Opinion Forum

Campaign for Science & Engineering in the UK

The Views of Members and Supporters of CaSE

Number 1 June 2005

Science & Engineering in Further Education

This report is based on discussions with science and engineering staff from the Further Education Sector.

The discussions were begun at a meeting in March 2005, which was followed up with correspondence and conversations with a wider range of Further Education staff.

All of the participants either worked in Further Education colleges or had significant recent experience of working with the Further Education Sector. All were based in England. The report therefore says nothing about the other parts of the UK, except insofar as their Further Education systems resemble the English system.

The participants represented colleges from inner and outer city areas, as well as more rural parts of the country.

The findings are representative of the participants' views, but the specific opinions are the responsiblity of CaSE.

This document is one of a series of Opinion Forums that present the views of CaSE's members, contacts and supporters about current issues in science and engineering policy.

Summary of findings and recommendations:

- Offical league tables distort priorities and affect students' educational experiences. Public authorities should use them with more sensitivity to the potential negative consequences.
- Advanced Modern Apprenticeships work well in engineering, and should be expanded to include more science disciplines.
- The weighting of public funding for science and engineering students in Further Education is totally unrealistic, and should be increased to recognise the real additional costs of equipment, space and technical support. Staff are being forced to subvert the rules to make ends meet. Additionally, a direct funding stream should be introduced to cover the capital costs of providing up-to-date laboratories in which students can learn the latest science and the latest techniques.
- The burden of marking coursework for public examinations lies too heavily with college staff; the awarding bodies should carry a greater share. The exam boards are effectively getting lecturers to work for them for nothing, and in some cases are even charging them for training.
- Appropriate training should be compulsory for anyone expected to mark coursework for public exams, and the costs of training should be borne by the awarding bodies.
- Initial teacher training should include a more substantial element of exposure to teaching in Further Education.
- The system of continuing professional development for Further Education lecturers requires considerable strengthening. Even though they generally have no direct financial link with colleges, Local Educational Authorities could usefully take a lead in improving the situation.
- Sabbaticals and other opportunities to update and enhance knowledge are particularly important for those involved in vocational education, because it is crucial that they remain in touch with industry standards.
- Many careers advisers are giving students unrealistically low expectations of their likely earnings and potential achievements as trained scientists. The scientific community needs to provide better training and information for those people who are reponsible for giving careers advice.
- Recruiting and retaining scientific staff in Further Education is particularly difficult; career structures for both lecturers and technicians must be boosted if there is to be any chance of achieving the Goverment's stated aim of making the UK 'the best place in the world for science'.

Funding for science subjects in Further Education

The relatively low level of funding for science and engineering in Further Education is an issue of serious concern.

Funding weighting for science and engineering

Colleges receive 12% more funding for most science students than they do for humanities students, but this is substantially lower than the 30% extra they receive for students of catering or interior design, and is dwarfed by the 72% extra they receive for those studying music performance, floristry or country sports. Figure 1 shows the ratios for a range of subjects.

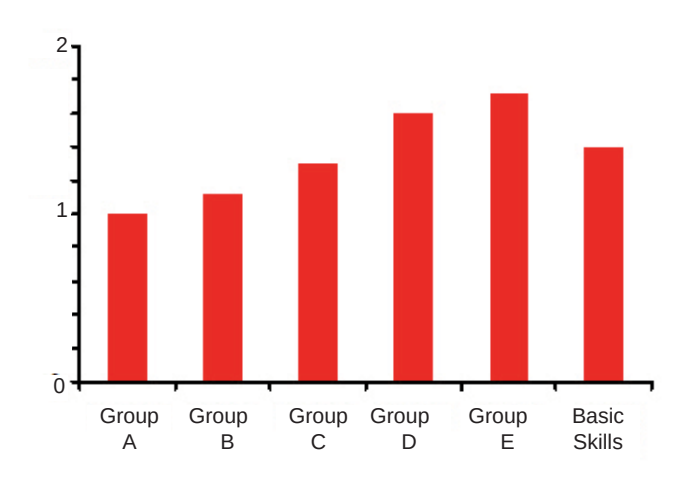

Figure 1. Relative levels of funding for students in different subjects groups in Further Education, with Group A set to 1.

