DESIGN & TECHNOLOGY in the School Curriculum

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FOREWORD

In England Design and Technology have always been a neglected aspect of secondary education. Mr Dodd, who has had extensive experience as a teacher, a college lecturer and a school inspector, describes the various attempts which have been made to introduce this aspect of our culture into the curriculum: manual instruction, Sloyd, technical studies, art and craft, handicraft, technology and, most recently, design and technology. So far all have failed to find a permanent or an adequate place in the secondary time-table – for various reasons which Mr Dodd analyses.

This is a sad story which illustrates from one particular viewpoint many of the current weaknesses of the English education system. It is, on the whole, a system which is snobbish and divisive; it is a system which divides pupils into academic and non-academic, and knowledge into high-status and low-status. Technical knowledge has, in the past, been seen as low-status knowledge suitable only for less academic pupils destined to become manual workers. Technology has been neglected and has been regarded as suitable for training the 'lower orders' rather than as liberal education.

Yet it is not a pessimistic story. In recent years there have been encouraging signs of a change in attitude and also useful leads given by such projects as the Schools Council's *Project Technology* and *Design and Craft Project*. Mr Dodd reviews sympathetically the advances made by these projects as well as the latest movement – Design and Technology. He also makes out a convincing case for the study of Design and Technology being a necessary part of a common curriculum for *all* pupils. He claims, justifiably in my view, that since our culture is to some extent dominated by industry and technology it is necessary for everyone to acquire at least a basic awareness of design and technology in order to behave rationally in our society. Problems of pollution and conservation, for example, are meaningless unless we have an understanding of basic scientific and technological problems. This study is a very important contribution to the discussion of a much-neglected aspect of the secondary curriculum. It should be read widely – not simply by handicraft teachers or design and technology teachers, but by all who have an interest in the curriculum as a whole.

Denis Lawton
February 1977

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Appendix E is reproduced, by kind permission, from Schools Council Working Paper 26, *Education through the Use of Materials: the Possible Role of School Workshops in the Education of Secondary-school Pupils* (Evans/Methuen Educational, 1969).

My wife and children all helped in their many ways and I thank them for their co-operation.

T.D.

PREFACE

This study traces the evolution of a secondary school subject, now referred to as Design and Technology, and in showing its development focuses particular attention on its aims and objectives. In its short life since the turn of the century, Manual Instruction, which was essentially woodwork, has developed into a myriad of practical educational activities within which it is possible to determine a number of common elements.

The notion that Design and Technology is essentially a physical skill-learning activity, with doubtful claims on a curriculum place for able pupils, is questioned, and the two important contributory threads of design and technology are exposed. The inter-disciplinarity of the activities, the nature of the method and the importance of this in the education of *all* children is discussed.

'Education through the use of materials' is a modern cliché, based on a considerably older idea, and it is argued that much educational benefit has been lost because of the misinterpretation of the aims and the unwillingness of educators generally to give due regard to the intrinsic educational benefits of such learning. It is an unfortunate anomaly that we have also failed to grasp the important benefits of vocational preparation and motivation. The extravagance of some of the aims and a general unwillingness to produce more specific learning objectives has obviously confused the issue. More important has been the validity awarded to those subjects which carry an implied vocational and therefore social status. The traditional influences still evident in the curriculum pattern have tended to create a hierarchy of subjects, with those having a practical element holding the lower places. There has been an unwillingness to equate high educational achievement with a career in industry and many most able pupils are annually creamed off into 'purer' research and other havens within the bureaucracy.

The need at this present time is threefold: first, to ensure that a fair proportion of able pupils enter the industrial sphere; secondly, to see that their education is relevant to them as individuals and national wealth producers; and lastly, but by no means least, to ensure that all pupils acquire a 'technology literacy' with which to cope with their future.

This study aims to provide a background to the nature of Design and Technology as a school subject by indicating some of the many social, economic and historical pressures which shape educational decisions.

