

Should CDT be part of a National Common Core Curriculum

In September 1984 the latest of a series of papers on the school curriculum was issued by the Department of Education and Science and Welsh Office.¹ Like many of its predecessors from government and HMI, since the so-called Great Debate on education of 1976, it advocates the need for a common core curriculum for all pupils until the age of 16 years. In many respects it appears to support CDT more strongly than most. Thus it suggests that the primary phase (5-11) should 'provide opportunities throughout the curriculum for craft and practical work leading up to some experience of design and technology and of solving problems'. The *Times* described the new position at the secondary stage (11-16) in one sentence:

'Ministers have set themselves the ambitious aim of providing craft, design and technology right through secondary school in a drive to foster practical skills'. It looks as if CDT, after years of being offered a peripheral place on the curriculum, has come of age.

Statements about the common core curriculum tend to fall into two categories: those concerned to discover which content and activities are most worthwhile and those concerned with what skills, values and knowledge our pupils need for life. The September 'Note' (as it is called) is almost entirely content-oriented, although it does concede in one paragraph that the important elements of the curriculum offered by schools are not subjects but such matters as the opportunity to develop personal qualities or to acquire study skills. However this comment is an exception: the paper is almost entirely concerned with content. After years of discussion it would seem to be highly rewarding for CDT teachers to find such apparent support, even though in a note that still raises a number of questions for further discussion, and show signs of haste in production.

In what follows I will examine the recommendations of this document further, though in no way can they be regarded as final or definitive. The Note belongs within a much broader historical debate about the nature and value of certain kinds of education in our society. I hope therefore to put the present issues into context by examining the meaning and different sets of criteria, as well as the ideological bases that have been offered for the common core. I will be looking in particular at some of the statements made about CDT, including the improvements that are looked for and the justifications that are offered for these activities. It is concluded that we cannot merely ask — as the Note does — whether or not CDT should be included in the common core. We need to indicate what aspect, what model and what content of CDT needs to be offered and can be taught to all pupils.

1. The Compulsory Curriculum

Historically a prescribed curriculum was laid down for British elementary schools until 1926 and British secondary schools until 1945. The elementary

curriculum had included practical instruction in handicraft amongst its compulsory subjects, though the 1922 Code of Regulations for Public Elementary Schools accepted that not all subjects need be taught in all schools. The secondary curriculum included manual instruction for boys and domestic subjects for girls. The school's autonomy to frame its own curriculum is thus relatively recent, though the State did not prescribe the actual details of what was to be taught, nor did it compel all subjects to be taught to all pupils.

In Europe there are several different types of educational system: a) the *Scandinavian* model which is highly bureaucratised, with teachers having to observe curriculum programmes which they have little part in constructing; b) the *French* model, highly centralised with the Minister of Education having overall control of the curriculum, though teachers and parents are consulted before any reform is entered upon; and c) the *West German* model with the states controlling their own curriculum, but with some general agreement about syllabi. If we extend our examination further we find curricular control widespread. In the United States, Canada and Australia, syllabuses are laid down by school boards. Britain is the only country in the developed Western World where schools do not have to conform to a prescribed common syllabus laid down from outside.² In these other countries the number of hours to be devoted to each subject is generally specified and the details of what is to be taught may also be prescribed.

This does not mean, however, that the British system has no external constraint, since it is the only system in the world with a double-barrelled examination leading to a university entry ('O' and 'A' levels). The NFER 1974-75 survey found in a sample of 939 schools, only 11 made no provision for a common core, and over four-fifths of the schools gave more than 30 per cent of its time to a compulsory curriculum, of which English, mathematics and physical education were the most common components. The HMI report *Aspects of Secondary Education in England* (1979) found that of 384 schools inspected, 243 operated with a compulsory core, while 92 had a core differentiated by bands, and 49 employed other schemes. The time devoted to the core varied from 23% to 93% of the timetable. There was variation, however, in core content. English and Mathematics alone were almost totally common while PE was offered as compulsory by 92% of schools. Two-thirds of schools had RE and Careers Education, though few top ability groups operated in either. Indeed even earlier than the fourth year top groups were often

allowed to enlarge the scope of their academic studies by substituting the different sciences for a combined science course and by taking a second language. One major way in which they made up for their extra time was by dropping the craft subjects.³ Other countries with a compulsory curriculum tend to lay down some form of craft, handicraft or technical education for all pupils.

