Science and Technology as Elements of Educational and Socio-Economic Change in Ireland, 1958-83

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While many European countries after the second world war were spurred into new industrial, social and educational development, Ireland, which had adopted a neutral stance in the conflict, was much slower to engage in and benefit from such initiatives. Indeed, for most of the 1950s Ireland experienced a stagnant or declining economic performance, a continuing population decline, high levels of unemployment, high rates of emigration and a poorly-developed educational infrastructure. The economy was largely based on traditional agriculture with limited industrialisation protected by various tariff barriers. The export market on which the country depended so much was preponderantly linked to Britain which, as an industrial economy, operated a cheap food policy. Society was also permeated by a crisis of confidence as so many of the younger generation could see no future for them in their own society and it did not seem that Ireland could break through to the standards of living which were being attained by many Western countries. As a foundation document of the economic recovery put it, in 1958, 'a dynamic has to be found and released'[1] and the document realised that investment capital was not the only factor. There would be a constellation of elements needed in which 'advances in education and technical training' would be central. The succeeding 25 years witnessed great changes in which the interplay of education, science, technology and socio-economic policy and development took interesting patterns.

In 1958 the Department of Finance made public its new strategy for a planned approach to economic development and

the government endorsed the approach by issuing its first *Programme for economic development* in the same year. While no specific section dealt with education the programme referred to the need for 'the raising of the general level of technological education and the stimulation of new ideas.'[2] The growth target of 2 per cent for the period 1959-63 was exceeded and it actually averaged 4½ per cent per annum. *The second programme for economic expansion* was published in 1964. This more wide-ranging programme devoted a specific chapter to education. The new policy of viewing education as an investment was clearly articulated.

> Expenditure on education is an investment in the fuller use of the country's primary resource – its people – which can be expected to yield increasing returns in terms of economic progress. Economic growth has become increasingly dependent on the application of the results of scientific research and development to the practical problems of production.[3]

Meanwhile, concern was being expressed about the inadequacies of the education system and its lack of alignment with the needs of an economy launched on an industrialisation policy and ambitious annual GNP targets. Several major investigations were undertaken to appraise the situation and identify deficiencies in relation to labour needs. These reflected a new social concern to extend the provision of education more widely among the population. In 1960 the Commission on Higher Education was set up but its voluminous report was not published until 1967. Among its many criticisms were that 'technological training as such is largely absent from the country's higher education. . . . This position urgently needs to be remedied'.[4] It also echoed the now accepted view that 'technology is an essential factor in the country's further progress, and our resources, actual or potential should come to be regarded as a major asset'.[5] It urged greater concern by the universities for basic research in science and engineering but, interestingly, it considered that because of the applied links of technology with industry the universities should not be asked

to take up close obligations in this field but that a technological authority should be established.[6]

Another major investigation was set up as a joint venture with OECD in 1962. This was to concentrate on first and second-level education and the report, published in 1966, was appropriately titled *Investment in education*. This report highlighted many defects of the schooling system in terms of participation, use of resources, curricula and inadequacies in relation to labour planning. In this latter regard the study showed 'a gap between the projected flow of qualified manpower and the projected requirements of qualified manpower'.[7] The report drew attention to the academic, literary emphasis of the secondary school curricula and pointed to serious problems in mathematics and science teaching in both the secondary schools and the short-cycle vocational schools. Unless policies were changed there would be serious shortages of people in the workforce with basic second-level certification and, in particular, there would be a grave shortage of technicians.

This question of technician training and supply was the subject of a separate contemporaneous study by OECD. This report also remarked:

> The secondary schools have a strong classical and linguistic bias, and in their curricula mathematics and science hold a position which leaves many students inadequately prepared for courses in engineering and science.[8]

It urged greater scope for apprenticeship training, more career guidance for pupils and the introduction of a technical leaving certificate at the end of second level. At the confrontation meeting which took place with OECD in Paris, Minister Hillery saw educational policy moving into a new era 'in which expenditure on education should be regarded as one of the most fruitful forms of long-term national investment'.[9] Indeed, in May 1963 the Minister announced significant new measures which included the provision by the state of new comprehensive schools, the intention of the government to introduce regional technical colleges, to establish a technical leaving certificate and to erode the binary tradition of grammar and

vocational education at second level.[10] Clearly the interaction of the investigative teams with international thinking, particularly through OECD channels, was having striking, direct effects. Also, in line with developments internationally, reform in science and mathematics curricula and pedagogy was initiated.

