

Selecting Craft and Technician Apprentices: Cognitive Explanations of Success in Further Education

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During the Courses for Craftsmen Project which resulted in the Scottish Council for Research in Education publication *A Day Off Work?*^{*}, it was noticed that the more able of the students often failed to perform well in City and Guilds Craft courses. It was also observed that an increasing proportion of entrants to Craft courses had secondary school qualifications which were adequate for entry to City and Guilds *Technician* courses.

The Council therefore agreed in 1970 to mount a two year investigation into the overlap of the entrance qualifications of Craft and Technician students. It was hoped that some alternative procedure could be suggested for deciding whether the prospective student arriving at college was better suited to a Craft or a Technician course. An alternative procedure was required in any case, since by 1973 the existing criterion for entry to a Technician course of "a four year secondary course with, in the final year, Mathematics and Science" would be satisfied by almost all college entrants in Scotland.

A random sample of new students undertaking Craft or Technician courses in Electrical Engineering, Mechanical Engineering, or Motor Vehicle Studies was drawn from all Scottish colleges which offered both Craft and Technician courses in any of these three subject areas. In September 1970, these students completed a battery of cognitive tests — of intelligence (verbal and non-verbal), mechanical comprehension, spatial ability, and arithmetic — and a short personality inventory.

At the end of the test programme, 647 usable sets of results were available, and the 647 students involved were followed up over a two year period to measure their success in further education. Interest was centred not only on whether courses were successfully completed but on whether the students even remained in Further Education: it will be appreciated that *unnecessary* premature discontinuation of courses can be a serious

problem in Further Education and that it is important to trace factors giving rise to it.

From the original test scores, measurements were made of the overlap of Craft and Technician entrants. This was found to be very great indeed, ranging from 56% to 97% on the cognitive tests and being almost complete on the personality inventory. This meant that most of the Craft and Technician entrants could have changed places without any obvious effect on the distribution of test scores. In addition, the redistribution of students due to promotion, demotion and drop-out over two sessions had very little effect in reducing the overlap figures. The new overlap on the cognitive tests ranged from 49% to 89% and the overlap on the personality scores was only slightly less than before. Whatever factors influenced allocation to initial course and subsequent promotion, demotion or drop-out, they had little to do with ability as measured by these tests. The only exception was in Motor Vehicle courses, where a common practice was to use the first year as a diagnostic one and to base selection for the Technician course on performance in it. The overall overlap figures indicated that the allocation achieved in this manner was distinctly better than that achieved by initial separation, as in Electrical Engineering and Mechanical Engineering.

An examination of student progress over the two-year period was disturbing. The situation is shown in Table 1. It will be observed that, in all three subjects, only between 55% and 61% of all entrants had achieved success at either Craft or Technician level. The proportion of *all* entrants passing at the higher — ie, Technician — level varied more widely. When due allowance is made for the national (as distinct from the sample) ratio between the number of entrants to Craft courses and that to Technician courses (approximately 2:1 in Electrical and in Mechanical Engineering, and 9:1 in Motor Vehicle Engineering), the

Table 1
Student Progress Two Years after Entry to Course

Type of Engineering Course	Number of Entrants	%Passing appropriate internal and external Examinations	% Failing	
			Dropping out from Further Education	Continuing in Further Education
Electrical (Craft)	108	80)	16 (80 ^x)	4 (20 ^x)
Electrical (Technician)	101	57 34)	41 (62 ^x)	25 (38 ^x)
Mechanical (Craft)	152	66)	22 (65 ^x)	12 (35 ^x)
Mechanical (Technician)	118	61 54)	22 (48 ^x)	24 (52 ^x)
Motor Vehicle (Craft + Technician)	168	55	42 (93 ^x)	3 (7 ^x)

x Re-expressed as percentage of *those failing* (instead of as percentage of entrants)

proportion of *all* entrants gaining passes at the technician level are estimated to be 11%, 18% and 6% for Electrical, Mechanical, and Motor Vehicle Engineering respectively. These inter-subject differences in pass-rate are due, in part, to there being different views in the three industries about their individual needs for technicians. For example, the road transport industry tends, it has been observed to find it difficult to accept that it has much need for apprentices with Technicians' training, whereas employers of mechanical engineers have been found to be reasonably content to allow their apprentices to seek to obtain the higher qualification.

It will also be observed from Table 1 that total drop-out from Further Education courses was greatest in Motor Vehicle Engineering (42%), being almost twice that for Mechanical Engineering courses (22%) and one-and-a-half times as great as for Electrical Engineering (29% — for Craft and Technician courses taken together). That in

Electrical Engineering and Mechanical Engineering Technician courses a larger percentage of those failing should remain in Further Education than is the case in the corresponding Craft courses is not surprising since only the former have an easier course available, but even in the Technician courses the complete loss of students to the Further Education system is very large. The extremely high rate of complete loss in the Motor Vehicle combined Craft and Technician group in part reflects the large preponderance of Craft students in that group, but the rate is high even by Craft course standards. That it is so is attributable partly to those students having been allocated to their respective courses only after a common first year, but probably mainly to the industry which, being reluctant to accept day release in the first instance, is happy to allow a potentially profitable third year apprentice to discontinue his further education for whatever reason.

