

The Council for Industry and Higher Education



“Strategically Important Subjects”

**Input into the review by HEFCE
from the CIHE Policy Forum**

April 2005

Strategically Important Subjects in Higher Education

Overall Context

There was a spate of closures of certain science, technology, engineering and maths (STEM) departments that focused attention on this issue around the end of 2004. This, combined with questions about the adequacy of the provision of certain language teaching, led the Secretary of State to ask the English higher education funding council (HEFCE) to consider the issues and make recommendations. The House of Commons Select Committee on Science and Technology also investigated the issue and reported in early April 2005. As additional background we note that HEFCE does not have planning powers and the Government has said that it will not make more money available.

The problem is largely one of inadequate demand: there are not enough UK students to justify running all the courses and departments now being closed. The problem in attracting students to study subjects at higher education is not confined to the UK. Indeed the UK can learn from how other countries are addressing the issue.

There is a limit to what HEIs can do in the face of falling student demand. The issue has to be tackled in schools and by appropriate business organisations, major companies and local recruiters sending messages and showing by their actions on pay and prospects that they value and offer rewarding careers to those with STEM capabilities. It would be inappropriate to propose a supply side solution to a largely demand side problem.

The changing nature of student demand is to some extent a reflection of where the UK economy is moving and where the future jobs will be. The growth of the service sector and of the so-called creative and knowledge based industries is inevitably reflected in student choice. Students are more canny than they are often given credit for being.

The other factor affecting demand has been a reduction in the number of graduates, including from overseas, wanting to undertake post-graduate research in these subjects. This reflects a wider issue of falling demand in Europe and the USA and the growing capability of universities in the Far East in STEM research.

But there has been another factor that has led to SET closures. *Most universities have to cross-subsidise those courses that require costly laboratories and other infrastructure.* Many universities and colleges make a loss on every student they graduate. Hence they need additional income from research, from endowments and other sources to spread the overhead costs or to directly subsidise loss-making courses. The main source of additional income is from research. Research funding that is not allocated to specific projects comes from the Research Assessment Exercise (RAE). With a greater focus of RAE funds on 6* and 5* departments, the funds for departments ranked 4 are limited. While some businesses value the work done in such departments, their funding is project related and even if it fully covered overheads, would not offer a surplus to cover teaching costs (and neither should it). That is why most of the departments that are closing in chemistry and physics for example are those that have only an RAE grade 4 or 3 even though there may be the student demand for those courses at those institutions. The lower

grade not only affects research funding but also the ability of the department to attract quality staff and students – including from overseas.

The final driver for change is that *universities are increasingly aware of the significance of their international research ratings*, the related need to keep and attract quality staff and by international perceptions on quality as evidenced in league tables as the way to attract quality overseas students. These league tables in turn reflect research ratings particularly in the natural sciences (the dominant element in the Shanghai Jiao Tong rankings table). So even if funds were found to support a grade 4 department in the short term, it does not follow that the department would be able to attract the overseas students it may need to remain viable.

The issue is not in all cases a national (English/Scottish etc) issue. In part it is a regional issue. *There are gaps in the regional map of provision for STEM subjects*. But these apparent gaps need to be related to regional needs. How many regions need how many chemistry, physics and engineering centres? Are those that have been rebranded, as forensic science for example, adequate to meet regional needs? The closure of the Exeter chemistry department, for example, will probably have minimum impact on a region that is not noted for its chemical or pharmaceutical base – and other universities in the region are maintaining their chemistry departments. However, in some cases the closure will impact on local demand for upskilling the workforce, for knowledge transfer and for widening participation given that small businesses and students from non-traditional backgrounds generally relate to their *local* university and college. There is also a broader need to stimulate regional and local business demand for the range of services and outputs from HEIs ranging from graduates, through work based learning, knowledge transfer to applied, application and fundamental research. *A department's survival will depend on how the whole spectrum of its capabilities are valued and utilised.*

Proposals

The focus should be firstly to influence demand and secondly to balance demand with long-term national and regional needs.