The above examples have illustrated the points that a) sometimes distinctions are made between compulsory, common and core curriculum; and b) sometimes because of banding or ability grouping CDT may not be taken at all by top groups or dropped because of option schemes.

Some further points need to be made about compulsory, common and core curricula.

2. Common, Core and Compulsory Curricula

The concepts of common, core and compulsory curricula do not mean the same to everyone. In most advanced countries 'core curriculum' means: courses in certain prescribed subjects or 'discipline areas' for all pupils of a given age throughout the school system as a whole.⁴ In this country it often means those subjects stipulated for all pupils of a given age in any particular school. In this sense the components of the core may vary from school to school.⁵ In the international sense this would not be a core curriculum. In a prescriptive sense as used in government papers 'core' refers to what ought to be regarded as of central importance, the 'protected' part which merits compulsory status. Frequently it applies to what subjects are common and compulsory either for all pupils or to particular bands of pupils within a school, particularly within the fourth and fifth year secondary programme.⁶ 'Core' in this sense is contrasted to 'options'. There are further difficulties here. It is one thing for a subject to be common and compulsory, it is another thing to teach common elements, concepts and skills within the common subjects. As Black and Ogborn have argued,⁷ a core of science may mean: 1. the continuation of at least one science subject until 16 (a science option), 2. a form of continuing science for those not taking CSE or 'O' level science or 3. a compulsory course of selected areas of science for all (This might include aspects of practical and applied science, or involve general science so that all girls, for example, would continue physics and boys biology to overcome an apparent sex-bias in choice).

Like the notion of core, 'common' may imply common within the system or common within a school. It can also mean common subjects or a common programme of studies. It seems to be differentiated from core in that 'core' is contrasted to 'options' and that 'common' may be that which is prevalent prior to option choices and in primary education. Thus the basis of the common curriculum might be certain forms of knowledge or areas of experience,⁸ with the core involving special or essential areas. We are told that some schools are moving towards an enlarged common

curriculum by extending the central core of compulsory subjects.⁹ The concept of a common curriculum implies common elements whereas the core part need not be the same for all pupils but implies educational opportunities appropriate to his or her ability, aptitudes and personal motivation.¹¹

Similarly compulsion may be achieved in several ways 1. within individual schools by a reduction of option choices, 2. by common compulsory examinations for all pupils nearing the school leaving age, 3. for local authority schools by LEA's or 4. by central legislation for the national system.

3. Criteria for a National Common Core Curriculum

While it is not possible within the limited space of this article to consider the various pro's and con's of a national common core curriculum, it is important to recognise the need to achieve a balanced and coherent education for all pupils, by avoiding specialisation at too early a stage of development, since that creates a subsequent distortion of cognitive perspective and a closing of doors to possible career choices. It should also be pointed out that such a national curriculum policy would have to cover all stages of compulsory education. The roots of such secondary subjects as CDT must be seen as being established in the primary stages, even if the subjects are not taught as such. Thus there must be established sequential programmes of growing complexity to take into account pupil development.¹² At the same time, as we have already noted, attention must be focused on those fundamental skills, concepts and facts which both ought and can be achieved by all.

