

# A Taste for Technology

For far too long there has been a lamentable shortfall in the number of able students who wish to pursue technological studies in higher education, and only in recent months (in figures revealed by the Secretary of State for Education) has the situation begun to improve.

As early as 1963 the Department of Education at the University of Oxford published the results of a survey into the career choices made by sixth form students. Mr. D.W. Hutchins, in charge of the survey,<sup>1</sup> was able to demonstrate that the most intelligent sixth form students were not, at that time, taking up careers in engineering and applied science but were instead concentrating on the arts and pure sciences. Following this survey, in 1966 the Joint Matriculation Board examined the A level entries of their candidates subject by subject for the year 1964 and, comparing them with previous years, illustrated the alarming fact that when expressed as percentages:

'... increases of 4% for Mathematics, 3% for Physics, and 1% for Chemistry must be set against increases of 14% for English Literature, 17% for History, and 19% for Geography'.<sup>2</sup>

The point was further elaborated by the publication in 1964 of the second report of the Universities Central Council of Admissions, which suggested that whilst a reasonable number of above average students were coming forward for pure science and technology, difficulties arose in this area:

'... when candidates with a comparatively poor performance have to be admitted in larger proportion to fill the vacancies'.<sup>3</sup>

These problems have existed for at least one-and-a-half decades. Nevertheless it was undoubtedly a step in the right direction for the Prime Minister to outline yet again these alarming facts, and enter the debate as to what might be done about it.

'Why is it that 30,000 vacancies for students in science and engineering in our Universities and Polytechnics were not taken up last year while the humanities courses were full?'<sup>4</sup>

The 'confidential' Department of Education and Science memorandum (the so called 'Yellow Book') on which it is believed Mr. Callaghan relied for the material of his speech, was by no means explicit in this regard, but the Times Educational Supplement, reprinting edited extracts of the memo, did comment on the supply of teachers in science technology and engineering.

'There is no quick and easy solution to the problem. In so far as initial training is concerned although the Secretary of State has some powers to direct institutions as to the number and category of students to be admitted, these powers cannot compensate for a shortage of qualified applicants. Schools need to encourage more pupils to study mathematics, science and technology ...'<sup>5</sup>

This view, that in some way it was the responsibility of the school to generate more science and maths

students, became a popular line in the great debate but Mr. Callaghan carefully avoided the simplistic conclusion by suggesting:

'There seems to be a need for a more technological bias in science teaching that will lead towards practical applications in industry rather than towards academic studies'.<sup>5</sup>

Mr. Callaghan was rightly unimpressed by the 'more as before' lobby, who would have us simply impose more maths and science onto the curriculum. What he was suggesting was a more careful examination of what we do under the heading of maths, science and technology in school. Just such a study was published in 1967 through the auspices of the Schools Council as their Curriculum Bulletin No. 2 entitled 'A School Approach to Technology', and, quoting from the foreword:

'The Council's purpose in issuing the bulletin is to assist teachers of science, craft and mathematics who wish to provide their pupils, girls as well as boys, with creative opportunities to apply their learning to the solution of a practical problem'.<sup>7</sup>

In making its final proposals, the bulletin drew attention to the Crowther Report '15-18' which had proposed 'alternative roads' to learning, that should lead through school to university level offering a practical education making progressively more exacting intellectual demands. The curriculum bulletin took up this challenge and proposed, among other things, a new course in science technology and craft which should be:

'... a new type of workshop activity forming an important part of a grouped course directed towards the needs of future engineering and applied science students ...'.<sup>8</sup>

This was the basis on which was built in 1968 the Schools Council 'Project Technology' after the publication of Working Paper 18 'Technology and the Schools' and it was a central belief that if the objectives of the project could be achieved then it would incidentally:

'... contribute towards the satisfaction of certain national manpower demands: a sufficient proportion of able pupils choosing scientific and technological careers'.<sup>9</sup>

It was the realisation that technology is essentially a disciplined decision making process that enabled the innovators in this field to combine it so successfully with the study of design. M. Deere in an article entitled 'The Anatomy of Technology' (written when he was Director of the Technical Education Unit at Reading University) went to great lengths to illustrate the essentially problem solving nature of the process of technology. We work, he says, as a designer from human purpose towards human achievement using the resources available to us and working within the restraints imposed upon us. He saw it as a necessity that as many children as possible should be involved in the technological design process, for:

