

Making the best of third-level science

Issues and recommendations

In February 2009 the Royal Irish Academy convened a meeting of senior representatives of institutions responsible for higher education to consider the effects of the increased numbers of students at third level on the performance of undergraduate science students. The following conclusions emerged from the discussion.

Key issues

- In Ireland, the number entering full-time undergraduate education annually has increased from 40,600 in 1980/1 to 119,800 in 2007/08.
- This increase implies a wide range of abilities among students and a need for different educational environments across a variety of institutions, as in the widely replicated higher-education system of the state of California.
- *In principle*, Ireland's universities, institutes of technology and post-leaving Certificate colleges provide an appropriately differentiated infrastructure for a broadly based higher education.
- *In practice*, the increase in numbers has led to over-expansion of the universities at the expense of institutes of technology. With respect to undergraduate science, this has led to large class sizes of mixed abilities compromising the overall quality of the educational experience for all students but particularly the brightest and the weakest.

Thus, instead of expansion at third level being accommodated within the range of Irish higher-education institutions, it has led to a *mismatch* of students and institutions.

The origins of this mismatch have roots in:

- A core funding model for undergraduate education based on numbers of students without regard to educational requirements and standards;
- The preference of school-leavers for a level-8 course in a university over a level-6/7 (or 8) course in an institute of technology.

Conflicting policies

The recruitment of poorly qualified students has been characterised as 'mission drift' on the part of universities. As a consequence, a combination of low CAO entry points, grade inflation and an imperative to maintain high retention rates has led to a reduction in standards of science degrees.

This is at odds with government policy and the needs of the economy as indicated by:

- Investment of nearly €2 billion for fourth-level research;
- Reliance for economic growth on a 'smart economy' dependent on the quality of higher education, research and innovation;
- Increased reliance upon overseas recruitment of science graduates for employment and as candidates for PhD degrees.

Remedies and actions

There is a clear and compelling case for encouraging students to avail of the smaller class sizes and individual attention of undergraduate education in the institutes of technology.

Achieving this objective will require:

- Restrictions on recruitment of science students to higher-education institutions: e.g. to the upper 20% of the Leaving-Certificate cohort for a university and upper 40% for an institute of technology;
- Cooperation to ensure transfer of qualified students between educational levels (6/7 and 8) within and between institutions.

Implementation of these measures would need to take account of the following caveats and implications:

Caveats

- Financial consequences of restricting numbers of students entering universities under the current funding model would need to be addressed.
- To avoid a risk of institutes of technology becoming feeder colleges for universities, transfer to a level-8 course within an institute should normally be available;

Implications

- A significant effort will be required to maintain the standards of science education in universities and improve the quality of first-year courses and laboratories.
- Limiting entry to science courses should improve competition for science places and increase the quality of applicants.
- Regional or national cooperation between institutions will be more easily facilitated in the first instance by a focus on science rather than on third level as a whole.
- Appropriate actions will be needed at school level, especially with respect to: student preparation in mathematics and the physical sciences; the continuing professional development of mathematics and science teachers; and more effective recruitment of female students to science, especially mathematics.
- If third-level fees are to be reintroduced there should be differentiation between universities and institutes of technology in favour of the latter.