It is easy to think that a common core curriculum is that decided by political or professional opinion. But this is merely to appeal to authority. If curriculum planning is to be rational we cannot just define a core curriculum in terms of what schools teach or government reports prescribe. We need to set out the criteria clearly, be able to justify them and then be able to apply them to particular activities. Initially this means that the content and methods of the curriculum must arise out of the aims. The DES curricular statements run into difficulty here.¹³ Thus one of the six aims that are advocated, prescribes 'the need to help pupils to understand the world in which they live, and the interdependence of individuals, groups and nations'. This would lead one to expect some aspect of geography, history, environmental studies or political education to be included in the core curriculum, but after stressing the need for a broad curriculum the government finally picks out English, mathematics, science and modern languages to occupy the key position in the curriculum. Modern languages do not seem to be supported by the statements of aims. It is no wonder that the document as a whole has been criticised as confused and incoherent.

It can be argued that historically there have been three main categories of educational aims: 1. liberal

or classical humanist 2. child-centred or individualist and 3. social or reconstructionist.¹⁴ Alan Harris has suggested that these provide three different ideological approaches to the core curriculum.¹⁵

1. *The Classical Humanist or Liberal view* assumes that the curriculum ought to be concerned with 'high culture'. Traditionally this involved the pursuit of knowledge for a core stress on the arts, history and languages as well as historically belated studies of the sciences. The RSA statement on Education for Capability describes the product of such an education as 'a scholarly individual who has been neither educated nor trained to exercise useful skills; who is able to understand but not to act'. Sometimes this view of education has been advocated for the minority, those who will enjoy more leisure because they are richer or those who are more able. In contrast, a non-liberal, more practical, vocationally-orientated curriculum has been advocated for those who are thought to be less able to pursue lesser goals in life. This is advocated on different grounds and in different ways by the Newson Report and by G.H. Bantock in his various writings. A more democratic, epistemologically-based, liberal account is to be found in the writings of Paul Hirst who argues that education is centrally concerned with the development of the rational mind, achieved through an initiation into the major forms of propositional knowledge. Such an education must be comprehensive and general in character. To some extent the writings of Philip Phenix in America and John White in this country offer parallels to Hirst. Phenix also offers some further principles such as those concerned with the economising of learning, while White advocates an egalitarian compulsory curriculum that operates with that knowledge for which one requires initiation to develop as an autonomous person. White suggests that only those activities which one cannot understand without participating in, should form part of the core curriculum.

Amongst the criteria, then, for core activities would be the following 1. they must be intellectual in character, unique in structure, cognitively complex, illuminating and transforming one's understanding of the world 2. they must be intrinsically valuable (ie not taught for vocational, utilitarian or technical ends) and exemplifying such moral principles as concern for truth as well as intellectual values and 3. they must cognitively open and taught in non-dogmatic, non-doctrinaire manner so that the mind is opened and developed.

2. *Child-Centred or Individualist* aims, argues Harris stresses creative activities, the individual needs and interests of the child, self-expression and discovery learning. 'In most cases the ethos of such a school seems to preclude technological pursuits: mysteriously boys taken to see a mechanical excavator will be inspired to take pictures of it, or mime it, rather than find out how it works'.¹⁶ While there may be highly structured study of

mathematics, English language, geography and history, the emphasis may occur through modes of enquiry and problem-solving rather than through specific packages of fact. The variation of child-centred movements from the Romantic (which sees teaching as an unfolding of the child's potentials) to the Radical (which is critical of society and the taken-for-granted nature of knowledge) tends to agree in stressing pupil autonomy, problem-solving methods of teaching and education as a process of acquiring capacities to learn rather than the regurgitation of accepted knowledge.

However, while child-centredness offers important considerations about pedagogy, it is difficult to see how such individualist approaches could produce clear and agreed criteria for the content of a common core curriculum.