The dilemma is one of striking the correct balance between, on the one hand, our belief in the individual's right to a liberal (and general) education and, on the other, society's need for a work-force able to adapt to the specific needs of industry and commerce. Part of the present problem has been the educationist's flight from anything 'vocational' rather than an acceptance

of its motivating force. One extreme interpretation of the vocational aspect has been that of 'training' and for this some of our secondary technical schools must accept the blame. The notion that vocational preparation must be training at the craft level is perverse because there is an acceptable layer of academic studies requiring intelligence of a high order which may be based on industrial life.

The time has come for a ruthless overhaul of the curriculum rather than continuing the process of adding more and more alternatives and confusing the issue. The modern curriculum needs to reflect industrial society as well as including the essential ingredients of our cultural heritage. Education needs to offer to the nation's industry human resources able to adapt to it *and* to accept its many benefits. Our quality of life is dependent to a large extent on the nation's economy and the two are complementary.

> 'An educational system which will not accept technology is an educational system which turns out cultural cripples.'
> *(The Teaching of Technology)*

Attention has recently been focused on the interface between industry and school by Central Government, and industrialists and parents have indicated their dissatisfaction with the present curriculum. The author hopes that this analysis of the evolutionary pattern of one school subject will contribute, in some small way, to a re-appraisal of present priorities within the curriculum. The final decision will rest on important attitude changes which will accept that, for example, personal abilities in the practical problem-solving processes of design and technology are as valuable as other educational goals. We must not forget that in the future our quality of life depends on our appreciation of the problems and opportunities which technological innovation offers us.

Tom Dodd

CONTENTS

INTRODUCTION

'Education through the use of materials'[1] may be a modern cliché, but it is considerably older than modern times as an idea. Rousseau, Pestalozzi, Froebel, Locke and Comenius all make reference to art and craft and lean towards some kind of 'practical' education. For example, Comenius, in his *Didacta Magna* (1657), urges that the older pupil:

> 'should learn the important principles of the mechanical arts, both that they may not be too ignorant of what goes on in the world around them, and that any special inclination towards things of this kind may assert itself with greater ease later on.'[2]

This theme is echoed more tersely in a 1950 UNESCO Report which, amongst the aims of teaching handicrafts in the United Kingdom, lists 'to discover interest and vocation'.[3]

Rousseau took a less pragmatic view of the benefits of practical education which he saw as an important part of his philosophy of 'natural' development. Emile was given 'practical problems in their natural setting' which he was expected to grapple with and solve, and thus we see Rousseau's developmental theory emerging, in which the boy is expected to deal with concrete things before the aesthetic, social and moral education of adolescence. Rousseau's enthusiasm for handicrafts stemmed from his belief that interest, intellectual development and correct habits of thinking could be encouraged through practical work and thus he contends that technical training has a transfer value.

> 'If instead of making a child stick to his books I employ him in a workshop, his hands work for the development of his mind. While he fancies himself a workman, he is becoming a philosopher.'

His general principle in Emile's education was to teach him to learn by 'doing', and in this he takes an extreme view when he says:

> '. . . let them learn nothing from books which they can learn from experience'.[4]

This early philosophy is indeed evident in the project-method approach of much present-day practical work, though, for the most part, overwhelming child-centredness has given way to guided freedom and direction. The views of Comenius and Rousseau are reflected in an account which Pestalozzi (1746-1827) wrote when he was a village schoolmaster:

> 'I tried to connect study with manual labour, the school with the workshop and make one thing of them.'

Proctor in an historic survey refers to Pestalozzi as 'perhaps the first practical

teacher to perceive the essential unity of head and hand work.'[5]

Herbart and Froebel, both followers of Pestalozzi, recognised the importance of manual work in the curriculum of the school, in fact, Herbart went so far as to say that every older boy should be as familiar with the tools of the carpenter as with the rule and compass. Froebel's 'gifts' and 'occupations' for kindergarten children were part of a remarkable series of activities which might be achieved using geometrical solids and a variety of other materials.

> 'In these activities we have the scientific ideas and the manual exercises which form the rudiments of handicraft.'[6]

H. Llewellyn Smith, in a report to a Special Committee, commented that he believed that if Froebel had continued with his ideas into the senior school, we might have gained a scheme of practical education which would have saved us many mistakes.[7] Nevertheless, it was from this source that Uno Cygnaeus derived his ideas which were to develop into that scheme of craftwork called Sloyd (see Chapter I, pages 19-21).

