distorted by the unpredictability of research funding.

11. The Institute accredits all UK physics degrees⁴. Our experience in physics is
that there is considerable integration of teaching and research and that
academics are always keen to introduce leading edge science into their
teaching, which is important as that provides the stimulus, potential
excitement and enthusiasm for undergraduates. Indeed this process has led
to problems, in that curricula are becoming overburdened with material as
more comes in, but little is squeezed out.

12. In physics and in science in general, there are some excellent examples of
teaching innovation, such as the Physics Innovations CETL⁵, which is a joint
project between the Open University (leading on electronic enhancements to
learning) and the University of Leicester (leading on problem-based learning).
However, there is a need for more of these projects across the UK. A major
issue here has been the RAE, which has tended to focus activity in research
and many staff who have had teaching interests have been made to feel
second-class. Although some universities have now introduced teaching
routes to chairs, the lack of an adequate funding stream and the culture of
universities do not allow research and teaching to be seen on an equal
footing. The Institute would like to see every department, certainly every
physics department, to have at least one member of staff specialising in
teaching innovation, which is common practice in American state universities.
Perhaps, a more practical solution would be to encourage a community of
such academics which can cater for a range of universities. Having someone
active in pedagogy research available to a physics department would ensure
contact with people active in frontline physics research. However, a way to
pay for these academics will need to be determined.

13. The Institute’s degree accreditation process requires visits to all physics
departments and to some extent provides a guarantee of a high-quality
minimum provision in the subject, although there is still considerable variation.
Where external accreditation is not available, it is difficult to see how any
minimum standard is maintained at the subject level.

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⁴ www.iop.org/activity/policy/Degree_Accreditation/index.html
⁵ www.open.ac.uk/picetl
14. The issue of determining excellence in research is one that has been the subject of numerous recent consultations as HEFCE attempts to find a fair and acceptable replacement for the RAE. We do not wish to add to that debate now. However, it is clear that there is no comparable measure of teaching excellence. The overly bureaucratic system of QAA subject visits did make a considerable difference to the support and administrative coherence of university teaching, although its effect on the actual teaching itself is arguable. But the subject visits were so disruptive and time consuming that no one should countenance their return.

15. Many universities take the issue of staff development seriously, within which the development of excellent teaching skills is a key factor that is resourced through the provision of time for training and the opportunity for mentored practice.

16. The role of teaching fellows in universities is a very grey area. Often, in science subjects, the teaching fellow has funding because a senior member of staff has found a way to buy time out of teaching. However, there is almost no career route for such people as essentially all appointments to permanent academic positions in science are on the basis of research ability, although candidates may be expected to have had some experience in teaching. For the most part, any young scientist who specialises in teaching too early in their career is placing a significant barrier in the path of their subsequent progression.

**Degree classification**

17. The QAA is essentially concerned with the quality and consistency of process and plays essentially no role in maintaining standards or in the comparability of standards between different universities. In addition, within a given university, although there is again considerable standardisation of process, there have been no attempts to have a common standard for degree classification. In fact, where some universities have tried to do so, usually introducing a one-size-fits-all approach to the treatment of marks, it has led to unfairness and obvious inconsistency of treatment. This is a very complex area where it is difficult to see how any realistic progress can be made and whether such attempts would be worthwhile. Different universities have different missions and these are generally recognised.

18. There is an issue with respect to differences in standards of degree classifications in such areas as teaching and eligibility for funding for further study, where it can be important to have achieved a first or upper second class degree. It may be that a more sophisticated mechanism of discrimination is required in these areas.

19. The system of external examiners leaves room for improvement. When the system works well, the external examiner is a critical friend, who can help improve courses enormously. However, the current system is open to abuse and would perhaps benefit from closer adherence to the QAA’s code of practice on external examining. It may be that external examiners should be
organised in a different manner to ensure genuine independence and to promote greater consistency within a subject.

20. The Institute concurs with section 3.21 of Professor Paul Ramsden’s contribution to the DIUS debate on the future of higher education, *Teaching and the Student Experience*, that there appears to be no intellectually coherent reason for the current system of degree classification. In particular, the distinction between an upper and lower second, which occurs near the peak in the distribution of marks and which can be important for future careers, is arbitrary and unfair. Just about the only thing that can be said in favour of the current classification scheme is that it is historically stable. While it is not difficult to think of replacements that avoid the trap of arbitrary class distinctions, for example with an academic record, it is much more of a problem to invent a robust scheme that takes into account the variability between subjects and universities.