A major purpose of the analysis was to

discover whether by using a combination of the available scores, each appropriately weighted, it would be possible to make predictions of success in each of the two grades of courses (ie, Craft and Technician) with improved accuracy so that the number of misallocations to courses would be minimised. The correlations between the individual predictors and successful completion of the course unfortunately varied between low and very low, and the scope for successful prediction through using a step-wise multiple regression was therefore small. Attempts were made to find a cut-off point on a score made up of a number of sub-scores each optimally weighted. *Applied to the sample from which the scoring equation had been derived*, this discriminant function technique achieved a 70% success in predicting who would in fact pass and who fail in Mechanical Engineering and in Electrical Engineering Technician courses. (The same level of success was achieved in predicting staying or not staying in Further Education). Applied to a fresh sample, this equation would almost certainly have a lower level of success – though how much lower only further experiment could tell. In any case it is worthwhile noting that maximising correct prediction is not the same thing as maximising the number of passes. Attempting the latter involves lowering admission standards to below the cut-off point optimising prediction.

Using a battery of tests such as the one employed in this investigation does not therefore seem to offer a very effective means of finding whether a Craft or a Technician course is the more appropriate for any given student. On the other hand, the present system of allocation achieves so little that even a system with only a very modest level of success is likely to be an improvement. What is quite clear is that many factors other than ability determine both whether a student drops-out of Further

Education and whether he eventually completes an appropriate course.

One thing clearly established by the investigation described in this article is that there are, despite the observations reported in *A Day Off Work?*, no grounds for believing that able students allocated initially to Craft courses would perform less well, or be more likely to drop-out, than other students. On the other hand, of the less able of those students initially allocated to Technician courses and subsequently demoted to Craft courses, around three-quarters caught up with the original Craft entrants, while of those retained on the Technician course only one-third passed the Part 1 Technician examination and three-fifths dropped out of Further Education. Thus, *providing that a proper monitoring system exists to demote a student to a more appropriate course before he drops out of Further Education altogether*, no great harm may be done by initially allocating a student to too high a level of course.

Such a monitoring system would depend on a more favourable staff: student ratio than presently exists in technical colleges and would depend on ensuring that key teachers had adequate opportunities to build up their knowledge of the types of student most likely to profit from either craft or technician levels of course.

Having ensured these two conditions, monitoring becomes very similar to continuous assessment with the critical emphasis being placed not on the attempt to classify his performance in pass/fail terms, but rather on diagnosing those aspects of the syllabus the student finds difficult and subsequently taking remedial action with regard to these learning difficulties.

This monitoring may be especially useful where a training centre and a technical college are dealing separately with the same people. The sharing of information on student progress and the co-ordination of

course content in a way that is possible in properly integrated college based courses would also make the identification of student disabilities a more feasible task.

There should be two major consequences of monitoring and remedial action. On the one hand more students should pass Technician examinations as a result of the extra assistance they receive and on the other hand when the stage is reached that the student is obviously being asked to work beyond the point where he can continue to benefit from a Technician course he may be speedily moved to a course where his abilities will gain more appropriate recognition. It is important to recognise that "can continue to benefit" is not synonymous with "will pass the external examination". There are a number of circumstances where the student and his employer can agree that continued attendance on a Technician course is of more value in terms of experience than dropping to a Craft course simply to get a piece of paper. In that situation college authorities have to re-educate their staff and their public that high examination pass percentages need not be the same as maximum benefit to students.

But of course the inevitable conclusion to this article is the same as the conclusion to a previous article in this journal+. There I was discussing Craft apprenticeship and the futility of placing a young person on a certain course at age 16 and expecting him to plod on in an unbroken line until he was 20. What is now obvious is that those conclusions were equally true for Technician apprentices, and that what we need is a basic course of a high enough level to stretch all college entrants near to the limit of their potential. Thereafter a wide variety of options and modules are necessary so that a student in consultation with his teachers and employer can take that combination of additional courses which will be of greatest value. It goes without saying that these

courses should be available in an agreed sequence but at any time.

The net result of a new system along these lines is that many students would finish up with a mixed certificate with some passes in what had previously been considered as Craft courses and some passes in what had previously been considered as Technician courses. The advantages of such a "cafeteria" system of further education would be that student wastage should be much reduced and that the student's final certificate should represent much more closely the needs of industries and the needs of students. The disadvantages are considerable — a great deal of redrafting work for examining bodies many timetabling headaches for principals and deputies, and a great deal of additional counselling, monitoring and remedial work for teachers.

Looking again at the statistics on student failure and drop out from both Craft and Technician streams (Table 1) I do not believe that there is any alternative but to prefer careful monitoring to careless categorising.

References

- 1 Available from The Scottish Council for Research in Education, 16 Moray Place, Edinburgh EH3 6DR.
- 2 "Who Cares About the Craft Apprentice?" — *Studies in Design Education and Craft* Vol 4 No 2 Spring 1972.