Innovative School Courses and Industrial Performance

A report on a Project to investigate the relevance of school learning to performance and attitudes in industry.

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A problem which concerns educationists, industrialists and, above all, young people entering employment, is the extent to which innovations in education and changes in industry reinforce or work against each other. It is important not to interpret this in terms of possible vocational courses in schools, but rather as relating to the interaction between school, training and further education. One of the effects of raising the school leaving age is to highlight problems of this kind. The following questions indicate important aspects of the problem:

1. What is the relevance to subsequent work in industry of attitudes and abilities developed by innovative methods in schools? Which aspects of their school education are likely to be of greatest value to young trainees?
2. What are the best methods of training young people who have had experience of innovative school courses? How may their skills be best used?
3. What problems arise if there are major differences between instructional methods used in schools, further education and industry?

A grant has been made jointly by the Engineering Industry Training Board and the Leverhulme Trust to sponsor a four-year research project (1971-1975) to investigate the relevance of school learning experience to performance and attitudes of young trainees who enter employment directly from school. The project offers a relatively rare opportunity for practical co-operation between education and industry in this country. The investigation will be directed by Dr. Erica Glynn and will be based at the Centre for Science Education, Chelsea College, University of London, which is closely associated with curriculum development and other innovations in schools and universities.

The aim of the project, primarily concerned with first-year craft trainees in the engineering industry, is to assist those concerned with education and training to re-examine methods in terms of mutual relevance, and to make adjustments which should ensure a consistent and motivating environment for young people, particularly during the last year at school and early years in training. Producing information of common interest to schools, further education and industry is seen as a particularly valuable outcome of the research.

The focus of attention will be on methods used at school, in training and further education, rather than on subject content. These are likely to affect in particular the learning of planning and diagnostic skills, learning of new tasks under minimal instruction, correlating information from multiple sources and using such information for decision-making purposes.

The objectives of the study are:

1. To provide education and industry with information about the effect of various training situations on young people with different educational experience; to relate this especially to experience of innovative types of school methods; to help towards establishing new communication links between education and industry.

2. To examine the effect of school learning methods in terms of subsequent industrial performance, rather than, as is usual in educational studies, subsequent academic performance.

3. To examine, in particular, the appropriateness of Engineering Industry Training Board craft training recommendations for trainees with different educational experience.

One factor in deciding to concentrate the study largely on the training of craftsmen was the recent research in this field by EITB and the Perkins Engines Company. This indicated that the intellectual demands of craft training are likely to be at a level suitable for the investigation and that the choice of method open to instructors is wider than had previously been supposed. Technicians will also be included in the study, for instance in cases in which large part of the first-year craft and technician training is common.

A crucial point which had to be considered was the overall number of young people undergoing training of the type to be investigated. Each year, over 30,000 boy school leavers enter craft and technician training in the engineering industry. In addition, substantial numbers are recruited into shipbuilding and the maintenance departments of most major industries, for example the coal and chemical industries. The investigation will in fact involve organisations within the engineering and other major industries.

It is hoped that any findings of the investigation will be capable of practical implementation in the fields of both education and training.

A feasibility study (1970-1971), carried out in co-operation with the EITB, showed that people in education and industry clearly saw the need for a project to examine some of these questions. Guidelines for the four-year project were established as a result of the study.

The remainder of this article is chiefly devoted to observations made during the feasibility study, but a few brief details of the main investigation are given later.

Feasibility Study

The facts and ideas outlined here relate on the whole to organisations where facilities for active work have been offered. They therefore do not necessarily represent all aspects of the problem. However, discussions involved individuals from a large number of training and education establishments, and, at least, provided some insight in a local context into perceptions of education and training, as well as problems of transfer between the two systems. Activities were fairly wide- ranging, probing the school-industry interface in a number of different geographical areas, such as Portsmouth and South Hampshire, Leicester and Leicestershire, Coventry, Teesside, Port Glasgow and Greenock.

Two points perhaps deserve special mention:

1. Offers of co-operation were made, almost without exception, by the organisations contacted.

2. The fact that the project represented a co-operative effort between education and industry, and that this was reflected in the membership of the project team, appeared to contribute towards fruitful outcomes in many of the discussions.

The need for the research project

It was felt that the feasibility study showed a general and strongly expressed need in training and educational establishments to foster a real understanding of each other's aims and methods, and to establish communication processes by which the present severe deficiencies in this understanding could be overcome.

Staff of training centres expressed awareness of their lack of knowledge of what went on in schools and the implications of this for training. In some cases, there was a tendency to make subjective value judgements about innovative methods in schools. Educationists were unsure about the real contribution that schools could make towards pupils' success in training and work.

A brief discussion of the role of craft work in schools will serve as an illustration of these points. There is, in schools, a decided move away from the 'engineering metalwork' tradition in which simple manipulative skills are usually taught in a didactic manner. This does not imply that craft work is seen as an irrelevant activity.

On the contrary, the Schools Council Crafts, Applied Science and Technology Committee stated that "craftsmanship is far from dead and should be represented in schools along with other fundamental human achievements as part of our national heritage", but stressed also that "design is a satisfying intellectual activity with both aesthetic and technological aspects, which can best be appreciated through actual experience of design and making, even on a humble scale". [1] The design approach to craft work, representing a change in method rather than in subject matter, is being increasingly adopted in schools without any real attempt at evaluating its effect. In discussion, many training instructors spontaneously expressed to the research team concern about this approach and the difficulties it caused in training. These are subjective views, which may perhaps correctly state the situation, but in any case, do not probe any underlying cause. So one can ask questions such as:

- Is the design approach method of teaching craft work in schools fundamentally detrimental to subsequent craft training, or is this an example of 'mismatch' of methods in education and training?
- Does this new approach in schools help to build up special skills (problem-solving, planning) and attitudes? Are these skills sufficiently used in training? To what extent are they relevant to the job?
- Given that the new methods are spreading in schools in any case, is it essential for training to adjust accordingly? Or is it up to educationists to enquire whether their methods may create difficulties in the future career of their pupils? Can mutual adjustment be made?

The basic thinking behind the original idea of investigating the relevance of school learning to performance in industry arose out of such questions set in the wider context of innovations in school activities. The feasibility study confirmed that these questions represent real problems, some of which are already evident to instructors and teachers on both sides of the school/training boundary. It is hoped that the research programme arising out of the feasibility study will help to provide solutions for some of these problems.

Perception of schools

Some training personnel were critical of 'open-ended' methods in schools, though it was far from clear whether this was in any way informed comment. In other cases, the value of project work and self-organised learning at school was stressed. Mathematics and English were considered the most important school subjects in relation to training. There was almost universal criticism of the schools' failure to achieve reasonable standards of basic arithmetic and this seemed justified at least in some cases. Training courses have to be adjusted to allow for this in the early stages, though at a later stage FE may prove helpful. Some instructors considered that they were able to remedy in a few months what schools had failed to do over some years.

Craft work in schools has already been mentioned. Similar comments apply to Project Technology, Nuffield Science and 'Modern Mathematics'.

These comments were at a general level, rather than directed at specific schools, possibly because training personnel were in most cases unaware of the schools from which particular trainees came. Training officers and instructors who did take particular interest in schools formed a relatively small minority.

Disappointment with schools was also noted among some trainees, especially in relation to the last year at school, which they felt should be used to 'develop them as people', as well as help them to prepare for work.

Career guidance was considered inadequate, although there was awareness of the difficulties involved.

Some trainees who had had experience of Nuffield Science Teaching seemed to regard this as potentially useful for their subsequent training and jobs; innovative methods as a whole were considered of greater value than traditional ones.

Perception of training and jobs

Teachers in schools tended to fear that the essential values in education and industrial establishments were too far apart to allow for a real community of interest.

Reactions in this respect varied in detail, but the 'educating-for-life' not 'training-for-work' oversimplification was a common theme.

Trainees tended to have a negative attitude towards parts of the training which they saw as irrelevant for their own future trade. There were also complaints that, even after several months of training, they had no real concept of the 'job'. An interesting aspect was the realisation by some second-year trainees of the importance of social skills in the performance of certain jobs – working with people was seen as an intrinsic part of the job.

Being allowed to tackle tasks in their own way seemed important to trainees from the point of view of being treated as individuals. It was this aspect rather than merely increased interest in a task which acted as a positive motivational factor if a discovery type of method were used.

The need for improved communication between school and industry

This need was expressed strongly in almost every establishment visited. At the same time, the present flow of information was considered inadequate and unlikely to lead to any kind of real understanding, or solution of problems of common interest.

Visits to training centres by pupils, talks by training officers in school, work experience and occasionally (e.g. in Coventry) secondment of a few teachers for short periods into industry, represent some attempts to improve the communication between schools and industry. One of the Coventry teachers commented that "much more publicity for the Industrial Training Boards is needed in schools", and that the "Schools Council Project Technology might with profit examine the EITB module scheme".

An outstanding, and possibly unique, degree of activity has been organised in Leicestershire by the Leicestershire Working Party on Education and Industry. One third of Leicestershire's secondary school teachers had had at least one week's secondment in industry, and one hundred executives and trade unionists have visited schools. The research team took part in a conference in March 1971, organised by the Working Party and attended by some senior executives of engineering companies in Leicestershire.

Selection procedures

Procedures adopted and factors influencing the selection of trainees were looked at, particularly in relation to:

1. Validity as predictors of performance and attitudes in training (of possible direct value to the project).

2. Factors such as the image and status of the relevant organisation, opportunities for employment, relations between the organisations and local schools (influences which are 'pre-selection' factors, that is, operate before the stage of formal selection and may considerably affect the nature of trainee samples).

In most cases, criteria used in selection were not clear. The main objective was frequently a reduction in the drop-out rate, a necessary but hardly sufficient aim. In other instances, the success of the selection and training system was judged by results in Further Education, for example, the number of HNDs obtained by ex-craft trainees. Prediction of potential for training on-the-job was not commonly put forward as a justification of some part of the selection procedure.

Selection tests of various forms were widely used. Most common among the standardised tests of ability and aptitude was the NIIP Engineering Apprentice Test Battery. About one third of establishments visited used the battery for selection of craft and technician trainees. It was noticeable, however, that there was little consideration of the characteristics of the particular firm, and consequently, little flexibility in the interpretation of the test results. Few attempts have been made to evaluate the results of using the information from the tests. (NIIP do such work, but, within their resources, are hardly in a position to draw conclusions about particular companies). The same criticism may be levelled against the use of other tests, which included:

AH4 Test,
Form Relations Test,
Daniel's Figure Reasoning Test,
Birkbeck Tests 1-5,
Vernon Graded Arithmetic-Mathematics Test,
Morrisby Differential Test Battery.

Some organisations are using specially devised arithmetic and English tests, but it is doubtful whether these are in any sense more appropriate than general tests in terms of the requirements of individual establishments. Inventories of interests are not in common use.

School examinations were frequently taken into account. These are of more obvious importance to technicians (or potential technicians) with regard to FE courses. Their precise relevance in other respects is perhaps doubtful. There was disagreement whether a 'specialist' with four CSE grade 1 passes in certain subjects was to be preferred to the 'all-rounders' with eight CSE grade 3, and indeed also about the usefulness of different school subjects. The role and value of school reports in selection procedures also varied.

Interviews remain for most selection personnel the source of most heavily weighted information. However, the purpose of, and emphasis on, interviews, while seldom clear, did vary from one situation to the next. In an extreme case, the aim was to select the candidate who was 'emotionally sure' as opposed to 'highly strung', 'the quiet, industrious' as opposed to the 'lazy bully' type, and so on.

The precise role of hobbies and interests, whether or not these need to be related to engineering, was perceived in different ways. These activities were sometimes seen as indicators of understanding and enthusiasm, and made useful discussion points during interviews.

Training aims and methods

Although attitudinal aspects such as 'enthusiasm' were often stressed, much of the instruction appeared to be didactic rather than parcipative. In some cases, a high degree of constraint was imposed on procedures which the trainees were expected to follow. Attempts to teach planning skills were relatively few, and the importance of problem-solving and decision-making seemed to be perceived more strongly in cases in which subsequent work involved maintenance work of a high level.

The approach to project work was varied. On the whole, it was only undertaken in the last 12 weeks of first year training, but the degree of freedom which was allowed the trainees in both selecting projects and determining the appropriate solutions to problems was by no means the same in all centres.

Assessment procedures

Systems of assessment were examined in terms of their value as criteria of success in training.

On the whole, systems of assessment in first-year training were found to have severe limitations. There seemed to be no clear objectives at a fundamental level, in most cases. Assessment tended to be used occasionally for rejection of trainees and as a measure of excellence (culminating in selecting the 'apprentice of the year', for example). There was little evaluation of the training itself, and, at best, it was possible to use the assessment information as a basis for short-term remedial action in extreme cases.

Individual instructors are no doubt able to assess and adjust the training without formal assessment of the trainees, but even in this case, it is important that such information is capable of being communicated to other interested parties, for instance, member companies of group training schemes. 'Craftsmanship', 'ability', 'enthusiasm' 'attitude' are examples of the generalised level at which a trainee's performance was frequently assessed.

The project 1971-1975

During the course of the feasibility study, a programme of investigation was devised. In 1971, the Engineering Industry Training Board and the Leverhulme Trust agreed to joint sponsorship of a four-year project.

The investigation will be in three stages:

Phase 1.	1971-1973	Local in-depth studies and development of research instruments.
Phase 2.	1973-1974	The main investigation.
Phase 3.	1974-1975	Follow-up, analysis and evaluation.

Phase 1 – Development of ideas during local in-depth studies

The initial phase of the research is concerned with local in-depth studies in a number of areas, for instance Coventry, Leicestershire, Teesside and Portsmouth. In these studies, people involved in industry and education are co-operating with the project team in the formulation of the precise problems to be investigated and the detailed planning of subsequent stages. It is hoped to ensure in this way that constraints due to initial preconceptions will be minimal and that the eventual findings will be of practical value for education and industry.

Development of ideas during the local in-depth studies

So far, these studies have concentrated on a number of central ideas. Much thought has been given to the role of planning and problem-solving skills in craft work, partly as a result of work sponsored by EITB at Perkins Engines Ltd.[2] which indicated that planning and decision-making skills were much more crucial elements in craft work and training than had previously been assumed and partly as a result of suggestions that many of the developments in schools may foster such skills.

A variety of cognitive skills are involved in planning engineering tasks and solving problems. It is felt, nevertheless, that the development of a test, or series of tests, involving some aspects of planning is essential to the success of the project. Analysis of the planning skills involved in appropriate engineering tasks must precede the devising of test situations, some of which will be used during the transition from school to work, others during training. It will doubtless be impossible to measure all aspects of training which are experienced by different trainees, but it is hoped to isolate enough elements to examine some of the more likely influences of school experience upon trainees' behaviour and performance.

Attitudes and 'social skills' have also come to be seen as important to trainees and instructors alike – though not all agree on priorities! The ease with which young people are able to work in a mixed-age community, for instance, becomes crucial as training progresses. It would seem reasonable that some school work is more likely to help in this respect. For example, the extent to which activities associated with projects involve pupils in contact with members of their local community could be an important factor.

The development of a method of assessing school and other learning experience is crucial. There is no claim that such a descriptor would be a generalised summary of an individual's experience of a school. It must be stressed that the descriptor would relate

only to the experience of individual pupils, and not be some kind of classification of schools.

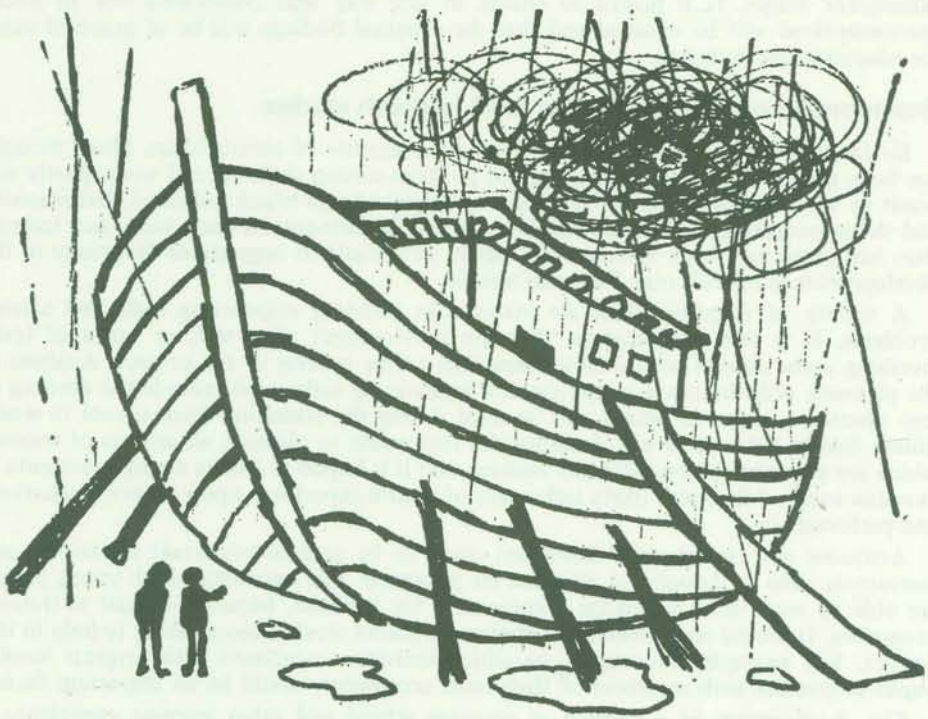
It would examine a pupil's experience not only within the classroom, but within the context of the school as a whole. Training and F.E. situations would be examined in a similar way. In practice, it will be impossible to take into account every aspect of school, training and FE. Attention will therefore be concentrated in areas such as craft work, science, etc.

The objectives of training must be kept clearly in view throughout. The fundamental aims of school and other education must inevitably also receive attention.

It is often assumed that there must be a clash between the aims of education and industry. This is to misunderstand the developing ideas behind the system of craft and technician training, and, in a wider context, the growing awareness in industry of the importance of human relations.

1 Schools Council Curriculum Bulletin No.2 – A school approach to Technology,(1964)

2 Engineering Industry Training Board (1971) The Analysis and Training of Certain Engineering Craft Occupations. Research Report No.2., Watford: EITB



"I think it's something to do with the R.E., Biology and Woodwork team teaching project".

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