The notion of practical education is not new, though in practice craftwork has only been a recognised school subject since the turn of the century. The curriculum has traditionally provided opportunities through a variety of subjects; clay, stone and card have been regarded as 'artistic', foods and fabrics as 'domestic', and wood and metal as 'heavy craft' materials.

The separation which exists in secondary schools follows on a multi-media scheme in the primary school and is generally distinguished by a greater emphasis on skills and processes.

The focus of this study is on the area of 'heavy crafts' which tends to retain some of the traditional utilitarian atmosphere even though contemporary programmes offer much more than the narrowly conceived courses of the Manual Instruction era (see Chapter I, pages 21-24). Its purpose is to examine the development of 'heavy craft' activities and to analyse their present contribution to the school curriculum by reference to the aims and objectives put forward on their behalf. Handicraft, Manual Instruction, Technical Studies, and latterly Design and Technology (the changes in title perhaps indicate the changing emphasis) make certain claims for inclusion which are based on the overall aims of education.

In addition to examining the nature of the subjects' contribution in past and present curricula, this book asks an important question centring on its justification in the future. That the subject had a part to play in the elementary school programme is no argument for its inclusion in curricula which exist in quite different circumstances. The nature of the development of Design and Technology, in the light of contemporary innovation, may yield some clues as to the nature of the change to be expected in the future and indicate the kind of organisational factors which may need our attention. It would be desirable to explore a number of other areas to obtain a fuller picture, particularly in the psychological field, for it is here that much of the evidence for further development must lie.

Manual Instruction was seen by Thring of Uppingham to provide balance within the curriculum by offering relief from academic study;[8] at other times it was regarded as a means of righting national economic and industrial problems by inculcating 'habits of industry' and providing much-needed skilled labour.[9]

Craftwork has been offered as a

'discipline' by which character may be formed (albeit, for the most part, the character of the working man) and as an essential part of the liberal education. Philip Magnus, writing about his early life, spoke of the defects in the education given at the time of the opening of the City and Guilds of London Institute (1880) and of the difficulty he had in 'persuading the English public that instruction in the use of tools might be made part of a liberal education'.[10]

Handicraft has been offered for the intellectual benefits which accrue from 'hand and eye' training, and Percy Nunn, who found complete physiological justification for handicraft, went so far as to say:

> 'In our opinion, healthy mind growth is difficult and exceptional without manual and motor activity.'[11]

By tradition there has been the belief that in work there comes an essential honesty and integrity which may be developed into a form of moral education; the Technical Instruction Commission (1882) advocated manual work because it 'gives boys a taste for it and tends to make them appreciate . . . the dignity of labour'.[12]

Mr Henry Cunynghame, (Assistant Charity Commissioner) when giving evidence before the Special Committee on Subjects and Modes of Instruction (School Board of London) distinguishes, amongst the aims of manual instruction, the 'moral' theory, which the Committee, in its report, speaks of as including:

> 'fearless truth, bravery, honour, activity, manly skill, temperance, hardihood, welded into a great national character'.[13]

These wide and extravagant claims occur throughout the literature of craft education (such as it is), but there is little indication for the teacher as to how they might be transformed into operational objectives within the school workshop. Not all the aims are of such a positive kind, even so, and many instances exist of workshop activities being awarded 'non-objectives' such as preventing misbehaviour, law-breaking or idleness. Locke saw handicraft as a 'harmless hobby' which might keep a man from dislolute habits:

> 'Cards, Dice, Drinking are the resource of those never learned in any Manual Art'.[14]

The educational aims have offered a great deal, or very little, depending on the standpoint, because not all have subscribed to the establishment of such work. H.B. Tarleton, Electrician and Philosophical Instrument Maker, referred to manual work being 'dead and belonging to a different age', while a Mr Bond judged manual instruction to be 'comparatively unimportant' as part of a regular curriculum.[15]

Aims and Objectives in Design and Technology – definitions and terminology

Education, according to Nisbet, has 'aims – general and particular, great and small'[16] which, if they are to be of value, need to be worth while in the eyes of the thinker, and dynamic in practice.