Group A: Humanities, Languages, Mathematics, Social Sciences, Psychology
Group B: Most Sciences, Software Engineering, Performing Arts, Education, Health Care
Group C: Catering, Interior Design, Surveying & Cartography, Art Studies
Group D: Music Technology, Agricultural Engineering
Group E: Music Performance, Country Sports, Animal Sports, Agriculture, Floristry
Basic Skills courses are funded as a special band of their own.

There was a strong feeling among all participants in the Opinion Forum that these ratios are unrealistic, and completely inappropriate for science-based subjects.

The increased costs of science courses include the requirement for space, the need for technicians and the costs of laboratory equipment. Equipment costs are increased because they attract VAT, which is not paid on most of the purchases made by humanities departments (such as textbooks). Most colleges have historic agreements with the Customs and Excise regarding their VAT liabilities, but even allowing for the ability to reclaim some tax, it remains relatively unattractive to buy science equipment.

Moreover, the weighting in Further Education is much lower than it is in Higher Education, where science students are funded at rate 70% higher than those in the humanities. Even this ratio has been condemned as inadequate.

Changes to the system

The system for allocating funds is changing to an activity-based model, in which some attempt is made to recognise the real costs of particular elements of Further Education courses. This may be an opportunity to raise the proportion of funding allocated to science and engineering.

Participants at the Opinion Forum agreed that national sampling was not an appropriate means of assessing the funding needed to teach different subjects, since existing accounts are pitched to fit available funds, rather than on genuine costs. International sampling may provide an informative alternative.

Capital funding for laboratory equipment

A particular problem for the funding of science and engineering in Further Education is that colleges are funded per capita for the students enrolled, but do not necessarily obtain any direct capital funding. The capitation may barely cover the direct costs of teaching, and colleges have a huge problem refurbishing laboratories and workshops. This is a serious disincentive to expanding science provision, and in some circumstances may be an incentive to close existing facilities.

A further related problem is that, given such tight budgets, lecturers waste a good deal of time sourcing the best deals on purchasing equipment. That time would be better spent on educating their students. To alleviate this, one solution would be to offer tax credits for companies that supply schools at a discounted rate, following the example of the USA.

Bending the rules

All participants had some experience of gaining further funding for their departments despite the inadequate basic weightings. Examples included bidding for 'at-risk' funds, where departments make a case that some students are at risk of failing because of disadvantaged circumstances. Any equipment obtained can be used by all science students. The rules are being bent to the point of destruction to overcome the deficiencies of the basic formula.

League Tables

Participants at the Opinion Forum felt that League Tables distort priorities and affect students' educational experiences. For example, because league tables count how many students pass certain qualifications at a particular age, there is a prejudice against allowing individuals to learn at a slower pace than traditional routes would demand. This counts against such courses when schools and colleges consider offering them.

The way that league tables are constructed sometimes means that excellent students may be neglected, as effort is concentrated on students whose achievements are judged to be at the boundary between passing and failing.

Participants also agreed that although league tables based on value-added scores provide a fairer assessment of the performance of colleges, they can also reinforce stereoptypes.

One possible refinement of the system would be for tables to include subject-specific scores, focusing on disciplines of national strategic importance, including science and engineering.

The availability of vocational educational routes

A number of participants in the Opinion Forum were concered about the low take-up of GNVQs in scientific and technical areas.

Some colleges cannot justify maintaining vocational courses and many have cancelled them. With the vocational route consequently available at fewer colleges in the region, it becomes possible to pool candidates with a definite interest in such courses, but only if they are able to travel to the regional centre. Anyone unable to travel easily is excluded from vocational courses.

Some participants felt that the separate pathways into technician-level and research-level scientific careers should be established at Key Stage 3 (at age 14 or younger).

The new GCSE qualification in Applied Science may increase the stream of candidates entering the technician-level route at the age of 16. However, the first cohort of students studying for the GCSE achieved a 33% pass rate at grades A-C (compared to 52% in Double Award Science). Some teachers have complained that there is a lack of appropriate guidance from the exam boards about the qualification, while others have had difficulty in identifying which pupils are appropiate for the course.