3. *Social or Reconstructionist* ideologies see education as instrumental towards the improvement of society. Thus social and vocational emphases may become overriding especially in developing countries. Both egalitarian concerns with the common curriculum and government concerns over industrial and economic needs operate within such a paradigm. One way of arriving at core curriculum is to analyse the needs of society or the nature of the culture. As with child-centredness, however, such a position begs a number of questions. How are local and short-term needs to be balanced against wider and longer-term needs? We have to avoid fitting people into pre-determined roles by too restrictive a training, for that reduces the flexibility of responses that society might call for at a later stage. Yet the fact that we have multicultural or technological needs or are part of an international community cannot be ignored. Some cultural analyses have advocated a common culture based upon knowledge, i.e. one in which neither elitism or working-class culture are supreme: 'a heritage of knowledge and beliefs which includes mathematics, science, history, literature and more recently, film and television is shared by all classes'.¹⁶ Social aims varying from those stressing a conservative attitude to the status-quo to those intent upon reforming society, tend to stress the main criterion of the core curriculum as being social relevance (though 'what is relevant to what and for whom' raises issues of value-judgement as well as empirical considerations about relationships between particular means and ends).

In many ways the three paradigms overlap. The needs of society and the needs of the individual and even liberal and utilitarian requirements may not be mutually exclusive. The individual exists within society and knowledge pursued for its own sake can nevertheless prepare one for life after school. The advantage, however, of the paradigm approach is that it draws attention to the need to base criteria for the core on prior aims.

There are other important considerations that cannot be omitted. Thus most writers stress the need for coherence, balance, breadth and coverage

among the core activities, though these concepts may be given different meanings. One can see a limited number of subjects as balanced between the arts and sciences; there may be balance in the sciences to each other and to their preparation for adult society; there may be balance between the arts and sciences, theoretical and practical work, or intrinsic and vocational pursuits. On breadth or coverage we need to have criteria by which coverage can be evaluated or the breadth looked for, can be judged on criteria other than keeping career choices open.¹⁷

4. CDT in Recent National Curricular Reports

It must be said that many of the statements about CDT made in national reports on the common core curriculum, are less promising than they first appear to be. The more important politically the group which produced the report the less supportive its statements, on analysis, are. The more helpful statement appears to have come from the School Council, but it, unfortunately, has ceased to exist. Thus its working paper called *The Practical Curriculum* (1981) considering the argument that children ought to encounter certain forms of knowledge or areas of experience in their learning, makes the suggestion that such areas need to be set against a check list of what schools regard as desirable learning. 'In particular we would suggest that every boy and girl should sample three distinct elements of craft, design and technology. We emphasise these because we believe that working with materials and designing and making solutions to problems are distinct kinds of experience and learning'.¹⁸

The HMI working paper *Curriculum 11-16* (1977) does not specifically include CDT on its list of essential areas of experience though it includes art/craft/music as one type of compulsory element in the curriculum. With regard to technology it maintains that 'by the age of 16 a pupil ought to know what we mean by technology; what are its origins, nature and purposes, and — just as important — what are the main issues and problems that it has generated'.¹⁹ However it prefers technology to be taught through other subject areas rather than as a subject in itself. It sees CDT as providing a fuller, more cognitive experience than handicraft, one which aims to give boys and girls confidence (presumably a confidence based on achievements in knowing rather than false delusions) in identifying, examining and finally solving problems with the use of material. This is said to involve an important contribution to preparation for living and working in a modern industrial society. Nevertheless the inspectors do not seem to rate CDT as highly as did the Schools Council.

However, in all this discussion about what ought to be regarded as essential within the curriculum, one must turn to the government paper *The School Curriculum* (1981) for a more definitive statement. We are told that two important criteria for school learning are that i. what is taught and the way it is

