

HEFCE consultation on developing the funding method for teaching from 2004-2005

The Engineering & Technology Board (ETB) is a unique partnership of industry, entrepreneurs, professionals, educators and policy-makers that promotes science, engineering and technology (SET) in the UK. Our central mission is to ensure that the supply of appropriately-skilled individuals into innovative and productive businesses better meets and stimulates demand.

The undergraduate experience is crucial to this. The 21st century higher education engineering department should be at the centre of a science, engineering and technology community which inspires throughout the skills supply chain – from schoolchild to experienced professional.

It must be outward-looking, encouraging a free flow of ideas with businesses, schools, the professions and other HE departments and institutions. It must deliver competent and motivated individuals who can invent, discover and produce.

Achieving this is an exhaustive and lengthy process. The need to develop competence and experience through both theory and practice puts time and resources at a premium.

No one is denying that the teaching of engineering and related subjects is an expensive business. But in the long term, a failure to invest properly in these disciplines will cost us even more. Innovation and productivity are the keys to boosting wealth, jobs and standards of living. And the key to innovation and productivity is diverse and well-funded science and engineering education and training.

It is in this context that ETB is responding on behalf of our partners and stakeholders including:

- Engineering Council UK
- Professional engineering institutions
- engineering departments in Higher Education Institutions (HEIs)
- SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technology
- Royal Academy of Engineering
- Engineering Professors Council
- Council of Professors and Heads of Computing
- ETB's Education, Policy & Innovation Panel

A full list of contributors is available in appendix A

A response to the proposals affecting the science, engineering & technology subjects

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Summary and Key Recommendations

Under HEFCE's proposals for developing the funding method for teaching from 2004-05, teaching in engineering and technology courses in universities across the UK will be significantly disadvantaged. This will potentially affect both quality of learning and a range of initiatives for widening access, improving retention, promoting research excellence and raising the levels of skills acquired by young people through higher education.

The HEFCE proposals threaten the engineering and technology sectors' economic and social development.

The main conclusion to be drawn is that higher education engineering departments could face closure due to the proposed splitting of the single price group for science and engineering programmes. Specifically, ETB would point to the following:

- Physics, chemistry, metallurgy and chemical, mineral, and materials engineering will see a 15.7% increase in their resource rate. This is most welcome. But despite HEFCE's own aspirations to assign academically cognate subjects to the same price groups, resources for general, civil, electrical, electronic, computer, mechanical, aero and production engineering will be reduced by an average 7.4%. The engineering subjects - and physics, chemistry and mathematics – greatly overlap so why separate them?
- From a broader perspective, the proposed funding methodology could have a negative effect on the perceptions of engineering and technology by a whole range of stakeholders. These proposals reflect confusion throughout our education system regarding the relationship between the sciences and engineering and technology; and how study options translate into careers paths. There is a great overlap between what is taught and practised in physics, chemistry, mathematics and the engineering subjects, so it is unwise to separate them. Furthermore, engineering skills are some of the most transferable in the modern workforce, and engineers end up in a variety of key roles in the economy.
- HEFCE needs to take account of the wider funding implications, particularly in relation to the Government White Paper '*The Future of Higher Education*', and the intentions to both expand the numbers of graduates and the need to create bridges between technician level training and vocational degrees.

This consultation offers an important opportunity for the SET sector to establish the extent and impact of past under-investment, present reform proposals and consider ways of contributing to possible remedial action, and longer-term solutions, including how HEIs can manage their funding in a more sustainable way.

ETB therefore recommends that HEFCE:

- ***reviews its proposals for the funding levels for all engineering programmes, to retain parity between them, and to ensure that no single engineering subject experiences reduced funding from 2004/2005***
- ***uses its funds more strategically to take account of the development of course programmes in line with the policy recommendations in "The Future of Higher Education" White Paper***

1 Key Issues

ETB has identified three general areas of concern:

- funding issues
- supply-side issues
- demand-side issues

1.1 Funding Issues

It is clear that many HEIs are already experiencing problems in funding their teaching and research infrastructure at the level that is necessary to maintain their innovative capacity. These HEFCE proposals reflect the disincentive effect of current funding mechanisms, which persuade institutions to deploy their resources away from SET subject areas and into more immediately lucrative ones such as media studies and other humanities.