'... not only are they learning to apply knowledge and skill but they are almost bound to be increasing their technological resources and increasing the awareness of the implications of technology for people'.<sup>10</sup>

However, it would be a mistake to assume that such a study is concerned simply with matters technological, requiring only that problems be tackled by the application of a logical sequence of operations to ensure a satisfactory conclusion. Problems of a complex nature, that have no one correct solution cannot be solved by the application of the intellect alone, but involve questions of 'feeling' as much as of 'thinking', of 'value' as well as 'correctness'. Design methodology, which makes use of a logical sequence of operations to encourage clear thinking, is thereby tempered with the intuitive response of children to materials.

The study of Design and Technology can be seen as a relatively new hybrid, with *design* forming a continuum link between the pure sciences and the pure arts, for anything other than these pure studies involves the solving of practical problems for human purposes. This thinking has resulted in 'Design and Technology' O and A level replacing the traditional craft studies with London University Examinations Board. Similarly the Oxford Local Examinations Board has encompassed O and A level 'Design', and the slowly expanding number of universities and polytechnics which accept these examinations as an academic qualification is a testament to the quality of the study as seen through the performance of students who gained their places through this qualification.

There is no doubt that the number of students engaged in A level courses in Design and Technology is growing steadily and perhaps it is merely coincidence that this trend is mirrored by an increasing interest in technological studies in Higher Education. Nevertheless the link is an obvious one; the encouragement of applied science and technology courses at university must stem from an enthusiasm for applied science and technology established in the children at school.

The real irony of the situation however is provided by those university faculties which refuse to recognise Design and Technology as a 'respectable' qualification, despite the advice of the Standing Conference on University Entrance. While a significant number of these university faculties continue to treasure two Maths and Physics as entry requirements for technology courses many schools will feel obliged to direct their children accordingly.

There has been much speculation and debate into the source of the resistance shown by some university departments to the developing examinations in design. There is no single cause for the resistance, but a frequent negative reaction results from the supposed lack of 'intellectual rigour' required in the study of design. The problem seems to rest in the lack of any specific body of knowledge which is uniquely the concern of design. It is true that the majority of the content of Design and Technology courses can be observed elsewhere on the curriculum. Science, art, mathematics, biology, and history indeed the majority of curriculum subjects contribute practical and conceptual knowledge which extends the work of Design and Technology.

Any attempt to identify the *raison d'être* of Design and Technology therefore must recognise its central concern as an *integrating force* for knowledge and experience which is characteristically rooted elsewhere. A student of design is likely to be involved in experiences which may demand at different times scientific, aesthetic, moral, or mathematical responses and one of the values of his study lies in the experience he acquires in evaluating their respective relevance and their interrelationship in the solving of design problems.

However this argument leads directly to the conclusion that if Design and Technology involves all those things it can only be skimming over the surface of the material, thereby failing to come to grips with any study in depth. This leads automatically to accusations of shallow intellectual demand.

There are two errors in this argument:

1. Because there is no depth study of a particular aspect of the course (e.g. the material science or the historical or the aesthetic aspects of design) it does not follow that there is a reduced intellectual demand. There is a *different* intellectual demand which centres on deriving, researching, evaluating and resolving the often conflicting requirements in a design brief. There is more to intellect than 'pure' scientific or artistic research and learning.
2. This article has been particularly concerned with the higher education of technologists and applied scientists, *not* pure scientists. It would be reasonable for a university dept. to require pure science A levels as an entry requirement for a pure science course, but it is very strange when a technology course in school is not regarded as a suitable preparation for a technology course at university. Here then is a simple difference of opinion. Some argue that success in A level Design or Design and Technology is not going to be a good predictor of success in a university course (even a technology course). Others argue that it would be. Any self respecting scientist would admit that the only way to resolve the argument is to get some evidence, and the only way to produce the evidence is to admit some students and observe their progress. There is plenty of circumstantial evidence to suggest that the experiment is worth trying.

## References

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