

This report is based on discussions with primary and secondary school teachers, university staff, education consultants, schools science inspectors and educational researchers in Northern Ireland.

The main discussions took place at a series of meetings in December 2005, followed up with further correspondence and conversations.

The discussions focused on a variety of issues concerning the education and training for Northern Ireland's youngsters in the fields of science and engineering.

The *Opinion Forum* is backed up with a more detailed analytical report, which can be downloaded from the web address on page 6.

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

## Science education in Northern Ireland's schools

### *Summary of findings and recommendations:*

- Despite the lack of political leadership in education policies, there is currently a strong climate of motivation within the region to take advantage of changes and create opportunities to improve science education. Those potential improvements could contribute to tackling social exclusion, and help to provide the skills base needed to strengthen Northern Ireland's economy.
- Official bodies do not consistently prioritise science education to the extent that they should. For example the Department of Education in Northern Ireland (DENI) included attainment targets for English and mathematics in its Business Plan for 2005-2006, but there was not even a single mention of science in the document.
- Whether devolved or controlled from Westminster, the DENI should create a post for a named individual to take overall responsibility for driving the improvements in science education needed to equip Northern Ireland's school children for university and the workplace.
- Northern Ireland has a higher ratio of teachers to pupils than the rest of the UK, and this in part appears to reflect greater relative financial returns. There are lessons to be learnt from Northern Ireland in other parts of the UK regarding the status of teaching as a career. Greater (relative) financial returns may not be the only significant factor. For example post-primary teachers in Ulster are generally not required to teach outside of their subject specialism.
- Most teachers in Northern Ireland are native to the region, so Ulster's science teaching workforce may be especially susceptible to the possible closure of local university science departments.
- While the teaching workforce appears relatively healthy, the situation for school laboratory technicians is worse than in other parts of the UK, and the supply is reported as almost non-existent. Northern Ireland needs urgently to address this shortfall, perhaps through the creation of a suitable Further Education qualification similar to an apprenticeship.
- Science suffers in some primary schools, relative to the effort afforded to the numeracy and literacy strategies. Teaching support should be available for practical lessons in primary schools, when it is needed most. Science should be explicitly included in DENI's annual business plan, in the regional targets of the Curriculum Advice and Support Service, and in school development plans.
- Primary school teachers in Northern Ireland would strongly welcome the benefits of having peripatetic specialist science teachers visiting their schools. A scheme at Queen's University achieves this by placing science graduates into primary schools as part of their training, but there is a need to make similar projects available to all schools on a regular basis.

## Summary of findings and recommendations:

Continued from front page:

- Science teachers are concerned that constant policy changes are harmful, and they are dissatisfied with the procedures by which the Council for the Curriculum Examinations & Assessment (CCEA) consults the teaching profession about changes. CCEA should take serious steps to build bridges with the science teaching community that appears to be alienated from it, through more inclusive collaboration and consultation.
  - Changes should be based on a meaningful consultation process, in which the involvement of teachers and subject experts from outside of the school education community is essential.
  - Teachers need more continuous professional development that is focused on subject knowledge, and science educators are missing out on valuable direct contact with the science community. New networks are needed for post-primary science teachers in Northern Ireland to interact both with one another and with the wider scientific community.
  - Basic minimum standards should be laid out for the amount of subject-specific continuous professional development that secondary school science teachers can expect to undertake. At an absolute minimum, this should amount to the equivalent of at least a day per year. To ensure that arrangements are effective, a mechanism must be developed to ensure that cover teaching can be funded while teachers are engaging in professional development activities away from the classroom.
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## Part 1:

### Participation in science and educational standards

#### Political commitment to science in schools

The UK Government has begun to respond to the need for an improvement in standards and in rate of participation in science after the age of 16. For example, the Roberts Review in 2002 looked at various issues concerning science in schools and the 2006 Budget set out targets for increasing the numbers of A-level students and teachers in physics and chemistry.

The relevant Government departments and associated educational bodies in Northern Ireland do not consistently prioritise science subjects to the same extent. For example, although DENI's Business Plan for 2005-06 includes specific attainment targets in English and mathematics, science is not mentioned anywhere in the document.

#### Interest in science in younger children

Participants in the *Opinion Forum* meetings generally observed that young children in Northern Ireland began to lose enthusiasm for science at the age of about 11. This contrasts with the impressions of teachers from England, who more commonly report their pupils turning away from science a little later, around the age of 13 or 14.

This may be because of the Transfer Test, which Northern Ireland students have hitherto taken at age 11. The decision have now been taken to abandon these tests, and teachers appear confident that this will delay the decline in enthusiasm for science among Ulster's children.