Need for industrial research

As a further demonstration of government concern in the area of education, science and economic development the Minister for Industry and Commerce, in association with OECD established an Applied Research and Technological Survey Team which produced a major report, *Science and Irish economic development*, in 1966. Among its disturbing findings the team reported that the science effort was piecemeal and scattered thinly, that industrial research was relatively non-existent and that financial support for fundamental research in the higher education sector was extraordinarily inadequate.[11] Comparative statistical figures indicated that research expenditure per head of the population was only one sixth that of the Western European average.[12] The report urged the immediate establishment of a National Science Council which would 'plan a strategy for science and technology made up of a national programme for research and related activities.'[13]

In line with these investigations, there was a fundamental shift in public policy and attitudes towards educational reform and expansion; science and technology was given a certain place within this. The speed with which the new institutions came on the scene was somewhat bewildering. With the help of Marshall Plan funds the Agricultural Institute was established in 1958. Then the Economic Research Institute was set up in 1960 and later expanded to become the Economic and Social Research Institute in 1966. The Institute for Industrial Research and Standards was re-organised and expanded in 1961. The National Industrial Economic Council was set up in 1963 (to be replaced by the National Economic and Social Council in 1973), the Medico-Social Research Board dates from 1965. The Industrial Training Authority (AnCO) was set up in 1967. The National Science Council began its activities in 1968 and continued for a decade until replaced by the

National Board for Science and Technology in 1979. This cluster of new institutions with a concern in varying degrees for research, technology and training was a clear indication of the new policy direction. As part of this new drive towards industrialisation the Industrial Development Authority, with the help of attractive aid inducements, was successful in attracting to Ireland significant levels of foreign investment.

Increased productivity, expanded employment opportunities, greater wage increases, reduced emigration, improved living standards, a more tolerant and outward-looking public opinion gave rise to a new sense of optimism and confidence in society. This was buttressed in 1966, the 50th anniversary of the Easter Rising, when the census figures revealed the first significant rise in population since the catastrophic Great Famine of the 1840s. Changes in education policy now assumed a new momentum and policies were implemented to restructure the education system, to greatly expand it, to improve participation by the economically and socially disadvantaged, to reform curricula with a greater emphasis on science, technology and practical subjects and to give higher education a greater research emphasis.[14]

The introduction of 'free' post-primary education and school transport schemes in 1967 was a dramatic gesture which caught the public imagination. There resulted an increase of 130 per cent in post-primary school enrolment between 1965 and 1981. The vocational schools were raised to full second-level schools and all post-primary schools now presented pupils for the centralised public examinations. It was planned that all the schools would offer a comprehensive-type curriculum, with subject choice assisted by a new career guidance structure. While a technical leaving certificate was not introduced efforts were made to encourage subject group specialisation in the senior cycle in 1969 and new technical subjects relating to engineering workshop practice, building materials and processes, technical drawing and applied business studies courses were brought in. At primary level a radically changed curriculum in terms of ideology, curricular content and pedagogic approach was introduced nationwide in 1971.

Expansion of facilities

However, it was at third level that the emphasis in public policy of harnessing education more directly to the technological and scientific needs of an expanding economy became most obvious. Of the existing institutions the two technological colleges under the Dublin Vocational Education Committee were expanded and got injections of staff and resources. All the existing universities undertook expansion programmes with impressive new buildings, laboratories and equipment. They were urged to improve their science, engineering and technological work and to adopt a more active post-graduate and staff research role.

However, it was considered that if national needs in the areas of science and applied studies were to be met different institutions were called for. The Steering Committee on Technical Education in its report (signed 1967) endorsed the government's decision of establishing nine regional technical colleges. These would 'educate for trade and industry over a broad spectrum of occupations ranging from craft to professional level, notably in engineering and science, but also in commercial, linguistic and other specialities'.[15] The crystallisation of policy towards a binary third-level system was evident in the Committee's proposal that a National Council for Educational Awards for the non-university sector should be established. This body was appointed in 1972 and the first regional colleges opened in 1970.

In 1968 a Higher Education Authority was established which was to have important planning and budgeting powers, acting as a buffer between the central government and many designated third-level institutions. The same year saw a state-sponsored student grant scheme introduced. Contemporaneously a further new institution was planned – a National Institute for Higher Education. This opened in Limerick in 1972. This institution, and a similar one which opened in Dublin in 1980, was intended to lead the way in flexible courses in technology and applied studies with close links to industry. The various changes were accompanied by an increase of 113 per cent in the number of full time third-level students in 1981 over the 1966 figure.

