Written evidence submitted by the Higher Education Funding Council for England (GAP0068)

Introduction

1. HEFCE is a non-departmental public body responsible for distributing public money for higher education to universities and colleges in England, and for ensuring that this money is used to deliver the greatest benefit to students and the wider public. HEFCE is the largest single source of funding for English higher education, but universities also have a range of other income sources, including student fees, endowments, business and public sector contracts, and research income from charities and Research Councils. In 2016-17 the total HEFCE grant allocated to universities and colleges is £3,674 million, within which £1,360 million is devoted to teaching, £1,578 million to research, and the remainder to capital, knowledge exchange and discretionary investments. Further details of these allocations are available at www.hefce.ac.uk.

2. This submission outlines how HEFCE directly supports Science, Technology, Engineering and Mathematics (STEM) within the English higher education sector, including addressing issues of supply and demand for specific skills. This includes through direct funding to HE providers as well as initiatives and programmes, and developing policy and an evidence base to help inform Government and support the HE sector to support and stimulate STEM provision. We need to ensure that universities can meet the increasing demand for study of STEM subjects and produce highly employable graduates for the benefit of the UK economy and society. Individual HE providers and professional, statutory and regulatory bodies (PSRBs) are also engaged in a range of activities to support and sustain STEM provision. Where helpful, we provide examples of these within this submission.

Section 1: Direct funding, initiatives and programmes

Funding for high cost and very high cost subjects

3. Our support for STEM currently takes the form of direct funding and support through specific initiatives. We provide institutions with funding for high-cost subjects. These are subjects where the tuition fee alone is not enough to meet the full costs of its delivery. High-cost subjects include laboratory-based science, engineering and technology subjects. In academic year 2016-17 we are providing £672 million in high-cost funding to institutions for students who entered higher education under the funding and finance arrangements introduced in 2012.

4. Since 2007 we have provided funding to help secure the provision of four very high-cost science, technology, engineering and mathematics (STEM) subjects. These subjects are: Chemistry; Physics; Chemical engineering, and Mineral, metallurgy and materials engineering. In 2016-17, this funding stream is worth £24 million.

STEM teaching capital funding

5. HEFCE has funded 73 higher education institutions (HEIs) and further education colleges (FECs) through a share of £200 million STEM teaching capital funding for the 2015-16 academic year. The fund, announced by the then Minister for Universities and Science in September 2013, required 1:1 matched funding by institutions.
6. The scheme intends to ensure that higher education responds effectively to the increase in demand for STEM studies by developing facilities that will support an increased flow of highly employable graduates into industry. The objectives of the fund were to:
   a. provide new or upgraded STEM teaching facilities to meet evidenced increased demand for STEM provision
   b. support an increased flow of STEM graduates into the industries that underpin the Government’s Industrial Strategy aims
   c. support the Government’s aim of a wider and more representative student population across subjects.

7. HEIs and FECs with significant STEM provision of more than 1,000 full-time equivalent (FTE) UK or European Union (EU) students were invited to apply for STEM teaching funding capital (a maximum of £5 million) on a competitive basis. Those with fewer STEM students, were invited to apply for a smaller formulaic allocation of funding.

8. Funding through the competitive round was typically requested for the construction of new buildings for delivery of wide-ranging STEM subject teaching. The buildings proposed tended to be designed to house new laboratories and upgraded teaching spaces. Proposals indicated significant anticipated growth in STEM provision, with institutions typically planning to expand STEM enrolments by 15-20 per cent with one institution aiming to grow its STEM enrolments by 100 per cent over the next five years.

9. Investment through the formulaic allocation was typically requested for the improvement and enhancement of laboratory spaces, for example purchase of new industry standard equipment. Proposals related to a diverse range of provision, for example, one sought to acquire a machine for the design and manufacture of vehicle parts, and another sought to establish an ‘industry liaison laboratory suite’. The funding allocations were much smaller than the competitive allocations and ranged from around £25,000 to around £650,000.

National initiatives and programmes
10. In addition to capital and direct funding for high cost and very cost subjects, we also support a number of initiatives and programmes to support the HE sector in sustaining particular areas of provision or in response to an identified skills need.

Sigma
11. The Sigma network of mathematics and statistics support in universities emerged from a collaborative HEFCE-funded Centre for Excellence in Teaching and Learning (CETL) between the universities of Loughborough and Coventry. HEFCE continued its support for the network until July 2016. During that time, the network has supported the development of maths ‘drop-in’ centres; developed resources for use across the network; provided staff training, and provided a platform through six regional hubs for the sharing of experience and practice.
12. One of the key roles of mathematics and statistics support is to enable all students to achieve their full potential in their chosen discipline by helping them to develop confidence, knowledge, skills and understanding in relation to mathematics and statistics.

13. More information about the programme can be found here http://www.sigma-network.ac.uk/.

**Engineering conversion courses**

14. HEFCE is supporting the development of conversion courses in engineering and computer sciences. The pilot scheme aims to help the higher education sector develop more courses that support graduates from other subjects in pursuing careers in these sectors. The scheme aims to support innovative approaches which increase the number of graduates pursuing engineering at postgraduate level and entering the profession. Separate funding under the same scheme will help to develop conversion courses in engineering-related computer science disciplines.

15. A total of 28 projects, involving 32 universities and colleges, will between them receive £1.7 million to develop and market a range of engineering and computer science conversion courses. They aim to help those who have studied other subjects to move into careers in these areas. The new courses began in the 2016-17 academic year. We expect that up to 1500 converting graduates in total may benefit within the first two years.

16. Demand for graduates in engineering, data science, cybersecurity, and software engineering is growing in the economy. Providing graduates in other subjects with the opportunity to study and work in these areas will allow them to develop their careers, and increase the supply of skilled practitioners. The courses provide a range of opportunities for graduates across England to convert to these subjects, while undertaking study delivered in a variety of different models.

17. We will evaluate the scheme and report on its outcomes, with a view to securing wider take-up across the sector.

**Q-step**

18. Since October 2012, HEFCE, the Nuffield Foundation and the Economic and Social Research Council (ESRC) is funding a £19.5 million programme – called ‘Q-Step’ - designed to promote a step-change in quantitative methods training in response to the shortage of quantitatively-skilled social science graduates.

19. Over a five-year period the programme funds 15 specialist training centres in universities in the UK. This aims to nurture social science graduates with the right skills, but also encourage more and better quantitative methods training at institutions in the long-term. The network of ‘Q-Step Centres’ develops new courses; produces new content for existing courses; and provides opportunities for work placements and
pathways to postgraduate study. The programme is also committed to ensuring the pipeline of highly skilled quantitative methods teachers in UK universities.

20. The initial programme of funding will end in 2019 and the Nuffield Foundation will be appointing an evaluator in Spring 2017 to assess the impact of the programme and help with future plans beyond the initial funding period.


Section 2: The introduction of degree apprenticeships

22. Degree apprenticeships are a new model and level of apprenticeship that combine workplace learning with study leading to a bachelor’s or master’s degree. Degree apprenticeships are developed by employer-led ‘Trailblazer groups’ who develop standards in response to identifying skills gaps within their industry. Of the 18 degree apprenticeships standards that are approved and ready for delivery, 11 are in engineering or digital professions. This provides strong evidence of demand from employers for skilled employees in these areas.

23. The Government has made a pledge to increase the number of apprenticeship starts to 3 million by 2020. There are currently around 1000 active degree apprentices. HEFCE is working to support the sector to develop and deliver new degree apprenticeships from September 2017.

24. Our work in this area spans a range of activities and includes distributing £8.5 million to institutions to develop degree apprenticeships, including working with employers and professional bodies. Annex A includes a list of the 18 HE institutions who are receiving funding through HEFCE’s Degree Apprenticeships Development Fund and the degree apprenticeships they will be delivering. The majority of planned provision is in engineering and digital professions which reflects the apprenticeship standards that are ready for delivery which are a direct response to employer demand.

Section 4: Building the evidence base

Data analysis and monitoring

25. HEFCE publishes annual data about demand and supply in higher education subjects, and we have developed a searchable facility to enable visitors to our website to conduct their own analysis of this data. This facility can be accessed at http://www.hefce.ac.uk/analysis/supplydemand/. In addition to quantitative data, we also gather information from institutions, other sector partners and those with a stake in the HE sector.

26. Using these sources of information we will continue to analyse and monitor the impact of the new funding and fee changes. Where necessary, we will work with others to address risks to a particular subject, including those that fall within STEM.
27. This analysis shows that there are large differences in the gender profiles of students across subjects, as STEM subjects continue to be male-dominated. More than 85 per cent of the students studying for undergraduate degrees in computer sciences and engineering and technology in 2015-16 were male. A range of initiatives are aiming to address this imbalance, including Women in Engineering which aims to address demand from employers for qualified engineers by increasing the supply of female graduates. More information on this is available here http://midlandsenterpriseuniversities.co.uk/women-crucial-to-plugging-the-regions-skills-gaps. Another project is Women in Engineering Science and Technology which offers bursaries to women and girls to help them to pursue careers in these areas. More information is available here: http://www.westskills.org.uk/.

**Reviews of graduate employment and degree accreditation in STEM**

28. The former Government’s science and innovation strategy commissioned HEFCE in 2015 to support two reviews to explore employment outcomes of graduates from STEM disciplines. This responded to concerns that some STEM subjects do not have a strong graduate employment record and that some employers have voiced concerns that STEM graduates do not always meet the needs of business and industry.

29. One review considered STEM graduates and the other considered the specific concerns related to graduates of computer sciences. Both reviews reported in May 2016 and presented the Government with a robust picture of the current provision of STEM and computer sciences graduates; their associated employment outcomes, and where further work might be needed to explore concerns in greater detail.

30. Both reviews found that:
   a. Employers are looking for ‘work-ready’ graduates who can apply their academic studies and abilities in a commercial or work context. Work experience is invaluable, but not all employers want the same things, or are willing (and sufficiently resourced) to mould and train staff.
   b. Industry is changing at a rapid rate. This presents a dilemma for universities and colleges if they try to keep up with industry demands.
   c. Graduates need to upskill and adapt to a changing jobs market. Their degree will only get them so far in a career that may span 50 years.
   d. Careers advice needs to be tailored to each STEM subject, and students need to learn about career options early in their studies.
   e. Industry and higher education need to engage collaboratively in curriculum design, in assessment and accreditation, and in providing work experience opportunities and careers advice.
   f. The value of degree accreditation systems varies by STEM discipline. Some have established, respected systems, while others are still developing or are yet to be recognised and valued outside higher education.
31. Details on each review are provided below together with actions taken in response to the reviews' recommendations. The final reports from both reviews are available here https://www.gov.uk/government/collections/graduate-employment-and-accreditation-in-stem-independent-reviews.

**Wakeham Review of STEM degree provision and graduate employability**

32. The review looked across the whole of STEM to investigate whether any disciplines other than computer sciences had concerns about graduate employment outcomes. Together with broad recommendations on HE providers working in partnership with industry, the review recommends the following discipline-specific actions:

a. Targeted investigation of poor employment outcomes for graduates from three economically important disciplines: biological sciences; earth, marine and environmental sciences; and agriculture, animal sciences and food sciences.

b. Further work to establish the extent of concerns relating to aerospace engineering, biomedical engineering and engineering design graduates, and ensure these disciplines remain able to meet employer demands.

c. Exploration by the Science Council of an overall accreditation framework for the science disciplines.

33. Work is now being taken forward by the Science Council to develop a common language for accreditation.

**Shadbolt Review of Computer Sciences degree accreditation and graduate employability**

34. The review also highlighted the importance of HE and industry working collaboratively to ensure that graduates had the best chances of employment and that they continued to meet the skills needs of employers and the economy. Specifically the review recommended:

a. Improved data, based on better collection and analysis, to establish more clearly which skills employers want and where graduates are working, and to inform horizon-scanning.

b. Improved work experience opportunities for students, with investigation of any barriers for particular groups.

c. Continued teaching of foundational knowledge and principles of computer science in line with the Association for Computing Machinery guidelines.

d. ‘Work-ready’ skills as a recognised and accredited part of degree programmes.

e. A campaign targeted at careers in computer science that also looks to accrediting careers advice as part of degree programmes.
f. Start-up companies and small and medium-sized enterprises as a more visible and vocal part of the employer landscape, with greater interaction with higher education providers.

g. Flexible, agile and responsive accreditation of degree courses, and work to make this more respected and valued by employers, students and higher education providers.

35. Building on the themes within the review and the former Chancellor’s announcement in November 2015 of an Institute for Coding, HEFCE is working with the Department for Education (DfE) to develop a Digital Skills Investment Fund to support higher level digital skills. Further details of this Fund is expected later this year.

36. Both the Wakeham and Shadbolt Reviews highlighted the value of work experience to the employment outcomes of graduates from STEM subjects. This was also reiterated in a ministerial roundtable held in November 2016 to discuss progress with implementation of the Shadbolt Review recommendations. However, the reviews also highlighted that employers need to work in collaboration with HE providers to provide a range of opportunities to their students to gain experience during their course, including industry-sponsored projects and competitions. The full range of employers, including SMEs and start up companies, also need to more readily supply opportunities for students to undertake work placements. Examples of work placement schemes to improve STEM graduate employment outcomes and employability include:

a. the Royal Society of Chemistry’s Enterprise Plus Scheme, which enables SMEs to host work placements
b. The Science Council Employability and Placements Project, which aims to improve student employability by endorsing year-long industry placements against the national professional standards of Registered Scientist (RSci).

Research activities

Athena SWAN

37. The Athena SWAN Charter award scheme was established in 2005, recognising employment excellence for women in higher education in Science, Engineering and Technology (SET). More recently it was expanded to include science, technology, engineering, mathematics and medicine subject group (STEMM). In 2015 the Charter was expanded to recognise gender equality across all subjects (including Arts, Humanities, Social Sciences, Business and Law). The Charter is owned and managed by the Equality Challenge Unit (ECU). Participating institutions and departments can submit for Athena SWAN awards at Gold, Silver and Bronze Award levels.

38. An evaluation of the effectiveness of the charter was commissioned by the ECU in 2013. Overall it noted that women were best represented in language-based studies and worst represented in science, engineering and technology (SET), where in 2011 only 15% of professors were female. However, it found that career satisfaction, opportunities
for training and development, knowledge of promotion processes and fairness in the allocation of workload was considered better in the Silver Award and other Athena SWAN category groups than in no award departments. There was also evidence of a positive impact on institutional practices. However, at the time of the report, there was evidence of only limited impact on postgraduate students with no impact on the undergraduate population.

39. The Science Council is supporting the development of STEM technicians in the HE workforce by creating pathways for progression through nationally recognised registered status. This helps HE institutions in both STEM teaching provision and supporting STEM-based research teams. More information about the scheme is available here http://sciencecouncil.org/employers/employers-in-higher-education/.

January 2017