The HEFCE cuts seem to have been devised through a separation of closely related subjects and their assignment to different pre-determined “price groups” that aim to reflect the relative cost of providing a programme. Previously, all science subjects fell into the same price group. Under the new regime, that price group would split to give physics, chemistry, metallurgy and chemical, mineral and materials engineering a 15.7% rise in their resource rate; while *reducing* resources for general, electrical, electronic, computer, mechanical, aero and production engineering by an average of 7.4%.

This contradicts HEFCE’s aspirations to assign academically cognate subjects to the same price groups in order to reduce “the likelihood of activity near the borders between disciplines being reassigned to higher-weighted cost centres”. A further example of this contradiction is that “information technology”, “systems sciences” and “software engineering” will face the same average change in resource rate (-5%), while “computer engineering” will lose 7.4%.

HEFCE describes the group of subjects to which it wants to allocate 15.7% more as “high-cost laboratory based science, engineering and technology”. Yet other degrees, such as aero and electronic engineering, which include expensive laboratory activity, have been assigned to the -7.4% price group.

Other inconsistencies are common in the proposals. For example, civil and mechanical engineering will attract 7.4% less funding from 2004-05, whilst material engineering will gain 15.7%. These two disciplines are very closely related and therefore any changes in one ought to be mirrored by complementary adjustments in the other. These changes may encourage departments to simply rename programmes to attract more funding.

Those engineering departments which do not close altogether could end up targeting greater numbers of full fee-paying overseas students for recruitment to lower funded courses, thereby squeezing out the UK’s potential in those fields.

- According to the Higher education Statistics Agency¹, there are currently 67,665 full-time equivalent students in biological sciences and a total of 20,250 in chemistry and physics.
- Across the engineering disciplines, the increase in some subjects (1,223 times the band B rate per student) is far outweighed by the decrease in others (4,719 the band B rate per student)²

¹ *All HE Students by Subject of Study, Domicile and Gender 2001/02* – HESA

² Based on HESA data showing full-time equivalent numbers of 3,450 in Chemical Engineering, 215 in Minerals Technology, 155 in Metallurgy, 90 in Ceramics, 2725 in Polymers and Textiles, and 1155 in Other Materials (all of whom would be funded at the higher level), together with 7845 in General engineering, 8835 in Civil engineering,

- Taken together, the core sciences and engineering would lose a total of 5,324 multiples of the current band B rate under the proposals. Allowing for errors in the estimates³, at least 75% of this projected cut would be real.
- The band B rate is currently £5,616 per student, so the fall in funding for core sciences and engineering under the current proposals would be approximately 75% of 5,324 times £5,616⁴, a total of £22.5 million.

The HEFCE proposal definitely discriminates against the universities trying to bring more students into engineering and in fact is beginning to penalise those that are successful in recruitment, especially of UK undergraduates.

Currently, HEFCE funding is based on a standard unit of resource per student, multiplied by a weighting factor dependent on the subject being studied, as follows:

- 4.5 (A, clinical subjects),
- 2 (B, science and engineering),
- 1.5 (C, subjects with a studio, minor laboratory or fieldwork element), and
- 1 (D, all other subjects, e.g. social sciences),

It is being proposed that this is replaced by a scheme whereby subjects are allocated into one of five bands, with the following weightings:

- 4 (A, clinical subjects),
- 2 (B1, chemistry, physics, chemical engineering, metallurgy & materials engineering)
- 1.6 (B2, all other science and engineering subjects)
- 1.3 (C, subjects with a studio, minor laboratory or fieldwork element), and
- 1 (D, all other subjects, e.g. social sciences).

Since it is not proposed to alter the total amount of money allocated by HEFCE, at subject level some will gain and some will lose.

- 4 +2.8% (A, clinical subjects),
- 2 +15.7% (B1, chemistry, physics, chemical engineering, metallurgy & materials engineering)
- 1.6 -7.4% (B2, all other science and engineering subjects)
- 1.3 -5.0% (C, subjects with a studio, minor laboratory or fieldwork element), and
- 1 +9.4% (D, all other subjects, e.g. social sciences)

22,995 in Electronic and/or Electrical Engineering, 13,445 in Mechanical Engineering, 4,670 in Aeronautical Engineering and 5990 in Production Engineering (all of whom be funded at the lower level).

³ The rough calculations are slightly out because they include all UK students, including those studying outside England, and some students from overseas who are not funded in the same way. But all overseas students (including those from the European Union) make up almost exactly 10% of the total full-times equivalents, while England makes up 83% of the total.

Allowing for the fact that some of the overseas students will be in Scotland, Wales and Northern Ireland, at least 75% of the calculated loss of income will apply to home students in England, and thus represents a real fall if the current proposals are implemented.