21. It is of concern that, in seeking evidence for the inquiry, the Committee did not mention once the Bologna Process; in no other European country would this be possible. We understand that the QAA will announce, in due course, that English degrees are compatible with the Bologna Process, an announcement that will presumably remove any pressure for change. However, colleagues from across Europe inform us that they do not consider our Masters’ programmes to be at a comparable level to their own. This remark applies particularly to the four-year, integrated masters that form the professional graduate route in the UK in physics, chemistry, engineering and a few other subjects. In the continued absence of any sort of leadership in the UK on this issue, it is unlikely that there will be real analysis of potential problems. Nonetheless, there are already reports of employers questioning the comparability of our Masters’ programmes and the large influx of mainland European scientists into UK academia may also be relevant. Our fear is that, by the time the problems of employability and, possibly, the reduced attractiveness of our programmes to international students are realised, it will be too late. Professor Ramsden in his report (section 2.9) states that the “Competition between UK and overseas universities to attract international students is likely to intensify…”; the UK’s blasé attitude to the Bologna Process is an obvious disadvantage particularly for STEM subjects.

22. Plagiarism is undoubtedly a major problem in many areas. In mathematical subjects such as physics, mathematics and engineering, there is a particular issue in that in solving a problem, students will often independently use identical methods, which makes it very hard to decide if anyone has copied from another person. The tendency, therefore, is to concentrate more of the assessment into unseen examinations which removes the problem but which is regrettable from a pedagogical point of view.

**Student support and engagement**

23. The Institute has considered the incorporation of undergraduate students into its degree accreditation process but rejected the idea on the grounds that their restricted experience of a single university and lack of knowledge of assessment and many other important issues would make them ineffective.

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7 [www.dius.gov.uk/policy/teaching_and_student_exp.html](http://www.dius.gov.uk/policy/teaching_and_student_exp.html)
24. Non-completion of university programmes is a complex area. On the one hand, universities might be expected only to admit students who are capable of completing the course but, on the other, there will always be students who fall by the wayside and others who will find themselves in the wrong environment. So, the key question is: what is a reasonable completion rate? This issue is also intimately tied to WP. If universities are being encouraged to sweep their net wider to allow more access, it is likely that they will be taking more risks. They should not subsequently be penalised if their completion rate falls. In many European countries, the admissions process is much less selective than in the UK and the corresponding failure rates are higher. There is a strong argument that this system is more likely to preserve standards than one in which non-completion is seen as a failure of the system.

25. In physics, engineering and some other sciences, one of the most frequent reasons for non-completion is the lack of preparation for the mathematical content of the course. The physics in A-level physics is not described mathematically but it most certainly is at university. One way of combating this interface problem is to have teacher fellows – schoolteachers seconded for a year or so to university departments – who are able to work with academics on this issue. The Institute has piloted this type of approach as part of its HEFCE funded Stimulating Physics project\(^8\).

26. Despite widely expressed fears, it appears that the introduction of top-up fees has not inhibited students from entering university, although the long-term effect of the debts on postgraduate recruitment has yet to be revealed. It is also not clear how the job market will respond to the existence of such impoverished recruits. In engineering and physical sciences, four-year first degrees are now the norm for those who are taking the subject seriously. The extra year means another year of debt accumulation. Furthermore, PhD courses are now drifting towards four years and, while these may not cause students to accrue further debt, they do not allow loans to be paid off either. There is the prospect of STEM PhD graduates emerging at the age of 26 or 27 with no money and substantial debt. That does not appear to be a very attractive proposition.

27. It could be sensible, for example, for physics graduates who enter teaching to have their debt repayments made on their behalf so long as they remained in the profession. This approach could make it financially advantageous to enter teaching while removing the controversy associated with differential pay that schools seem to find so unappealing.

\(^8\) www.stimulatingphysics.org
The Institute of Physics is a scientific membership organisation devoted to increasing the understanding and application of physics. It has an extensive worldwide membership and is a leading communicator of physics with all audiences from specialists through government to the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics.