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Students and Universities

The Council for the Mathematical Sciences (comprising the Institute of Mathematics and its Applications, the London Mathematical Society, the Royal Statistical Society, the Edinburgh Mathematical Society and the Operational Research Society) is pleased to present its evidence for the Innovation, Universities, Science and Skills Select Committee's Inquiry into *Students and Universities.*

Our response focuses on matters relating specifically to mathematical sciences. As a result not all aspects of the Committee's inquiry are addressed in the text below.

General comments

1. The geographical remit of this inquiry is not clear. The terms of reference refer to UK HEIs but subsequently only to HEFCE; given that education is a devolved issue the remit should be clarified in the Committee's report.

The effectiveness of the process for admission to HEIs, including A-levels, Advanced Diplomas, apprenticeships and university entrance tests.

2. Current A-level mathematics is doing a reasonable job; numbers taking A-level Mathematics are increasing[1] following a slump in the change to the AS-A2 system, with dramatic increases in Further Mathematics thanks to the Further Mathematics Network[2].

3. However, A-level mathematics fails to distinguish between high-achieving students; an 'A*' grade may help to some extent, but only if it rewards mathematical thought rather than simply a higher degree of accuracy.

4. It is unclear that the proposed diplomas in science or engineering will have anything close to the content of the current mathematics A-level, which suggests that these would not be appropriate preparation for university-level mathematical sciences programmes. We endorse the February 2008 statement by the Advisory Committee on Mathematics Education (ACME) on mathematics in diplomas[3], noting the importance of mathematics training to the further study of a range of other science and engineering subjects.

The implementation and success of widening participation initiatives, and the impact of the current funding regime on these objectives

5. Successful initiatives in mathematical sciences include the HEFCE-funded *More Maths Grads* project[4], Masterclasses run by the Royal Institution[5] and the various 'Challenges' organised by the UK Mathematics Trust[6].

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[1] See, for instance, the 14 August 2008 DCSF press release at http://www.dcsf.gov.uk/localauthorities/index.cfm?action=content&contentID=15518
[2] Increases credited to the FMN in *State of the Nation Report: Science and Maths Education* (Royal Society, September 2008), numbered page 60, available from http://royalsociety.org/downloaddoc.asp?id=5698
[3] Available from http://www.acme-uk.org/news.asp?id=91
[4] More Maths Grads - www.moremathsgrads.org.uk
[5] RI Masterclasses http://www.rigb.org/contentControl?action=displayContent&id=00000000844
[6] UKMT Challenges - http://www.mathcomp.leeds.ac.uk/Maths%20Challenges.htm

Levels of funding for, and the balance between, teaching and research in UK HEIs, and the adequacy of financial support for the development of innovative teaching methods and teaching/research integration.

6. Research funding from the EPSRC Mathematical Sciences Programme has been diminishing year by year – from £21M in 2006/07 to £16M in 2008/09[7] and £14M in 2009/10 – in favour of multidisciplinary research themes. The CMS is concerned that this is a move away from funding basic research in mathematical sciences, which will ultimately be to the long term detriment of the research base across science and engineering.

7. There is concern at the low level of the HEFCE unit of resource for mathematics given that contact hours are high and that labour-intensive student support is required.

8. We are also concerned about the effect of Full Economic Costing on a subject with relatively low grant volume. This is a recent policy change whose effects need to be monitored carefully for unintended consequences.

9. Good teaching and research go hand-in-hand in the mathematical sciences and should not be pitted against each other. The design of undergraduate mathematical sciences degree courses can be guided by recent research and advanced courses within them often are.

10. Teaching standards in mathematics are generally very good but often involve large classes, with many in excess of 200 students. At these levels the lecturer is not easily able to interact with the audience; similar considerations apply to tutorial sizes.

11. MSc courses are often the vehicle by which recent research is disseminated and for the training and recruitment of PhD students – it is a considerable blow that EPSRC's move to narrowly-defined 'Knowledge Transfer Accounts' will effectively withdraw funding from the more 'general' mathematical sciences MSc courses. Responsibility for funding for the second cycle is unclear.

The suitability of methods of assessing excellence in teaching and research and the impact of research assessment on these activities

12. There is general confidence in peer review as a means for research assessment but rather less so in any formulae based on mechanically collected data[8].

13. The Research Assessment Exercise has been a mixed blessing for teaching and research. On the positive side, it has encouraged staff to maintain their interest in research throughout their career which also has a positive effect on their teaching. On the negative side, it has encouraged short-termism; many of the most substantial results in mathematical sciences have taken many years to come to fruition, and this can be at odds with the need to produce publications on a regular basis.

14. The RAE's emphasis on research groups can lead to patchy coverage of some areas of mathematical sciences in some departments – thus having a negative effect on the undergraduate curriculum.

15. The RAE has been a driver of concentration of research into an increasingly small number of 'centres of excellence'. This may be advantageous where investment in large scale equipment is needed, but is not necessary or suitable in mathematical sciences;

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[7] The EPSRC Mathematical Sciences Programme budget for the current year is given at http://www.epsrc.ac.uk/ResearchFunding/Programmes/Maths/Intro.htm

[8] See, for instance, *Citation Statistics* (International Mathematical Union, et al, June 2008) for a mathematics-focused critique of bibliometric approaches (see http://www.mathunion.org/fileadmin/IMU/Report/CitationStatistics.pdf)

departmental closures following RAE-based funding decisions have a number of effects, including the creation of mathematics 'deserts' in parts of the country[9].

The availability and adequacy of training in teaching methods for UK academics

16. The current training provision offered in many HEIs to UK academics in mathematics is very poor, and makes poor use of valuable time. It is often generic and pays no attention to the special way that mathematics and statistics must be taught; this is widely recognised by the community. It is vital that it is replaced by proper subject specific training such as that offered by the Higher Education Academy's MSOR Subject Centre[10] and currently being piloted at the University of Birmingham[11]. This needs proper funding.

The responsibilities of the Government and HEFCE in assuring (a) the quality of teaching provision and learning opportunities in UK HEIs; and (b) the balance between teaching and research in HEIs

17. Some aspects of funding and support in these areas fall between the two stools of HEFCE and research councils (EPSRC in the case of mathematical sciences). Much more 'joined-up' action is required here. The lack of clarity in responsibility for second cycle funding (e.g. for one year Masters courses) is one result here.

18. Mathematics support groups, drop-in sessions and small tutorials are all essential to back up teaching in lectures and Government support for these is vital. A difficulty with mathematics is that one tends to get 'stuck'. Giving help to students who are stuck is an essential but very labour-intensive, and hence expensive, business.

Potential methodologies for the standardisation of degree classifications within, and between, HEIs

19. Degree classifications cannot easily be standardised across different subjects; there are inherent differences between disciplines that would hinder attempts to do so. Mathematics tends to have a much wider (often bi-modal) distribution of marks compared with other subjects and this needs to be carefully considered. For individual mathematical sciences students the profile of module marks may show more variation than in some other disciplines. Some university regulations require that all modules are passed, and this can fetter the professional judgement of boards of examiners in mathematical sciences when determining degree classification.

Any further action required by the Government and/or HEFCE to ensure that UK HEIs offer students a world class educational experience

20. The Government should ensure that the UK can recruit, motivate and train the best possible university lecturers, excellent in both teaching and research. To do this we need to make it clear that there is a great career available for them. An apparent reduction in support for basic research in mathematical sciences in the UK works against this.

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[9] For a more detailed treatment of the negative effects of concentration of research see *Keeping HE Maths Where it Counts: the decline in provision of mathematical sciences courses with more moderate entry requirements – drivers and implications* (Council for the Mathematical Sciences, 2007) available from http://www.cms.ac.uk/reports/2007/steele_report.pdf

[10] See http://www.mathstore.ac.uk ; The HEA MOSR Network distance learning courses on 'Teaching of statistics in HE' are run in association with the Royal Statistical Society's Centre for Statistical Education (http://www.rsscse.org.uk/activities/tsihe.asp)

[11] See http://www.hr.bham.ac.uk/development/courses/landt/MSS013_Associate_module_in_Learning_and_Teaching_in_Higher_Education_mathematics.shtml