⁴ Funding Higher Education in England: How HEFCE allocates its funds, HEFCE 2003 (HEFCE 2003/20).

Many universities use the HEFCE weightings as a way of allocating money to departments internally. Multi-departmental schools (e.g. Engineering at Birmingham University) will be especially lose out because the reductions in the subjects that attract large numbers of students (e.g. Electrical & Electronic Engineering, Mechanical Engineering, Civil Engineering) will not be offset by gains in those subjects that are less popular (e.g. Chemical Engineering and Metallurgy & Materials)

There is also concern that the methodology used by HEFCE in deriving the proposed weightings is flawed, rewarding as it does small unpopular subjects and entertaining a massive swing in funding from Science and Engineering into the Arts and Humanities.

This is counter to the statements and policies outlined by various government departments. It particularly penalises engineering departments – departments that have already had to cut back on necessary teaching in design and projects which require small groups and close supervision. It also deters industrial secondments and programmes for similar reasons.

1.2 Supply-Side Issues: Quality and Competency

Quality in learning and teaching needs to be not only maintained but also enhanced if they are to meet the increasing expectations of students and the heightened requirements of employers resulting from global competition. Levels of funding must reflect this.

There is an ongoing need for up-to-date laboratories and well-qualified staff with time to liaise with industry - and to plan and deliver well-prepared teaching that supports and stimulates student learning and emphasises the creative nature of engineering.

This must be supported by an adaptable curriculum that can keep pace with and adequately reflect the fast-developing technological world that it is preparing students to enter. This requires time and money for faculty and staff to continuously develop and update their knowledge and skills. Engineering is unique in this respect (for example, languages do not evolve at such a rate as to threaten the relevancy of their teaching).

Cuts in resources therefore threaten a “double-whammy” to engineering under-graduate programmes: not only will some disappear altogether but those that remain will risk becoming irrelevant. They will swiftly lose their attraction to technologically aware students who want, and indeed need, to be taught in the most recent contexts. And they will also experience difficulty in recruiting and retaining staff in the SET subjects, increasing student to staff ratio and lowering “observed cost relativity” which will in turn lead to a reduced weighting factor

This is more than a matter of purely academic concern. The competent application of engineering skills is central to the safety of society. Cutting unit costs in engineering disciplines threatens the quality of the professional competency of graduates as course directors are forced to focus on theoretical and desk-based activities in an attempt to cut costs.

1.3 Demand Side Issues

There are three significant questions as to the impact of the funding changes:

- What impact does this proposed regime have on the skills shortages that are being experienced by such sectors as electronics, civil engineering and the construction industries?
- What effect do they have on the quality of graduates leaving university?
- In terms of graduate recruitment, how do these proposals, coupled with those in “*The Future of Higher Education*”⁵, affect initiatives to recruit engineers and technologists?

In preparing our evidence on behalf of the professional engineering institutions and partners, we have been primarily concerned with these unaddressed demand-side issues. In particular, we would ask why the sector appears to have become so chronically under-funded, and what foreseeable measures could be put into place to stop the decline.

2 Policy Considerations

The wider policy debate around higher education also has an important bearing on the funding issue. “*The Future of Higher Education*”, published this year, outlines plans to increase access to education, promote social equality and move the nation closer to becoming a knowledge economy.

As has been well documented, this policy will put significant additional budgetary pressures on universities. However, this seems to be inconsistent with other policy announcements such as The Research Assessment Exercise Review by Sir Gareth Roberts and the findings of the Lambert Review of University-Business Collaboration.

ETB also notes the intention to allocate ring-fenced funding to the creation of an extra 10,000 Foundation Degree places. Although many of these may be allocated to colleges, there are certain implications regarding the further pressure on existing teaching and learning resources to take account of this new field of activity.

ETB would make the following observations in respect of these wider funding implications:

- The Government’s stated intention to work towards a target of 50% participation in higher education by 2010 will create a variety of additional pressures on university departments. It is crucial that the quality of output in those obtaining an HE qualification be sustained in the long-term. In other words, the volume of graduates needs to be matched by at least maintenance of, and preferably an improvement in, the calibre of the candidates completing their degree.
- One important aspect of this process is the incorporation of more generic skills sets. Science, engineering and technology (SET) departments should be supported in broadening their subject options to develop more rounded graduates, who can acquire workplace skills before they enter the world of full-time work. Government policy needs to promote a broad balance between the supply and demand of graduates and skills. The quality, not just the number of the graduates, is the key to increasing output and productivity.