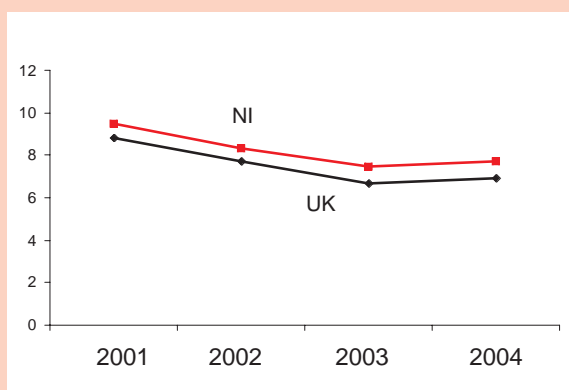


Figure 1. Percentage of total A-level entries that were in mathematics in Northern Ireland and the UK as a whole in recent years [Source: Joint Council for Qualifications].

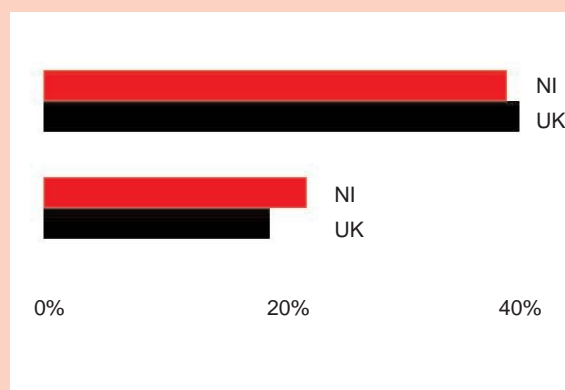


Figure 2. Percentage of Higher Education students in all Science, Technology, Engineering & Medicine (STEM) subjects (top) and in STEM excluding medical and veterinary subjects in Northern Ireland and the UK (bottom) [Sources: DELNI and HESA]

### Participation rates in science after the age of 16

A higher proportion of young people choose to study science in Northern Ireland than in other parts of the UK, but the overall trends are similar.

For example, Figure 1 shows how a slightly higher percentage of Northern Ireland's youngsters choose to study mathematics A-level than their counterparts in the UK as a whole, but that in both cases, the numbers have fallen in recent years. A similar general picture applies in biology, chemistry and physics.

At Higher Education Level, Ulster's students are more likely to study healthcare subjects than students elsewhere, but are about 20% less likely to study biology, the physical sciences, mathematics or engineering (see Figure 2).

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## Part 2: The schools science workforce

### Laboratory technicians

While the situation regarding the teaching workforce is better in Northern Ireland than it is in the rest of the UK, that for school laboratory technicians is, if anything, worse. Participants reported that the supply is almost non-existent.

In one of the schools we contacted, the post had eventually been filled by a dinner lady because no suitably qualified person was available.

Because of the shortage of trained technicians, schools rely heavily on science teachers to train the unqualified staff who are appointed to these posts.

Teachers who took part in the *Opinion Forum* meetings felt strongly that there should be mandatory standards and qualifications for school technicians and that every school should automatically be entitled to an adequate number of posts.

### Teaching staff

National figures show that science teachers are among the hardest to recruit, but most surveys and reports that have looked at this challenge have either excluded Northern Ireland or lumped the data together with other parts of the UK.

However, in general, teaching tends to be viewed as a more attractive career in Ulster than in other parts of the UK, partly because financial returns show a higher premium for teachers

in Northern Ireland than elsewhere (see Figure 3). The average ratio of pupils to teachers in Northern Ireland is 16.3, compared with 17.9 in England, and 18.0 in Wales. Only Scotland has a better ratio, at 14.9.

The vast majority of Northern Ireland's teachers are home-grown - more than 90% of students studying for a Post Graduate Certificate in Education in Northern Ireland are native to the province.

In the current climate, this does not present a problem, but it could potentially make the supply of science teachers in Ulster particularly vulnerable to factors outside the schools system. For example, the closure of science departments at either of Northern Ireland's two universities could have a dramatic effect on the supply of teachers in the relevant disciplines.