Raising demand has to start in schools. There is a shortage of teachers with the qualifications, knowledge or experience to make the STEM subjects exciting. The report on *SET for Success* by CIHE Council member Sir Gareth Roberts sets out the challenges and responses needed. The Government is acting on many of those. Equally, HEIs can do more to ensure an adequate supply of qualified teachers through pricing potential teachers onto courses. In this they will want to work with their RDAs, the professional bodies and others who can offer supportive funding packages.

Demand is driven at least in part by businesses and the signals they send. Student demand responds sometimes imperfectly to signals from the market place. How can demand and supply be more reflective of changing requirements in a fast changing business environment? The onus should be on those business organisations, major companies and local recruiters which need graduates with STEM capabilities to better explain the range of exciting and challenging jobs and careers on offer and the financial rewards available. The issue is not one just for the chemistry or engineering industries.

Indeed only about a third of graduates with chemistry degrees subsequently use their specific subject knowledge (*Change and Diversity* Mason for CIHE 1998). STEM graduates offer capabilities to a wide range of sectors. The financial services, IT and other growth sectors need such graduates as much as the manufacturing or other sectors and they should be involved in that strategy. The CIHE/UCAS publication on *The Value of Higher Education* (35,000 copies of which have gone to all schools and FE colleges) which notes the higher financial and employment benefits of studying STEM subjects could usefully be supplemented by more detailed and coordinated information on STEM subjects. The professional bodies might work together and with the financial services sector to produce such informative guides for students and those who advise them.

The requirements for those with STEM capabilities vary depending on the organisation and the function to be performed. An international pharmaceutical company will have a different set of demands from a local supplier of speciality chemicals or dispensing chemist shop. The wide range of opportunities in the economy need to be better articulated and differentiated.

Businesses have to work closer with schools from primary level upwards to give these more informed messages. Lessons can also be learned from overseas – Canada being an example. That country has also tackled the lack of female demand that itself is a factor in overall falling demand.

The Government with the British Council and HEIs can ***increase the overseas marketing efforts*** to attract more students and researchers to counteract falling home demand including for post-graduate courses. The Home Office must not undermine this effort through its short-term approach to increasing visa fees. HEIs can also price differentially and offer bursaries to improve the financial attractiveness of certain courses. In the USA there appears to be an increasing move for universities to work with their states and communities and alumni associations to price students and graduates into threatened courses that are considered important for the local economy; this is particularly the case for maths and STEM subjects. UK HEIs might usefully adopt a similar approach.

Much might also be learned from the experience of other countries – and we have mentioned Canada – where policies have encouraged an increase in demand including from women and ethnic backgrounds who are generally under-represented.

Businesses have to consider the scale and disposition of their R&D effort (as stated in the Lambert Review and the Science and Innovation Framework) and the strategic relationships they want to have with universities at the global and local level. More might be done to extol the research strengths of UK universities to multinational, overseas and local businesses. The RDAs and SSCs have a role to play in supporting individual institutional efforts at reaching out via HEIF to local businesses.

Equally, ***business opinions and investment decisions have to be fully reflected in RAE ratings***. The definition of international excellence must reflect business as well as academic views and we support the changes in RAE 2008 that aim to achieve this. But the jury is out as to whether change will happen. We have also argued for and welcome the move towards Research Councils providing 100% of the costs of the projects they

support so as to reduce the need for internal cross-subsidies; this will be particularly important where RAE income might not be available in the case of grade 4 departments (though Research Council and RAE appreciation of excellence should be aligned).

Overall the funding for higher education in the UK is inadequate to support world-class provision. This is especially true for high cost STEM subjects. Therefore the overall unit of resource for teaching has to be increased as a matter of Government priority. The £3,000 cap on graduate contributions also has to be raised at the earliest opportunity.