⁵ The Future of Higher Education. See <http://www.dfes.gov.uk/highereducation/hestrategy/>

- Investing in higher education in isolation of other factors is flawed as it cannot provide sufficient stimulus for increasing skills levels in the workforce. There is strong evidence of a present and future need within the economy to strengthen the labour force at technician and post-technician levels (e.g. NVQ Levels 3 & 4). ETB would point to the need for universities to address the Foundation Degree agenda and create bridges from sub-degree programmes such as Advanced Modern Apprenticeships to the mainstream degree programmes. This will again have budgetary implications.
- Universities which have a strong SET base have already been identified as key players in the progression of the economy to an innovation-driven stage. They have been able to foster the creation and commercialisation of new knowledge, alongside the provision of highly skilled graduates. Such universities have become increasingly important to regional and national competitiveness through successful research and development, cooperating with businesses throughout the innovation process. The continuing efforts of individual departments, especially in the technology departments of new universities, will continue to play a key role in developing our economy. ETB suggests that any reduction in funding will dilute and undermine the universities' capacity for this.
- Engineering and technology graduates experience excellent progress once they have entered the workforce. SET skills are very transferable and such graduates are widespread in the highest levels of the FTSE 100 companies. If the government wants to meet the increased expectations of young people who are building up debts to obtain a first degree, they should invest more money in areas that yield greater individual rewards and wider social returns on investment.

Appendix A:

Contributions and Acknowledgements

We would like to acknowledge the following organisations whose contributions have formed a part of this response.

ARUP

British Computer Society

Corus Group

Engineering Council UK (EC^{UK})

Echopilot

EU Skills

GWINTO

Institute of Physics

Institution of Agricultural Engineers

Institution of Civil Engineers

Institution of Electrical Engineers

Institution of Highways and Transportation

Institution of Incorporated Engineers

Institution of Mechanical Engineers

Institution of Structural Engineers

Institution of Water Officers

Joint Board of Moderators

Queen Mary University of London

Rolls-Royce plc

Save British Science

SEMTA

Society of Operations Engineers

The Energy Institute

The Open University

The Royal Academy of Engineering

UMIST

University of Bath

University of Birmingham

University of Bournemouth

Appendix B: The ETB agenda

Part funded by the registration fees of professional engineers, by business and industry and also by Government, the ETB's strategic objective is to ensure the supply of Science, Engineering and Technology skills better matches, and stimulates, market needs. Therefore, a critical aspect of the ETB's mission is to promote initiatives that enhance education and professional development.

ETB works closely with the UK's engineering institutions via EC^{UK}. These institutions, many of which were established in the 18th and 19th centuries to provide engineering education and training before engineering was on the universities' curriculum, also recognise the importance of education and professional development. This has led to three important strands of activity for the ETB which address the problems of UK businesses absorptive capacity and hopefully in turn their capacity to engage productively with the universities:

- raising the profile of SET
- developing professional qualifications for SET employees
- developing Continuing Professional Development schemes for SET employees

Raising the profile of SET

ETB brings together a wide-range of organisations from the sector to enhance public perceptions of SET. Specifically in this area, ETB have conducted extensive research looking at critical stages in young people's careers and attempted to find out why – at key decision points in the educational system – talented individuals are not realising their full potential in a SET career. The ETB also supports the Science and Engineering Ambassadors (SEA) scheme which supports and trains scientists and engineers to go into schools to promote science and engineering.

Supporting the development of professional qualifications

EC^{UK} is the body with sole responsibility for the regulation and registration of the profession. ETB is supporting their review and development of new professional qualifications that meet with the contemporary requirements of education, business and industry for the SET community. Part of this review also involves a detailed look at the role, status and training of technicians. Another aspect is the development and market testing of a new Chartered Technologist qualification.

Development of CPD

Linked to the proposed new professional qualifications which have a renewed emphasis on Continuing Professional Development the ETB is examining CPD and how this relates to competency and occupational frameworks.

Engaging Business & Industry

The ETB is working to ensure that the business and industry community is fully engaged with its agenda. Working in partnership with a number of organisations, the ETB is building business and industry networks. Its membership programmes are designed to (i) engage Business & Industry in the skills agenda, (ii) act as a source for research and (iii) build a more coherent and credible voice on behalf of the sector. The ETB also has sponsorship programmes which seek to secure the support of business and industry for ETB's work to promote Science, Engineering & Technology to 7-16 year old pupils and their primary influencers.