taught must reflect fundamental values in our society and ii. there is a need for breadth, 'which is commonly defined in terms of subjects'.²⁰ In this same paragraph CDT is mentioned with physical education and home economics as making a 'particular contribution to the acquisition of physical and practical skills which are an essential complement of the pupil's intellectual and personal development'. In other words it is to be justified, as handicraft was, as a practical experience, so that despite the greater cognitive elements in CDT noted by the Inspectors or the mental stimulus of designing or the valuable experience of acquiring technological concepts operationally, it is still seen as something complementary to the intellectual. One wonders if the strange juxtaposition of the physical and the mental in the first aim of education is an expression of this belief. CDT is not included amongst the suggested common elements that every pupil ought to study up until 16. Yet two sections are devoted later on in the paper: 1. on the use of computers and other microelectronics-based devices and 2. more specifically on CDT. Here we are told that the Secretaries attach special importance to CDT as a part of the preparation for living and working in modern industrial society (Note the vocational association). In particular under 3 conditions it is strongly supported: 1. *when taught imaginatively* it enables pupils to be aware of the social values of the practical application of discoveries (as vital as scientific research); 2. *with able pupils it can be intellectually demanding, stretching them to the fullness of their inventive and innovative powers*; 3. *when used to demonstrate science and technology in action*, it can help pupils to understand the possibilities of technological change and to profit from them later.²¹ (presumably when set in a social and historical context). In short, with imaginative teachers, able pupils and when related to science and technology within society, it can be as valuable as science. The inference following on from the statements about its practical rather than intellectual value, is that for the average pupil with the average teacher, it could not be regarded as a core subject.

5. The Latest Note

Altogether the DES and Welsh Office note on 'The Organisation and Content of the 5-16 Curriculum' shows less internal coherence as well as less coherence with previous reports than one would expect. It is a mixture of positive statements and questioning uncertainties ('It is Government policy that the 11-16 curriculum for all pupils should contain etc.' and 'Is it acceptable that any of these three elements (history and geography and principles that may be taught in history and geography) can be dropped in these two years (years 4 and 5)?'). From the 1981 paper's prescription that most should study a modern language and many should continue to do so for the five years of the secondary curriculum, we come to a position of greater doubt in which questions are raised as to

whether the least able should study a foreign language at all and whether the majority should not be limited to studying one language for three years only. From a position where physical education was prescribed as part of the common curriculum we find now that physical education and games should be considered as free options in years 4 and 5. Such changes, of course, may constitute improvements rather than vacillations of policy. However the idea of a national common core curriculum is also held less strongly than initially appears to be the case. Thus we are told that the actual balance between subjects depends upon practical considerations and the local situation, such as LEA policies, parental and pupil wishes, curricular policies of the school and what the school can offer in terms of teacher time and group size. While it is argued that for a subject 'to confer lasting benefit there is a minimum period for which it has to be studied during the compulsory years' (this is an essential point to remember when employing rotational schemes, particularly in secondary schools whose youngest pupils may be 12 or 13 years), it is also pointed out that what aspect of the subject is taught will depend upon pupil ability (hence it cannot be a common core of concepts, skills or values that is advocated).

In the light of these doubts, what then are we to make of the proposals about CDT? Are they airy statements or do they offer strong advocacy? When we consider again the statement of support for craft, design and technology in the primary phase it seems a little ambitious, for, at this moment, even many middle schools lack suitable semi-specialists, appropriate workshops or equipment. Of course it depends upon what you mean by CDT, particularly the technological element. Perhaps what is actually being implied suggested is that with a crash programme of in-service training there could be a more genuine place for practical problem-solving in primary school projects. In other words the apparently positive prescription is really a hypothetical possibility. Actually the term 'ambitious' is used in the Note itself to describe its ideas about CDT at the secondary level. The 'ambitious requirement' of getting all pupils throughout the five-year period to study and solve problems involving the use of materials and . . . some element of designing and making things . . . is made more difficult to meet by the shortage of good CDT teachers'. Doubts are expressed about their own proposals in four ways; by the term 'ambitious', by the recognition of CDT teacher shortage and by saying that this only 'might be' 'a possible objective'. However, we are told that CDT can be taught 'by a variety of activities and a wide range of materials, including the use of modern technology. Some contribution may be available from teachers of other subjects, with appropriate support, including teachers of art and design'. In the light of these statements it would be useful to know what kind of CDT is being advocated.

The Annex to the Note seems to exemplify the Government's ideas by setting out the curricula of five schools in which a compromise between what is desirable and what is possible is given expression. Do these examples support a key position for CDT in the common core curriculum? Only in one out of the five schools is the subject taught as CDT and not as metalwork or woodwork, and only in that one school is it compulsory for the fourth and fifth year. For the other schools the traditional crafts rotate with the art subjects or domestic science in the first three years and then occur amongst possible options in the fourth and fifth years. Is this sufficient time, on the Note's own criterion, to make the study of the subject worthwhile? The subject seems to be taught in the traditional way, with the rotational system of sharing time with other subjects (and remember some secondary schools, with middle schools as feeders, have no first or even second years). Are we to conclude that the practicalities will continue to render CDT as a peripheral subject for some time to come? There is no mention of CDT as science and technology in action, in the mode of the 1981 document. We can only await a stronger advocacy of CDT as a core subject for all pupils.

6. Criticisms and Justifications of School Craft

In considering what justifications can be offered for CDT within a national common core curriculum, it soon becomes clear that the issue is one of comparing the educational value of CDT and other subjects in the competition for time and space, within the curriculum. Whether or not there is ever a compulsory national common core curriculum, this competition for status is being fought in every school. In many schools where staff and CDT are respected the subject is already part of the common core curriculum. In others it may seem to lack university credibility, intellectual and academic standing and a staff that is in tune with the demands of a modern curriculum.

CDT has emerged from the craft areas of woodwork and metalwork. It is craft that has been the subject of often spurious justifications or has been attacked as intellectually inadequate. It has been defended on vocational grounds despite the small number who become professionals. It has also been advocated because of certain supposed outcomes. Thus S. Glenister wrote of craft serving to train the memory or of to develop logical thinking.²³ S. Nisbet argued that craft helps to create a sympathetic understanding for manual workers 'an essential adjustment for the non-manual worker to make if he is to play a useful part in political life'.²⁴ (Perhaps a study of politics or experiences of community work might be better!) R. Stewart in an examination of such justifications comments that the diversity of craft might prevent its acceptance as a serious academic subject. He then goes on to say 'It must be shown to demand a sufficient level of intellectual and creative

involvement on the part of the pupil and provide an introduction to important human or natural phenomenon pertinent to the society in which he lives'.²⁵

John White rejects the idea of handicraft as a common compulsory activity on the grounds that it can be understood and its concepts can be made intelligible to the onlooker who does not participate in the activity — its skills are not mysteries into which one requires initiation like looking at paintings.²⁶ White thus fails to recognise the complex nature of craft know how. Broudy, Smith and Burnett,²⁷ writing from an American context, argue that while perhaps it is no longer possible to pick up tool manipulation informally as once one may have been able to, nevertheless such skills can be and are picked up at the level of amateur use by trial and error or by following instructions. At the same time, the understanding of such technological devices or processes such as those involved in electronics can be acquired through the study of science.

Robin Barrow, an English philosopher, argues that, in comparison with history, woodwork is more physical but less intellectually demanding. History can be practical by being studied for the solution of certain problems, it can be pursued for leisure purposes, and it casts more light on the human condition than woodwork.²⁸ It is noticeable that such writers as these stress academic understanding and undervalue skills and attitudes in their discussion of craft areas.

Patrick Walsh in a refreshing defence of practical subjects argues that any set of criteria that is broad enough to apply to the wide range of academic subjects will apply also to the practical subjects. The practical areas have their own values which are equally as important as those of the sciences or humanities. 'To truth, consistency and clarity as intellectual virtues do there not correspond effectiveness, economy and good workmanship as virtues of practical activities and are not these, too, peculiarly "mental" virtues?'²⁹ The craftsman's feeling of respect for his material has as much ethical significance as the liberal pursuit of truth. Latin can be pursued mindlessly no less than woodwork. The leisure-time or vocational activities of the many have at least as much right to consideration as the liberal pursuits of the few. The essential question to be asked is whether or not the subject can help the development of the individual.