Unreliable and inaccurate usage of such words have meant that terminology and definition have presented particular problems in this study. A first requirement is to create a distinction between aims,

goals and objectives, because it is here that the greatest difficulty is experienced in establishing with precision the nature of the statements.

Aims are the general statements which may be made as part of the curriculum process, or in isolation from it, about the directions in which behaviour is to be modified, and are often geared to some value-system. They are of little use, because of their generality, in day-to-day planning within the classroom or school. Wheeler differentiates between aims, goals and objectives, and indicates a three-step process from aims to specific objectives by way of proximate, mediate and ultimate goals.[17] Objective, as a word, appears in much present-day literature relating to curriculum development and generally is not discussed in isolation, as aims frequently are, but in relation to specific behavioural outcomes:

> 'By educational objectives, we mean explicit formulation of the ways in which students are expected to be changed by the educative process. That is, by the ways in which they will change their thinking, their feelings and their actions.'[18]

Thus the objective needs to be used in the context to which it refers, though there are those who would not confine it to behavioural predictions but rather regard it as 'principles of procedure'.[19]

Eisner clearly differentiates between 'instructional' objectives and 'expressive' objectives. In the former the teacher must predict exactly what behavioural changes will take place if the teaching is successful, whereas the latter identifies a situation in which children may work, explore and learn,[20] and where the outcomes will differ.

There has been not only variety but inconsistency in the terms used, and statements with clear intentions are hard to find. Differing institutional views surround craft objectives and what may be intended by the teacher may not be the view of the parent, pupil, or employer. There may be conflict, or confusion, between the views of advisory bodies, external examination boards and specialist teachers and there may be disagreement between craft teachers and other teachers, on the merits and priorities of such work. Craft teachers themselves may not always be consistent in their approach; for example, a craft which serves to prepare pupils for profitable use of leisure time may also be used, without modification, as vocational preparation. The Schools Council *Enquiry 1* provided an example of the differing views of pupils, teachers, parents and headteachers when asked to consider an objective, 'Things in direct use in jobs', and recorded the level of importance they attached to it. Figure 1 (page 12) shows the widely differing opinions and interpretations.[21]

An interesting study surrounds the specified aims of courses and the actual outcomes, which reflect the various pressures, constraints and exigencies of everyday life in school. One speaker at the Third International Curriculum Conference at Oxford in 1967 gave a particularly practical view of how objectives are formulated:

> 'We've all heard about clarifying our objectives over and over again. But what happens? You set up a course. You write down an ambitious list of objectives. The course is a great success but when you come to apply the tests you find it hasn't attained the objectives. So what do you do? You change the objectives!'[22]

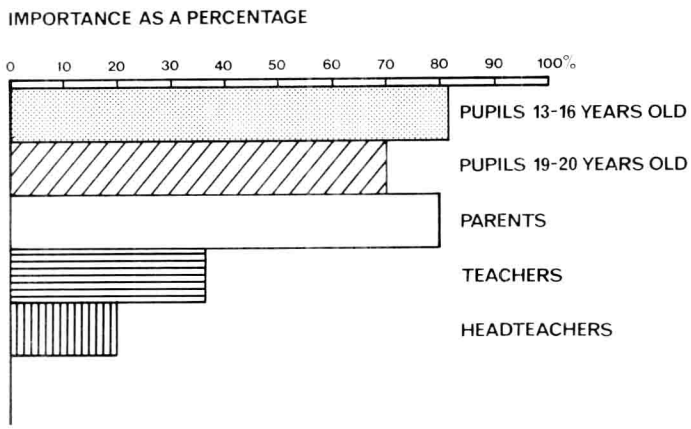

FIGURE 1 THINGS IN DIRECT USE IN JOBS

Hirst, Jenkins and Pring all agree that not all parts of the curriculum are open to analysis and the essentially practical nature of some activities means that the 'logical' plan is not always the most 'rational'.[23] There is much to be gained in looking at the success, and failure, of many of the curriculum projects as an alternative method of determining 'means' and 'ends'. Second-generation Schools Council Projects are learning much from the findings of those concerned with the early efforts in this field. Blyth, of the University of Liverpool, indicates how he and his team built on the experiences of others, even to the extent of changing the theory in the light of their practical experience.[24]