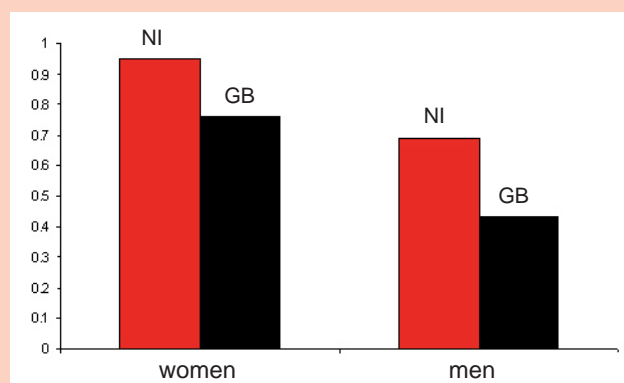


Figure 3. Estimated rates of economic return on teaching qualifications in Northern Ireland (red bars) and Great Britain (black bars) [Source: *Education and Earnings in Northern Ireland*, Harmon and Walker for DELNI, 2000].

### Continuing Professional Development

One way of helping to ensure that teaching remains an attractive option for science graduates is through appropriate development and progression opportunities - Continuing Professional Development (CPD). Recent work by the General Teaching Council of Northern Ireland and the Department of Education in Northern Ireland will mean that CPD plays a more important role in Ulster's teaching workforce and will help to raise the profile of the profession.

However, participants in the *Opinion Forum* meetings thought that although these developments were positive, they were not entirely in line with the most pressing needs. They concentrate on professional and pedagogical knowledge, with insufficient emphasis on subject content, which advances rapidly and dramatically in the sciences.

Science support and training is one of the greatest unmet needs of Northern Ireland's teachers; primary school teachers, for example, would strongly welcome peripatetic science specialists into their lessons. Queen's University already offers placements for its science graduates to go into primary schools as part of their teacher training, but the number of schools reached by the scheme is limited.

## Part 3: The science curriculum

### Interaction between teachers and the curriculum authority

Northern Ireland has a single examination board, unlike England, which has several independent bodies awarding GCSE and other qualifications. In Ulster, the exam board is combined with the curriculum authority in a single body - the Council for the Curriculum, Examinations & Assessment. However, the two functions are now divided into separate branches.

The teachers who participated in the *Opinion Forum* meetings were generally satisfied with the examinations team of the CCEA. However, they were much less content with other aspects of the CCEA's work, and felt alienated from it. Of concern in recent years has been the constant change that has characterised CCEA's interactions with schools, although there are hopes that the new curriculum will prove to be an opportunity for improvements to science education.

Participants were most critical of the ways in which the CCEA consults and engages teachers. They were concerned about what they perceived as:

- the inappropriate manipulation of results and misrepresentation of proposals
- ignoring or misunderstanding teachers' responses to consultation questions
- leading questions and excessively long documents to which sensible responses were impractical within realistic timescales, and
- inappropriate timing of consultations

Clearly, the teaching community feels alienated from and mistrustful of the CCEA, and this creates a risk that teachers will be unwilling or unenthusiastic about implementing changes, however potentially valuable those developments may be.

### Interaction between the curriculum authority and the science base

Participants in the *Opinion Forum* meetings stressed that, in determining the content of the school curriculum, the CCEA does not appear to make sufficient use of the expertise found in the universities.

Only a handful of members of Northern Ireland's universities have regular or meaningful contact with the authority. One barrier to communication is that it is difficult for universities to offer incentives

for individual staff to engage with such issues, in terms of career structure, ratings in the Research Assessment Exercise or financial rewards. But a more important barrier to involvement appears to have been the attitude of the CCEA itself.

Participants reported that their attempts to join CCEA curriculum boards had repeatedly been rejected over a period of more than ten years.

They also pointed out that some relevant disciplines can be unintentionally excluded from debates about the curriculum. For example, because engineering is not taught as a subject in schools engineering faculties can easily be neglected, even though school-level qualifications in mathematics and science are essential for anyone wishing to go on to study engineering.

This is one in a series of *Opinion Forums* designed to represent the views of CaSE's members, supporters and contacts about current issues in science and engineering policy.

It is backed up by a more detailed analysis, which can be downloaded from:

**[www.sciencecampaign.org.uk/documents/2006/CaSE0613b.pdf](http://www.sciencecampaign.org.uk/documents/2006/CaSE0613b.pdf)**

Other Opinion Forums recently published or currently being planned include subjects such as *Science & Engineering in Further Education*; *Regional Policies for Scientific Businesses*; *Costs and Incentives of Investing in British Research & Development*; *Careers Advice for Young People Interested in Science*; *Major Priorities for Science and Engineering in the 2007 Comprehensive Spending Review*; and *Science & Engineering Policies in Wales*.



Participants at one of *Opinion Forum* meetings in Northern Ireland.

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Campaign for  
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