Advanced Modern Apprenticeships

The Advanced Modern Apprenticeship in Engineering (AMAE) is considered a good model for qualifications in other areas (such as the sciences). It includes both work and training, and is structured in such a way that the training element can be used as credit towards a foundation degree.

This model allows different students to develop at different speeds, each learning different skills, but does not exclude them from potentially entering Higher Education. It is believed that about 60% of AMAE graduates go on to university.

This experience for engineering trainees contrasts sharply with the experience of science students from colleges represented in the Opinion Forum. Among these only about 65% of students on vocational courses complete their studies, and of those that do, about 20% fail to get into university, which in the principal aim of almost all.

These problems are partly due to an system that encourages many students into an educational trajectory that is wrong for them. Many of these students may benefit from an approach more like the Advanced Modern Apprenticeship.

At present, scientific apprenticeships are available for only a small number of areas, including pharmacy technical skills and physiological measurement technology.

There would, however, be fresh challenges in running apprenticeships in sectors that consist mainly of small employers. For example, most veterinary practices are too small to run their own accredited scheme, but veterinary nurses require training in a broadly similar way to apprentices in other fields.

The burden of assessing coursework

The marking of coursework is seen as an unreasonable burden on teachers and lecturers, particularly as work is generally re-marked by examiners appointed by the awarding boards. In some cases, every single script is re-marked by the boards, meaning that lecturers need not have wasted their time. Exam boards should carry a greater burden of the marking of coursework.

In addition, not all lecturers are trained properly. This is partly because in some cases they (or their colleges) are expected to pay the examining board for training, when it is the examining board itself that requires them to carry out the marking. To ensure consistency, training should be compulsory and the costs should be carried by the examining boards.

The table below shows the variation among boards in the training offered, and the charges to staff and colleges. The information is taken from the websites of the bodies.

Awarding body	Training and costs for internal markers	Training and benefits for people acting as examiners
AQA	Free support sessions for new specifications, thereafter fees set at a level to recover costs. Current courses cost £110 per day. Also working to produce free subject materials.	Coursework-standardising meetings free of charge with 'teacher release' payments.
Edexcel	£120 for a day's training for teachers and lecturers. Training delivered at the college or LEA at variable cost.	Board pays a fee and travel expenses for examiners who attend a training for standardisation meeting.
CCEA	Not given	Board provides cover for the compulsory one-day training session and standardisation meetings.
City & Guilds	£95 for a one-day training course, £300 for an advisory visit to the college and £500-£700 for a presentation delivered at the college. Subject-specific events at between £50 and £95 for a one-day course for assessors and verifiers, tutors, heads of department etc.	Not given
EAL	Charge of £180 per day for a one-day training course for assessors and verifiers. £1,200 for training delivered at the college.	Not given
NAA	Not given	Payment of about £175 per day to college for day-release of a teaching for examining. No obligation to use these funds at the time of the teacher's release.

Continuing Professional Development for teachers and lecturers

There is a need to substantially improve the continuing professional development of science staff in the Further Education sector, particularly as the pace of change in the sciences is so great. While the new Science Learning Centres will generate important additional opportunities, the lack of funding to provide cover for teachers absent on courses will in many cases be prohibitive.

There was no clear consensus among participants at the Opinion Forum as to how many days per year are allocated for training by the Standards Unit. This appears to be an indication that the recommendations are not followed consistently. Estimates of the recommended numbers of days per year to be spent on training were around 17, but none of the participants had in fact enjoyed this amount of continuing professional development.

Sabbaticals would be particularly important for those involved in vocational education, because it is crucial that they remain in touch with industry standards.

While there is often an emphasis on the need for educators to meet with working scientists and engineers as part of their continuing professional development, the essential nature of meeting with other teachers and lecturers is often overlooked.

Although Further Education colleges are not directly funded by the Local Education Authorities, in practice there are common interests and are often links.

It might therefore be appropriate for Education Authorities to play a valuable role in bringing together college lecturers and teachers from secondary schools to share their experiences.