In addition to raising the quantum of funds for teaching (including of STEM subjects), ***the distribution of funding between subject disciplines should be changed by HEFCE.*** The STEM subjects should receive a greater unit of resource in line with the costs associated with delivering those subjects. This means that some other subjects will inevitably receive less. Equally we recognise that it is for individual institutions to allocate their block grant internally as they think appropriate and hence such an increase offers no guarantee of additional funding at the subject level.

RDA's should be well placed to determine local need . But they are inadequately resourced and lack the experience and operating capability. They will need to strengthen their Science and Technology Councils and ensure a coherent, realistic and informed approach to the development of their regional economic development strategies and the related provision of the HEI capability that will underpin that. They should have the resources to support the provision that they conclude is important to the competitive future of their regional economy. They might offer students bursaries to study regionally significant subjects in return for agreements that the graduates will remain in the region for a given period of time (as happens with many company sponsorships). Companies might also increase their student sponsorship schemes.

But in an age of student mobility and where companies will recruit the most appropriate graduate irrespective of where they have studied, reliance cannot be placed solely on regional action. The artificiality of some regional boundaries and the cross-regional relationships between HEIs would also make such a solution inadequate. The proposal from the Science and Technology Committee for there to be regional hubs of STEM excellence supporting regional spokes needs to reflect the realities on the ground. The proposal that this model should somehow be imposed by HEFCE as though it were a central planning body also ignores reality and the opposition of HEIs to the funding council assuming a sector-wide planning role.

However, ***greater cooperation between institutions at the local level would enable resources to be shared.*** Partnerships between institutions in urban areas in particular can enable efficiencies to be achieved, resources to be pooled, provision shared and quality raised. Few institutions can afford the £30 million needed to develop and sustain a world-class chemistry laboratory. Pooling resources and gaining additional funding from a mixture of regional and national sources (notably the HEFCE Strategic Partnership Fund) offers the type of solution adopted by Manchester/UMIST. Greater cooperation between HE and FE can help better inform students and those who advise them and can encourage progression, local knowledge transfer and the greater valuing of SET capabilities. The role of Local Learning Networks (LLNs) should be considered.

HEIs can do more to influence demand. In addition to differential pricing and the greater availability of bursaries, they can:

- better articulate the capabilities including the employability characteristics that the study of STEM subjects offer; the range of subjects covered in the CIHE/Graduate Prospects document on *Student Employability Profiles* - which notes the employability capabilities developed in certain subjects - should be extended with support from the Higher Education Academy to cover all subjects;
- make the study of STEM both challenging and exciting; many students shy away from what they perceive as the difficult options which many employers look for; the sector might work closer with employers to better appreciate the granularity of their demand and also make the challenging more exciting through case studies with employers that can make the theoretical come alive; the RDAs, SSCs and local networks of employers all have roles to play;
- more widely apply and develop the initiatives from such organisations as the Royal Society of Chemistry, the Institute of Physics, and the Engineering Technology Board.

But institutions currently do not have the resources to price many students and researchers into high cost STEM subjects. ***A national bursary scheme is needed for a set number of students to study STEM subjects*** – with an agreement that the graduate stays in the UK for a given number of years.

The issue of whether there is adequate language provision might be tackled differently from subjects where there are usually high costs associated with laboratories and other fixed facilities. Minority languages could be offered by the Open University through a central spine approach and as a supplement to other subjects offered by individual institutions. In other cases the creation of sub-regional centres of excellence in specific languages can be encouraged with regional and national funding – as is happening in London.

Conclusion

The spate of closures of uneconomic departments is an inevitable reaction to market and cost pressures. It may be short-lived but equally if the underlying causes are as suggested above, then the shake-out will continue. Universities have to adjust to changing pressures and focus on where they have competitive advantage. If Governments or RDAs or other stakeholders want universities to do things that are not economic, then they will have to pay accordingly. Equally, universities will want to engage with their stakeholders to ensure that the decisions they take are indeed in the long-term best interests of their institution and the communities to which they relate.

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