It became clear that some of the targets of the Second

Economic Programme would not be met and a Third Programme for Economic and Social Development was launched in 1969. Its title suggested a greater social dimension and the Programme recognised that 'economic growth is not an end in itself, its ultimate objective is an increase in individual and national well-being'.[16] It endorsed the role of science and technology for national development and pledged increased support for science. Economic growth averaged about 4 per cent per annum in the decade 1959 to 1969 and the Third Programme envisaged a growth rate in GNP of 17 per cent over the succeeding four years. As part of a policy towards full employment the Programme stressed the need for fundamental changes in education with a special role for science education.

A scheme of financial support for science research grants was introduced by the National Science Council in 1969. In 1970 a Science Policy Research Council was established in University College Dublin. In its *Progress report* for the period 1969-71 the National Science Council emphasised that science and technology 'were now one of society's main sources of innovation' and it also urged greater co-operation and liaison between the universities and industry. The Council also sought greater powers so that a national science policy might have more teeth in effecting change.[17]

Shortage of scientific and technical skills

In a detailed analysis of the educational system, *Studies in Irish science policy* (1972) pointed to serious shortages in science and mathematics graduates in the teaching force, to shortages of technicians, to insufficient scientific and technological research in the universities and to lack of satisfactory liaison between the universities and industry.[18] This concern of the early 1970s for the quality and direction of science policy was again reflected in a report by Cooper and Whelan in 1973. They raised disturbing issues and claimed that 'the growth of the Irish economy in the past decade or so has resulted in a form of economic organisation in which Irish science and technological skills only play a very limited part'.[19] Ireland's contribution to research and development had remained small by international standards and, unlike other countries, was concentrated on agriculture, though industry had by now well

outstripped agriculture in terms of percentage of GNP and level of employment. As part of a recommended change of direction the report stated:

> We argue that it is desirable to switch *from* a situation in which foreign science and technology is largely a substitute for the productive development of science in Ireland, to one where Irish technological capability can be built and extended by a complementary use of foreign technical achievement.[20]

Ireland's entry to the EEC in January 1973 was to have profound impact on many aspects of Irish society. The OPEC oil crisis in September of the same year with its implications for change in the world economic order was also to be the harbinger of deep social change in Ireland. Unlike most Western countries Ireland continued to experience a growth in its youth population with an overall population increase of 22 per cent over the last two decades. Ireland actually experienced a net immigration increase for a period. The changes in educational policy were now showing dividends – 'if educational credentials give a general sense of the quality of a workforce, then Ireland by the mid 70s was on the road to having one of the finest in Europe'.[21] This well-qualified, increased youth population was, however, no longer encountering a climate of economic growth. Instead, recent years have experienced deep international recession with high unemployment, high inflation, declining markets and little economic growth. Indeed, it is being increasingly realised that society is undergoing a technological and communications revolution which has the most profound implications for future patterns of employment and societal organisation. The mirage of full employment which, as late as 1977 was government policy in Ireland, has evaporated.

In 1979 the National Board of Science and Technology was formed and a new momentum and more co-ordinated policy in science and technology was in evidence. This co-ordination is very necessary to maximise return.[22] While the take-up of the new technical-type subjects in second-level schools was not as satisfactory as anticipated, particularly among girls, the

change of emphasis in third-level education is very striking.[23] Whereas 80 per cent of third-level students were in universities twenty years ago almost 50 per cent are now in the non-university sector with its greater emphasis on applied and technological studies. The percentage of full-time students in science and engineering have increased by 32 and 58 per cent respectively in the period 1976 to 1981 while the percentage increase in arts has only been 0.6 per cent.[24] Of all new entrants to higher education in 1980 only 15 per cent enrolled in the humanities and 41 per cent entered science and technology programmes.[25]

Linkage with industry

Policy steps have been taken to link higher education institutions with industry: recent years have seen the introduction of innovation centres, technology parks, incubator factories, a microelectronics application centre, a biochemical research unit onto the campuses of third-level institutions, while a 'university-industry centre' is planned for the campus of University College Dublin.[26] A national working party of deans in their report *Education, innovation and entrepreneurship* (1982) have urged wide-ranging initiatives linking education more actively with industry and scientific development and calling for a pedagogic/study style with more emphasis on problem solving, creative projects and innovative thinking.[27]

The policy of the Industrial Development Authority has been emphasising electronics, mechanical engineering, industrial biotechnology, chemical and health care goods.[28] It has also been concentrating more on the development of indigenous industry and scientific expertise. This policy has been endorsed by the National Board of Science and Technology which, in its *Science budget* for 1981, has also urged increased investment in research and development, pointing out that the percentage of GDP invested in research and development in Ireland at 0.8 per cent is less than half the EEC average.[29] The National Board for Science and Technology has been preparing a new national science policy to be issued late in 1983.