Equipment sharing schemes may also be effective at the level of the Eduation Authorities, and participants in the Opinion Forum suggested that these could be combined with local support and training sessions in how to use the equipment in lessons.

Participants felt that the availability of development opportunities in Further Education depends as much on the attitudes of senior staff as it does on the funding and time available.

Initial teacher training does not cover a sufficient amount of Further Education subject content. Lecturers may qualify by obtaining a Postgraduate Certificate in Education, based primarily in secondary schools, but if they enter the Further Education Sector, end up teaching entirely different material.

Increasing the uptake of science subjects

The continuing decline in interest in science and engineering among young people is of serious concern in Further Education, in both the vocational and the academic arenas.

Decisions to take up science at college are probably largely based on an individual's experience of science at school, so improving uptake at Further Education level is as much a job for secondary schools as it is for colleges.

Some participants in the Opinion Forum were optimistic that the establishment of an increasing number of specialist science and technology colleges will increase the uptake and enthusiasm for sciences in the sixth form.

However, there remain concerns that top-up fees will deter students who might enter Further Education as a route to Higher Education, particularly among immigrants to the UK. University 'masterclasses' and work-shadowing schemes for local sixth-form students are being developed in some areas, while in others graduate students volunteer to supplement the support of laboratory technicians during A-level coursework investigations.

Among some students, there is a perception that science is a poorly rewarded career, although recent evidence suggests that, in fact, engineering, chemistry and physics are among the most lucrative degrees. This may reflect a more general failure of the careers advice services in colleges.

Conversely, two categories of students may be encouraged to take science subjects when it is not really appropriate for them to do so. First, the educational maintenance allowance may be encouraging some people to stay in education for the money, even though they are uninterested in the courses.

Second, others may be studying sciences because they believe the technical and mathematical nature of science will mean they can escape their difficulties of using language. Too few scientists and engineers do enough to dispel the common misconception that their work does not require excellent language skills.

Recruiting and retaining science staff in Further Education

As in much of the educational system, recruiting and retaining science staff is a serious problem in the Further Education sector. There are difficulties both in terms of lecturing staff and in terms of of technical staff.

Some of the colleges represented in the Opinion Forum have a core of long-serving science lecturers, but they exerience serious difficulty replacing them when the retire. Colleges are forced to use visiting teachers to fill the gaps, and this proves disruptive to students.

The introduction of top-up fees for Higher Education will exacerbate the recruitment problems of Further Education lecturers, as careers in Further Education are not as well remunerated as many other jobs that are open to graduates of science subjects.

Even other educational jobs in science, such as teaching in secondary schools, are better remunerated than lecturing in Further Education sector. Until careers in Further Education are made more attractive, there will continue to be a serious problem of recruiting and retaining the best staff.

Teaching hours

According to participants in the Opinion Forum, the amount of time a Further Education lecturer spends in the classroom has increased over the past ten years from around 17 hours to around 24 hours per week. There is a wide variation within the sector, and the issue is regulated by individual colleges. National regulations to limit the growth in teaching hours would not be welcome, but the recent increase has affected the quality of education on offer to students, as well as reducing the appeal of a career in Further Education. More advice and training for college managers may be the most appropriate way of tackling the issue of unrealistic amounts of time spent in class by lecturers.

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Campaign for Science & Engineering in the UK

The Campaign for Science and Engineering is a pressure group aiming to improve the scientific health of the UK.

Our objective is to communicate to Parliament and the nation as a whole the economic and cultural importance of scientific and technological development and the vital need for the funding of this research by Government and industry.

We achieve this by meeting directly with ministers, civil servants and advisers in Westminster and Whitehall, as well as in Edinburgh, Cardiff and Belfast; by networking with a wide range of industrialists, educationalists, researchers and academics involved in science in engineering; by commenting in the media and interacting with backbench Parliamentarians to keep science policy at the forefront of the public agenda; and by publishing analyses, briefings and responses to public consultations.

Our work is supported by 1,500 individual scientists and engineers and by a wide range of industrial companies, universities, city financiers, learned societies, publishers and others.

To discover more about our work, please visit our website:

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