Project Technology and the Design and Craft Project, both sponsored by the Schools Council, have provided two different patterns of innovation, with varying degrees of success. The most significant service they have both offered teachers is in showing how theory and practice can be compatible, by analysing and exhibiting examples of work produced in the schools. Often in the past, craft teachers have assumed that the successful completion of a sophisticated piece of craftsmanship has automatically meant that full educational value has been obtained.

The sources from which objectives are derived are listed by Tyler, as follows: *the learners, contemporary life, subject specialists, philosophy, and psychology*, but D. Lawton criticises this model on the grounds that, because Tyler has offered no weighting or priority order, it is of little practical use.[25] Nevertheless the list offers a focal point for the discussion of objectives in this study.

Nisbet, in his very practical book,[26] shows how craft subjects can contribute to most of the worth-while aims in education (though there is a question as to how effectively they do this), thus providing a possible general pattern for subject development within two main groups. Lawton detects three groups of aims – vocational, self-cultivated, and social/moral – and

shows how, by constructing a grid and setting the aims against social and economic trends, a basic curriculum structure can be obtained.[27]

It is, therefore, only quite recently that the craft teacher has been offered something a little more specific than the wide, extravagant claims of early craft educators.

'Heavy craft' activities have been referred to by a number of different titles as their nature and contribution has changed. Concealed in this on-going discussion is the matter of 'status' and 'respectability', and although the most recent change from Handicraft to Design and Technology reflects a change in emphasis, there is something of the former argument. 'Practical' describes quite adequately an essential part of the subject, but it is an adjective which is little used because, in the terms of the Crowther Report, it is 'an emotionally-charged word'.[28] As the subject has developed there have been efforts made to encourage its acceptability by participation in certain kinds of external examinations (which have not always been the best instruments of assessment), the use of syllabuses (often malformed to make them acceptable by other institutions), and by euphemisms like the 'alternative road', but these have failed to hide the underlying low status which practical subjects have by tradition (see Chapter I, page 16).

Throughout the history of Design and Technology there have been attempts to shelter under the wing of 'high status' subjects such as Science and Art. Correlation and integration have sometimes been the means used, though for the most part the craft activity has been the handmaiden of other subjects and used essentially to service them.

Design and Technology has no recognisable body of knowledge or peculiar research method by which it may claim discipline status but is, in Professor Hirst's terms, 'a field of knowledge'.[29] As with Geography and Engineering, the knowledge and method employed will depend on the theme involved and the particular usage of the other disciplines. Crudely put, the field of knowledge provides for the application of the 'purer' disciplines, in some 'practical' and 'commonsense' way which mirrors the complexity and inter-disciplinarity of everyday problems. Such structures, on the other hand, may become outmoded as new educational situations arise and those proposed within the field of Technology (see Chapter III) may require a different kind of organisation.

The wide spectrum of activities contained within the subject makes definition difficult. The interpretation of the word 'design' has been a major stumbling block because it means so many different things to different people (see Chapter III). A. Cannon recently drafted a definition for consideration by the University of London, for the purpose of B.Ed. administration, which reads:

> 'Handicraft is specifically concerned with all aspects of the artefact and its creative production'.[30]

This definition was followed by the Committee for Applied Science and Technology Council in an Occasional Bulletin in which they refer to handicraft (as a school subject) having as its central theme, 'the artefact and its production'.[31]

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CHAPTER I

TRADITIONAL OBJECTIVES

Introduction

Making things has always been a necessary skill for man's survival, and consequently he has always placed great importance on the training of the young. Perhaps the first craft teacher was a tribe member who was selected, because of his special expertise, to teach young members his particular skill. Often the acquisition of complicated skills took a man a lifetime to perfect, hence their great value to society. Man has also found great delight in adorning himself with his creations and expressing his emotions in a variety of ways, from drawing on cave walls to decorating his pots.

