The Academy of Medical Sciences

Academy response to the House of Lords Science and Technology subcommittee inquiry into higher education in STEM subjects

Summary

1. The Academy of Medical Sciences welcomes the opportunity to contribute to this inquiry into Higher Education (HE) in Science, Technology, Engineering and Mathematics (STEM) subjects. The Academy of Medical Sciences promotes advances in medical science and campaigns to ensure these are translated into healthcare benefits for society. One of the Academy's strategic goals is to attract and develop the brightest individuals to careers in biomedical science so this inquiry is of particular relevance to our work. Our elected Fellowship includes some of the UK's foremost experts in medical science who have contributed to this response and who would be happy to provide oral evidence to this inquiry.

2. The Academy's response focuses on postgraduate biomedical training and research, although many of the issues raised are applicable to other disciplines. We understand that other organisations, such as the Medical Schools Council (MSC), will address aspects of undergraduate training and we have liaised with them in the preparation of this document. We believe that medicine should be included among STEM subjects so have covered this area in our response.

3. HE is crucial to maintaining the UK's excellence in STEM areas. Many of these fields have been highlighted by the Government as strategically important for rebalancing our economy.[1] Our response highlights the following key ways in which HE in STEM might be improved:

4. ***Interdisciplinary science***
    - Many problems are inherently interdisciplinary and so need to be tackled by collaborations between different fields. An interdisciplinary team-based approach needs to be encouraged and prioritised in STEM teaching and research.

5. ***Workforce planning***
    - It is of critical importance that postgraduate medical education and training are run by effective academic-health service alliances throughout the UK, in line with other developed nations. The governance of Local Education and Training Boards (LETBs) should reflect this requirement.
    - Maintaining our STEM workforce is crucial but also challenging to plan. Closer monitoring of numbers and career progression of students would be beneficial to strategic planning for the future.

6. ***Sustaining a world class biomedical workforce***

[1] Department for Business, Innovation and Skills (2011). *Strategy for UK Life Sciences.* http://www.bis.gov.uk/assets/biscore/innovation/docs/s/11-1429-strategy-for-uk-life-sciences.pdf

- The prolonged high cost and often more modest financial rewards of postgraduate STEM education may discourage some talented individuals from pursuing HE in STEM subjects and undertaking careers as researchers. This should be taken into account when planning to expand the contribution of STEM fields to the UK's economy.

7. ***Teaching***
    - The value and recognition of teaching needs to be improved. Teaching will determine the quality of our future STEM graduates and should remain research-led.

8. ***Industry-academia collaboration***
    - Industry has largely adopted a new model of open innovation to form closer partnerships with academia, health services and charities. Our graduates need to be equipped with the skills necessary to benefit from this environment.
    - The mobility of researchers between industry, academia and the health service needs to be improved to facilitate closer partnership and the dissemination of talent.

9. ***Immigration***
    - Immigration policy needs to be closely monitored to ensure that the UK is not perceived as unwelcoming to overseas students or researchers.
    - We propose that the current cap of 7.5% overseas medical students be relaxed with some safeguards.

Introduction

10. The Government has identified science, especially life and biomedical sciences, as areas of special interest for growth in the UK economy.[2] For science to contribute to our economic recovery and future prosperity, we need to have expertly trained graduates in STEM subjects in adequate numbers.

11. Prior to the current economic downturn, a succession of inquiries raised concerns about the supply of the skills needed by UK pharmaceutical and biotechnology companies. A survey of pharmaceutical companies by the Association of British Pharmaceutical Industry (ABPI) identified skill shortages predominantly in the *in vivo* science disciplines (e.g. physiology, pharmacology including clinical pharmacology, toxicology and pathology) and chemistry.[3] Skills gaps in the drug development pipeline also need to be addressed. It is timely to review the UK's approach to educating graduates in STEM fields in terms of the quality of their education as well as the number of graduates.

12. There has been significant additional support for clinical academics over the last decade from organisations such as the Medical Research Council (MRC), National Institute for Health Research (NIHR) and Wellcome Trust. However, one overarching concern is that we believe graduate recruitment to some STEM subjects is being hampered by a shortage of

[2] Department for Business, Innovation and Skills (2011). *Strategy for UK Life Sciences.* http://www.bis.gov.uk/assets/biscore/innovation/docs/s/11-1429-strategy-for-uk-life-sciences.pdf

[3] Association of British Pharmaceutical Industry (2008). *Skills needs for biomedical research. Creating the pools of talent to win the innovation race.* http://www.abpi.org.uk/our-work/library/industry/Documents/skills-biomedical-research.pdf

PhD studentships within the UK as some funders have restricted the availability of these schemes.

Interdisciplinary science

13. There is growing recognition that many research challenges such as climate change or ageing are only going to be solved with an interdisciplinary approach. For example, understanding the genetic basis of disease is increasingly reliant on mathematics and computing. The loss of some academic departments, such as chemistry, is a concern for fostering interdisciplinary approaches as they can be important to the biomedical sciences.[4] Cross-fertilisation of traditional academic disciplines from a wider range of relevant research areas must be encouraged. We welcome the Government's commitment to increase investment in collaborative research training with private, public and third sector research partners.[5]

14. The development of talented interdisciplinary researchers who take a more team based approach to science can be achieved by:[6]
    - creating funding opportunities that specifically combine disciplines
    - modifying degree courses to contain a greater interdisciplinary component
    - creating specific training positions that allow and facilitate interdisciplinary training to ensure this approach pervades all career levels
    - multi-level networking between scientists of different disciplines and seniority
    - high-level support from institutions to commit to increasing interdisciplinary work

Workforce planning

15. The Academy has given workforce planning for clinical academics considerable attention so we have focused on this area in our response. Toward the end of this section we also touch on some broader issues for workforce planning across the STEM subjects.

Clinical academics

16. As well as maintaining adequate numbers of medical workers, it is important to sustain appropriate levels of specialised medical professionals. The MSC's annual survey of clinical academics is an important tool to help achieve this goal.[7] The workforce needs to be dynamically managed to ensure that adequate numbers of trained staff are entering each clinical academic speciality. The planning cycle needs to take account of the length of medical training and the need to sustain critical mass in small volume but crucial areas (e.g. community paediatrics, medical ophthalmology, allergy and public health).

[4] More information available at: http://www.publications.parliament.uk/pa/cm200506/cmselect/cmsctech/1382/1382.pdf
[5] Department of Business, Innovation and Skills (2011). *Innovation and Research Strategy for Growth.* http://www.bis.gov.uk/assets/biscore/innovation/docs/i/11-1387-innovation-and-research-strategy-for-growth.pdf
[6] Academy of Medical Sciences (2010) *Reaping the rewards: a vision for UK medical science.* http://www.acmedsci.ac.uk/p48prid78.html
[7] Further information is available from: http://www.medschools.ac.uk/AboutUs/Projects/clinicalacademia/Pages/Promoting-Clinical-Academic-Careers.aspx

17. The ongoing restructuring of the NHS will significantly impact on medical education. In the current system, regional Strategic Health Authorities (SHAs) coordinate clinical training posts via their Postgraduate Deaneries in collaboration with universities. Under government reform proposals, SHAs will be abolished. A national coordinating body, Health Education England (HEE), will be established and NHS healthcare providers will form Local Education and Training Boards (LETBs), which will fund postgraduate medical education through a new levy on providers and take over the functions of Postgraduate Deaneries. The Academy has been working to influence these reforms and has produced a number of documents on this topic.[8] Our key message is that it is of critical importance that postgraduate education and training are run by effective academic-health service alliances throughout the UK, in line with other developed nations. This academic-health service link will assist clinical academics in their tripartite mission of research, training and health service delivery. The governance framework established for LETBs should minimise any conflict of interest by containing representatives of both the service providers and the HEIs with an independent chair.[9]

18. National planning and coordination will continue to play a major role in workforce planning, especially within medicine. Sufficient oversight must exist through HEE to ensure high quality and consistent standards across the UK and that sufficient numbers of trainees exist across all specialties. LETBs will need to be responsive to the national priorities set out by HEE, which in turn will be informed by the Centre for Workforce Intelligence and nationally determined healthcare priorities. More specifically, HEE must be able to manage overall trainee numbers on a UK-wide basis and provide indicative numbers for professional training. This is particularly important for medical specialties.

19. There is also a need for flexibility in medical training. For example, clinical academics should be allowed to undertake relevant work abroad at a time that is suitable both for themselves and their institution.

Broader issues

20. The UK has been an attractive destination for overseas students; however, we cannot rely on this continuing to be the case. Other countries such as China have increased their provision of graduate courses, creating more competition for the UK to attract students and retain them as part of the workforce.[10] The UK will become vulnerable to skills shortages if low numbers of UK-domiciled students study particular subjects, and if the number of non-UK domiciled students falls, or if they leave the UK after their studies. This is of particular concern in the STEM sector. STEM subjects have traditionally attracted overseas students who have then been recruited into STEM-based industries. Changes in the composition of postgraduate students must be monitored to provide early warning of potential skills shortages.

21. The UK must sustain a world class STEM workforce that has the skills and capacity to manage and utilise innovation. Highly skilled individuals are UK medical science's most valuable resource and play significant roles in attracting commercial activity and investment, and in improving health. To understand the benefits of postgraduate

[8] Further information is available from: http://www.acmedsci.ac.uk/p47prid96.html
[9] Academy of Medical Sciences response to the Government consultation (2011). *Liberating the NHS: Developing the Healthcare Workforce.*
http://www.acmedsci.ac.uk/download.php?file=/images/publication/1301323497100.pdf
[10] Academy of Medical Sciences (2009). *Department of Business, Innovation and Skills consultation on postgraduate training* http://www.acmedsci.ac.uk/p100puid171.html

education and training, UK higher education institutes (HEIs) should develop and implement a simple system of tracking postgraduates. More data on workforce numbers would allow more strategic appraisal of capacity and re-profiling needs. New initiatives from the Higher Education Statistics Agency (HESA) and the Futuretrack project are encouraging, but we emphasise the need to gather robust data on the long-term career destinations of postgraduates.[11,12]

Sustaining a world class biomedical workforce

22. The financial burden of cumulative tuition fees and the long duration of postgraduate training, especially in medicine, could potentially discourage some from pursuing a career in STEM-related fields. Generally, STEM subjects are more expensive to teach than non-STEM subjects and this cost may be reflected in the fees charged in the future. Higher tuition fees may result in a greater level of debt, which may dissuade some talented students from choosing STEM careers.

23. Relatively modest remunerations in some STEM jobs may also encourage some qualified graduates to leave STEM areas and pursue careers in better-remunerated fields, such as finance or consultancy. While a STEM education does equip graduates with skills that are valued by financial services, to realise its objective of rebalancing the economy government should ensure that STEM graduates have sufficient incentive to work in STEM industries.

Teaching

24. The UK has a world-leading track record in biomedical research. To maintain this track record it is important to deliver research-led teaching within STEM subjects at graduate and postgraduate level, enabling the UK to develop and foster the researchers of tomorrow. However, teaching, as part of an academic's portfolio of work, can often be under-valued and under-recognised.

25. In 2010 the Academy published a report concerning the valuation and recognition of teaching.[13] It emphasised the importance of research-led teaching, highlighting that academics should be encouraged and supported to engage fully with teaching. The report considered that teaching should be an important component of decisions around career progression and it is important to undertake teaching across all career grades.

26. Government has advocated that excellence in teaching should be recognised and rewarded.[14] Guidelines on best practice for this are integral to improving the value and recognition of teaching. Learned societies and professional bodies, academies, Higher Education Funding Councils and the Department for Business, Innovation and Skills (BIS) should be proactive in orchestrating the spread of good practice in the management of teaching load. The quality of research-led teaching in the UK is a significant factor in

[11] Further information is available from: http://www.hesa.ac.uk/
[12] Further information is available from: http://www.hecsu.ac.uk/hecsu.rd/documents/Reports/futuretrack_stage1_singlesummary.pdf
[13] Academy of Medical Sciences (2010) *Redressing the balance: the status and valuation of teaching in academic careers.* http://www.acmedsci.ac.uk/p48prid59.html
[14] Department for Business, Innovation and Skills (2009). *Higher ambitions: the future of universities in a knowledge economy.* http://www.bis.gov.uk/wp-content/uploads/publications/Higher-Ambitions.pdf

attracting overseas students. It will be important to protect teaching in the higher education reforms to ensure that quality education continues to be delivered from those who can bestow a spectrum of skills on our students.

Industry-academia collaboration

27. The UK has historically enjoyed a vibrant pharmaceutical and biotechnology sector that is the largest in Europe and second in size only to the USA.[15] The benefits of this strong commercial presence are well established: the sectors support over 165,000 high-value UK-based jobs.[16] However, the sector is experiencing challenging times with many drugs going off patent, increasing drug development costs and a diminished drug development pipeline. Much of the pharmaceutical industry has adopted a new business model, focusing on partnerships with academia and biotechnology firms. Our STEM workforce needs to be equipped with the skills required for this open model of innovation.

28. The mobility of researchers and staff across the academic-industry interface will be an important component of sustaining a world-class STEM workforce; exchanging skills, forging opportunities for innovation and promoting mutual awareness. The Government has committed to promoting mobility in the life sciences, which we welcome.[17] Opportunities for flexible collaboration across sectors need to be seized by developing a biomedical workforce with the skills to move between and bridge sectors. Currently, there is limited mobility between industry and academia and this should be addressed to maximise our workforce in these sensitive STEM areas. Mobility issues can be eased by a number of potential routes:[16]
    - Secondments or mentoring across sectors.
    - Promoting flexibility in career options, such as indicators of success that are shared between academia, industry and the NHS.
    - Mapping the profile of the workforce to gain a greater understanding to strategically appraise mobility between sectors.

Immigration

29. To maintain our role as a leading scientific nation in the face of substantial investment in science in other countries, the UK must continue to attract world class research talent. Careful consideration must, therefore, be given to UK immigration laws in relation to our STEM workforce. It is important that our immigration policy does not create a real or perceived barrier to attracting and retaining first class individuals within the education system or workforce. Considerable efforts are needed to ensure that there is an understanding among STEM students and researchers internationally that the UK welcomes their talents. The impact of immigration policies on our STEM workforce needs to be appropriately monitored and quantified.

30. In economically challenging times we are concerned about barriers that impede universities from capitalising on the substantial international market for higher education. The number of overseas medical students that universities are able to accept is currently

[15] Academy of Medical Sciences (2011) *Submission to the 2011 innovation and research strategy*. http://www.acmedsci.ac.uk/p100puid230.html
[16] Department for Business, Innovation and Skills (2011) *Strategy for UK Life Sciences.* http://www.bis.gov.uk/assets/biscore/innovation/docs/s/11-1429-strategy-for-uk-life-sciences.pdf

capped at 7.5% of the number of home/EU students completing the first year. We would propose that this cap is made more flexible. There would be an explicit understanding that the default position would be that the overseas graduates would return home post-registration, although some could be offered the opportunity to continue their training in the event of a shortfall of home/EU graduates.

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