

Educating engineers for the 21st century economy

The Royal Academy of Engineering brings together the country's most eminent engineers from all disciplines to promote excellence in the science, art and practice of engineering. We work to enhance the UK's engineering capabilities; to celebrate excellence, inspire the next generation and lead debate by informing and influencing public policy. Working closely with engineering institutions our aim is to promote and enhance the contribution of engineers at the centre of society, public life, business and the economy.

The UK Government's 2009 National Skills Strategy called for a more skilled workforce to help build the economy of the future and tackle the major global problems we face.¹ However, despite the fact that the number of people graduating from UK universities has risen by 25 per cent² over the last ten years, the number of young people finishing degrees in engineering and technology has only increased by a little over 3%.³

The Academy's comprehensive review of engineering education as perceived by employers⁴ highlighted potential skills gaps and showed that the UK faces an increasing shortage of high-calibre engineering graduates entering industry over the next decade. This problem must be addressed if the UK is to weather the economic downturn, remain globally competitive and attract investment in cutting-edge technologies.

The Academy has recently launched the report into its wide-ranging study on experience-led engineering degree courses, *Engineering Graduates for Industry*⁵, aiming to identify the most effective practices within current and developing experience-led engineering degrees to meet the

needs of industry.

There is also serious concern in the engineering community about shortages in the technician workforce which is equally vital to industry. Skilled between level 3 (equivalent to A Level) and level 5 (HND, Foundation degree) technicians account for some 50% of the workforce in numerous engineering sectors including petrochemical and transport industries. The Academy is working

Key issues in engineering education

- The best of the UK's 20,000 engineering graduates are world class and industry is generally satisfied with their overall quality but there are simply not enough of them. More must be done to ensure that school students perceive engineering as an exciting and rewarding profession that is worth pursuing.
- Engineering courses at UK universities are now seriously under-funded. The quality of innovative learning and teaching being developed in universities should feature alongside research excellence in the assessment of the funding requirements for universities. The Engineering Graduates for Industry Report⁵ demonstrates that funding levels are on average 15% below what is required to make current engineering degree courses sustainable. However, there is a further need for capital investment to provide the facilities and staff to deliver experience-led engineering degrees. The report exhorts the Higher Education Funding Councils to provide focused ringfenced funding from which universities could enhance experience-led engineering degree courses.
- Universities and industry need to find more effective ways of ensuring that course content reflects the real needs of industry by enabling students to gain practical experience of industry as part of their education. Schemes such as the Academy's Visiting Professor Scheme (see below) and sandwich placements in small and large companies should be expanded to promote better dialogue and working relationships between industry

¹ *Skills for Growth. The National Skills Strategy*, DBIS 2009

² *Higher Education Statistics Agency*, www.hesa.ac.uk 2010

³ *Strategically Important and Vulnerable Subjects, advisory group report*, HEFCE 2009

⁴ *Educating engineers for the 21st century*, The Royal Academy of Engineering, June 2007

⁵ *Engineering Graduates for Industry*, The Royal Academy of Engineering, March 2010

and universities. Further funding for the Engineering Subject Centre (engSC) and engineering education initiatives would strengthen industry links and to enable the introduction of new schemes.

The Royal Academy of Engineering

As well as identifying issues and how they might be resolved, the Academy has established a number of programmes to encourage entry into engineering and maintain the highest standards of engineering education:

Visiting Professors scheme

This programme fosters industry-academia links and aims to help universities to teach in a way that relates to real professional practice by enabling senior engineers in business to work with their academic colleagues and provide a bridge for undergraduates from education to industry.

Best Programme

The Best Programme aims to recruit, train and retain the brightest and most motivated young people into engineering, create mutually beneficial partnerships between industry and education and provide education and training opportunities at every career stage. The Academy runs a suite of programmes – from undergraduate to senior management – to develop the UK's leading engineers.

Diversity in Engineering campaign

It is crucial that people from diverse backgrounds are encouraged and motivated towards engineering study and careers. The Diversity in Engineering campaign aims to promote diversity within the Academy and engineering employers as well as recognising and promoting good practice.

The National Engineering Programme (NEP)

Women, ethnic minorities and those

from low-income households are under-represented in engineering. The National Engineering Programme, managed by the Academy, recognises the connection between engineering and society and began in 2005 as the London Engineering Project (LEP), a widening participation project to help strengthen engineering as a strategic subject. The LEP has worked across London, taking engineering activities into schools, supporting the launch of the Diploma in Engineering and modernising university degrees. The NEP now includes the Welsh Engineering Project, and Barrow Engineering Project. Also part of the National Engineering Programme are the Engineering Engagement Project and the Best Programme.

Education for Engineering (E4E)

The Academy hosts E4E, the body through which the engineering profession offers coordinated and clear advice on education to UK Government and the devolved Assemblies. It deals with all aspects of learning that underpin engineering. It is both proactive and reactive to ensure that the education system continually remains appropriate to meet the challenges facing society. E4E has a wide membership drawn from the professional engineering community including all of the professional engineering institutions.

Engineering Engagement Project

The Academy has established a National Network to support teaching and learning of science, technology, engineering and mathematics (STEM) in schools with the support of BAE Systems. By supporting teaching and learning in these disciplines, the project aims to widen participation in engineering by helping teachers and pupils realise the significance of engineering to their everyday lives.

National HE STEM Programme

The National HE STEM Programme is a three-year initiative which aims to generate interest in STEM subjects among young people, enhance

higher level skills in the workplace and increase accessibility of higher education courses in these subjects. The £21M programme, funded by the Higher Education Funding Councils for England and Wales and based at Birmingham University, involves six partner universities who will develop and initiate activities in their regions. The Academy is the lead organisation for the Engineering strand.

CASCADES Project

Cascades is an action-research project to predict the impact of planned changes to the primary curriculum. Delivered in partnership with STEMNET, this uses a combination of after-school clubs and teacher Continual Professional Development in 40 primary schools. There is external evaluation and an Advisory Group drawn from QCDA, Royal Society, National STEM Centre, ASE and DATA.

Engineering Further Education (EFE)

Supported by BP plc, this project runs until Summer 2013 to support individual students in the transition into Engineering Further Education (FE). The programme aims to help FE colleges deliver a better, more attractive and more engaging engineering curriculum, through additional maths coaching, e-mentoring and teacher CPD. The project also aims to influence national policy on engineering FE.

Contact

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