Since these early times, groups of craftsmen have supported each other and jealously guarded the secrets of their trades, up to the present day. Throughout the development we have seen the emergence of different social groups which have had a considerable effect on the growth of craftwork in education.

'Class' grew out of the static concepts of rank and order and reflected a group's view of society. The view was formed by the common interests of the group which gave it its 'social character' and in which it sought to educate its young. The development of classes was based on the formulation of a set of ideals which reflected both social and economic factors. Thompson sees these classes, or groups, not as a static structure but a changing, dynamic situation:

> 'By class I understand a historical phenomenon, unifying a number of disparate and seemingly unconnected events, both in the raw material of experience and in consciousness. I emphasise that it is a historical phenomenon. I do not see class as a 'structure', not even as a 'category' but as something which in fact happens (and can be shown to have happened) in human relationships'.[1]

The Industrial Revolution gave rise to the formation of classes of people and was responsible for many of the changes. When the skilled craftsmen and artisans gave up working for themselves and became 'hired hands', they virtually became 'unskilled' workers overnight. The very nature of the industrialised processes and the change in the work relationship was such as to present a whole new situation to this group. More recently we have witnessed the emergence of technicians and technologists who, though of 'high' status, are yet similar to unskilled workers in offering their labour for hire within the industrial scene.

Lawton establishes the nature of class and points to its peculiarities of allowing interclass mobility, of not being distinct, of having no legal distinction and of being connected to 'life style'.

> 'Social class, however defined, is found to be statistically related to life chances such as infant mortality rates and aspects of life style such as leisure pursuits.'[2]

What in effect has happened is that workers who have practised the crafts and who have been engaged in practical work have been regarded as being members of the 'lower' classes. There has also existed a 'non-practical' *élite* who, because of wealth or authority, have been able to enjoy craftsmanship without personal involvement, except in some cases as patrons. Within this group there have been many discerning and interested people who have encouraged and supported developments in craft and, from this point of view, are important in craft history.

Notwithstanding the fluidity and changing nature of social class, these groupings have affected education in many ways. A hierarchy of subjects based on 'high'- and 'low'-status knowledge developed and became equated with certain institutions. Crafts, technical studies and practical activities were regarded as low-status subjects because of the vocational and, hence, social status they conferred.

In Britain, we have inherited two distinct educational traditions: the scholastic tradition of the grammar school and the apprenticeship system of the workshop. From the sixteenth century, when the 'importance of letters' gave a powerful impulse to grammar school education and the apprenticeship system was consolidated under the attention of Elizabeth, the two systems co-existed side by side for nearly two hundred years. The aims of the former largely included the acquisition of knowledge, particularly of the Greek and Latin tongues, whereas the aim of the latter was 'the acquisition of skill of hand and knowledge of the "mysteries" of craft'.[3] The only similarity was the agreement that education could be equated with instruction.

The school curriculum has been fashioned by social and historical pressures as well as by educational reasoning, and it is inevitable that class-structure has been reflected in its design. It is interesting to compare two examples of this from the nineteenth century. In 1861 the Newcastle Commission [4] reported on the possibilities of cheap elementary education. There was a growing belief that the money being allocated to popular education was not being used to the best purpose and this, coupled with the shortage of finance generally because of the recent Crimean War, resulted in a cry for economy.[5] The Royal Commission was to:

> 'inquire into the present state of popular education in England, and to consider and report what measures, if any, are required for the extension of sound and cheap elementary instruction to all classes of the people'.[6]

The Commission considered the requirements of the lower orders of society and recommended that the curriculum for them should include instruction in letter writing, reading a newspaper, some Geography, Arithmetic and the Holy Scriptures. Thus was the worker to be given a practical education to fit him for a life of service and, incidentally, to ensure that any movement to another social group would be extremely difficult.

The Clarendon Commission[7] in 1864, on the other hand, reported on the conditions in public schools, and within its recommendations stated that: