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Campaign for Science and Engineering in the UK

CaSE 06/16

Making Higher Education fit for all of its current purposes

Response to the Royal Society's working group on Higher Education

1. The Campaign for Science & Engineering is pleased to submit this response to this review of Higher Education. CaSE is a voluntary organisation campaigning for the health of science and technology throughout UK society, and is supported by over 1,500 individual members, and some 70 institutional members, including universities, learned societies, venture capitalists, financiers, industrial companies and publishers. The views of the membership are represented by an elected Executive Committee.

2. We have not answered all questions, but have made comments where we have a meaningful position.

a. The nature and benefits to a student that accrue from studying STM at HE level

3. The benefits of HE are many and varied, but the only one that is easily measurable is earnings potential.

4. The OECD produces regular figures showing the return on an individual's investment in HE, which typically demonstrate that UK students do relatively well by comparison with those in other countries.

5. Surveys of salaries typically show that science graduates outperform those in other subjects. For example, a study in 2005 showed that after medicine and law, the three subjects that it was most financially advantageous to study at university were engineering, chemistry and physics[1].

b. The demand for STM graduates

6. Almost everyone agrees that we need more science graduates, if only to plug the gap in the teaching workforce.

7. Many employers tell CaSE they value the mathematical and analytical skills associated with scientists. For example, when we consulted some investment bankers recently, they told us they were very keen on analytical ability (not just numeracy) and were currently especially interested in graduates who had studied engineering or the biosciences.

8. Changes in demand are difficult to predict and are probably contingent partly on supply. If the UK can produce many good graduates, scientific firms will locate their business in the UK and the demand will be higher. If we fail to stem the spiral of decline caused by lack of specialist teachers, closure of university departments and low levels of student interest, companies will not see the advantage of coming to this country and there will be little demand. The former is a vastly more attractive economic picture than the latter.

c. The quantity of graduates and the quality, depth and breadth of their educational and training experiences

9. CaSE has no figures on the numbers graduating other than those that are publicly available.

10. On the quality of students' experiences, university staff privately admit to us that changes in the system have placed huge pressures on the quality or educational experience. For example, a 40% reduction in the unit of resource of public funding has been partly responsible for the decline in the amount of practical experimentation that occurs during science degree courses. Publicly, universities have had little choice but to give the impression that they have somehow counteracted this problem, with the prime excuse being that experiments have been replaced with computer simulations. But few really committed educators in science give the candid impression of believing this to be true.

11. In part, these changes have been inevitable: it is not practical or affordable for 50% of people to have the same depth of experience enjoyed by just 5% in the past. The problem is that nobody is asking the question of what proportions of people it is now appropriate to educate in different ways. Is it better to give 50% of youngsters a cheaper experience or to give a fairly-selected 5% the gold-plated version and the rest something else?

12. The introduction of Foundation Degrees as a cheaper alternative to traditional Bachelor-level degree courses and the constant debate about how many state-educated pupils get into the 'top universities' make it clear that everybody really knows that higher education is now an enormously varied landscape. But regulation and funding mechanisms tend to be so rigid that everyone has to pretend that all degree courses at all universities provide the same depth and breadth of experience, when this is patently untrue.

d. The length of time HE studies should take

13. We have serious doubts about the idea that the value of HE studies can be measured by the length of time they take. It is educational outcomes that matter, not temporal inputs. The timescales set by the Bologna proposals, which are wholly arbitrary in nature, have nothing to recommend them.

e. The current discipline boundaries

14. The three core sciences of biology, physics and chemistry, have an intellectual coherence. It was absurd of the former Chief Executive of HEFCE to describe them as nineteenth-century disciplines (actually, the *Oxford English Dictionary* gives examples of the words 'chemistry' and 'physics' in their modern senses from the seventeenth and eighteenth centuries, respectively).

15. Of course there is room for the study of subjects that either cross the boundaries (such as biochemistry) or that encompass a defined subset of a single core discipline (such as nuclear physics or zoology). There is also room for courses that combine elements of different sciences for practical or vocational ends (such a medicine or forensic science). But the core disciplines are and have for centuries been considered core for good reasons that are not subject to fashion and whim.

16. There is no reason why a general science degree should not be appropriate for some people, so long as it is genuinely a broad science degree rooted in core subjects rather than a mish-mash of unrelated material.

f. The skills, knowledge and experience of those entering the HE system

17. It is inevitable that skills, knowledge and experience of new entrants to the HE system have changed dramatically. The system has moved from one designed for a handful of people selected on the basis of a particular kind of academic merit to a mass system for half of the population.

18. Three years ago, we surveyed the Deans of Science at UK universities, who confirmed that, in their experience, students starting at university had worse elementary knowledge, poorer mathematical skills and less practical experience than students a decade earlier[2]. For example, on 58% of science courses, the Deans judged that a majority of students arrived at university without the mathematical skills considered "necessary or appropriate at their level".

19. However, there was a recognition among some of the university staff involved that the solution was not wholly in the hands of the schools and colleges the students had attended. Professor Ian Haines, at that time the Chairman of the Deans of Science, observed that: "The results of this survey show very clearly the need for a greatly improved dialogue between the various sectors of education. This must involve large numbers of those in pre-19 education and in the universities. There is much too little dialogue at present and I believe that very few university staff have any real idea of what performance has been required to obtain, say, a B in mathematics at GCSE or the various grades in advanced level or GNVQ in the sciences"[3].

20. In other words, the HE system needs to adapt to the intake it has rather than hark after the intake it would want in an ideal world.

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Notes and References

[1] *The economic benefits of higher education qualifications*, PriceWaterhouseCoopers, 2005.

[2] *Skills and knowledge of students entering higher education*, SBS, 2003, available at http://www.sciencecampaign.org.uk/documents/2003/SBS0313.htm

[3] Press release available at http://www.sciencecampaign.org.uk/press/releases/2003/pr0307.htm