While most thinking on science and technology has concentrated on how they can be fostered and expanded so as to improve economic performance and material well-being, there

is also some questioning of the control exercised over their development. In the course of an important recent address, *Whither science policy?*, Professor Lynch, who had been central to many of the developments over the last twenty-five years, emphasised that technology must not be given a life of its own and that the future of civilisation depended on the quality of the social and economic objectives set by humans towards which technologists are to be directed.[30]

Notes to article

[1] Department of Finance (T. K. Whitaker), *Economic development* Dublin: Stationery Office, 1958, p. 7.

[2] Government of Ireland, *Programme for economic expansion* Dublin: Stationery Office, (Pr. 4796) 1958, pp. 8, 9.

[3] Government of Ireland, *Second programme for economic development* Part II. Dublin: Stationery Office, (Pr. 7670), 1964, p. 193.

[4] Commission on Higher Education, I, *Preparation and summary of report* Dublin: Stationery Office, (Pr. 9326) 1967, p. 34.

[5] Commission on Higher Education, II, *Report Vol. I* Dublin: Stationery Office, (Pr. 9389), 1967, p. 180.

[6] Ibid., p. 184.

[7] *Investment in education* Dublin: Stationery Office (Pr. 8311) 1965, p. 391.

[8] OECD, *Reviews of national policies for science and education: the training of technicians in Ireland* Paris, 1964, p. 88.

[9] Ibid., p. 101.

[10] John Coolahan, *Irish education: history and structure* Dublin: Institute of Public Administration, 1981, p. 193.

[11] *Science and Irish economic development*, Vol. I. Dublin: Stationery Office (Pr. 8975), pp. xiv, xv, xxii.

[12] Ibid., p. 66.

[13] Ibid., p. xxvii.

[14] For details see Coolahan, *Irish education*, pp. 131-220.

[15] Steering Committee on Technical Education, *Report on regional technical colleges* Dublin: Stationery Office (Prl. 371) 1969, p. 11.

[16] *Third economic programme for economic and social development, 1969-71* Dublin: Stationery Office (Prl. 431) 1969, p. 16.

[17] National Science Council, *Progress report, 1969-71* Dublin: Stationery Office, 1972, pp. 7, 28, and see also National Science Council, *Science Policy Formulation and Resource Allocation* Dublin: Stationery Office, 1972, pp. 9, 10, 11.

[18] Science Policy Research Centre, *Studies in Irish science policy* Dublin: Stationery Office, 1972, pp. 29-49.

[19] Charles Cooper and Noel Whelan, *Science, technology and industry in Ireland* Dublin: Stationery Office, 1973, p. 7.

[20] Ibid., p. 40.

[21] D. B. Rottman and P. J. O'Connell, 'The changing social structure' (p. 73), in *Unequal achievement – the Irish experience 1957-82:* a special issue of *Administration* 1982, Vol. 30, Nos. 2 & 3. Dublin: IPA, 1982.

[22] For a directory of involved associations see W. K. Downey and R. Brew, *Ireland: science and technology* Dublin: NBST, 1980.

[23] D. G. Mulcahy, *Curriculum and policy in Irish post-primary education* Dublin: Institute of Public Administration, 1981, pp. 33-50 and Employment Equality Agency, *Schooling and sex-roles* Dublin: EEA, 1983, pp. 28-31.

[24] Higher Education Authority, *Student statistics* 1981/82, Table 9. p. 19.

[25] Pat Clancy, *Participation in higher education* Dublin: HEA, 1982, Table 4, p.16.

[26] Confederation of Irish Industry, *Strategy for industrial innovation: the role of third-level institutions* Dublin: CII 1981, pp. 32-34.

[27] National Working Party of Deans, *Education innovation and entrepreneurship* Dublin: National Board of Science and Technology, 1982.

[28] Industrial Development Authority, *Industrial plan, 1978-82* p. 5, and National Economic and Social Council, *A review of industrial policy* 1982.

[29] National Board of Science and Technology, *Science budget 1981*, pp. ii, iii.

[30] Patrick Lynch, *Whither science policy?* University College Dublin, 1980; see also Padraig Hogan, 'The central question in technological education' in M. Farry, N. McMillan (eds.). *Higher technological education in Ireland.* Dublin: Association of Technological Education, 1983, pp. 80-90.