Walsh is right in maintaining that craft no less than history has intrinsic values, but the critics are asking whether or not the learning of its skills cannot occur elsewhere, and whether systematic long-term instruction is required, with some element of compulsion in order to bring long-term benefits. How is its social and educational value to be measured when placed alongside and competing with other subjects? Is it a subject only for the Newsom-type pupils?

7. Should CDT be included in a National Core Curriculum?

The creation of CDT should go some way to meeting these objections to craft. It involves three elements woven together by the act of problem-solving and has a different character from that of craft. It should not, therefore, be subject to the same criticisms. Craft involves a product approach to education, with the artefact as the object of assessment; of more concern in design is the process, the thinking, the problem-solving.³⁰ Of the three paradigms we noted — the Social Reconstructionist approach stresses social relevance, the Child-Centred model advocates creativity and personal development, and the Liberal model emphasises certain intellectual values and breadth of outlook.

a. *Social Reconstructionist Criteria.* Both the design and technological aspects are often regarded as socially relevant. Lawton has pointed out that we are short of high technologists in society and our industrial management lacks engineering qualifications. School technology is grossly neglected because of the time allowed for it, the status and quality of its teachers and its failure to achieve a place in the compulsory curriculum.³¹ Schools are said by some to engender a lack of interest or even a positive hostile attitude towards industry. These are all arguments beloved of industrialists and government, because they direct the blame for industrial and economic failure, elsewhere, on teachers.

But there is a danger of identifying high technology with industry, and believing that the major social concern is industrial production. I have argued elsewhere that the aims of a technological education must be primarily that of preparing children, morally and politically, for understanding and being critically aware of the social issues of technology.³² Incidentally, these are the aspects of technology which girls seem to want to study.³³ There should also be some 'hands on' experience of technological devices, and the understanding of areas of technology, especially those related to designing and making. However, Bernard Aylward is surely right in warning us of the danger of, over stressing the theoretical aspects of technology to 'facilitate CDT becoming a training ground for future university students. This falls into the same trap as have academic studies in the traditional curriculum. It is divisive and would tend to elevate the academic study of technology, above the use of technology in serving mankind'.³⁴ In emphasising the economic relevance of technology it is easy to create an educational imbalance by stressing present industrial needs to the detriment of future social understanding.

b. *Child-Centred Criteria.* The problem-solving basis of CDT has its origins in child-centredness. It is not therefore surprising for writers to justify design education in particular by talk of its opportunities for developing students' abilities in

tackling 'real-world ill-defined problems',³⁵ or its advantages in encouraging 'the development of creativity and of problem-solving, decision-taking and evaluation which are valuable in all walks of life'.³⁶

The claims about developing problem-solving abilities are no doubt sometimes exaggerated for there is no general problem-solving ability.³⁷ Also, as Douglas Lewin reminds us, 'it is impossible to teach creativity. All one can do is to encourage and allow the students to experience design situations for themselves, the basic principle being to draw out rather than cram in'.³⁸ Nevertheless the virtue of getting pupils to design is that they are actively learning and being asked to think about the various issues rather than to follow the teacher's instructions. That cannot be bad.

c. Liberal Criteria. Hirst argues that a liberal education involves an initiation into the unique forms of propositional knowledge. There are strong arguments for maintaining that there is a unique element to design, for its language is modelling, with designs being expressed through drawings, diagrams, physical representations and other forms of non-verbal as well as verbal representation. Bruce Archer has argued that such graphic thinking involves important skills which have parallels with the skills of literacy.³⁹ The term 'graphicacy' has been coined to cover such non-verbal communication.⁴⁰ While it could not be maintained that modelling or graphicacy is unique to design, (it constitutes an essential part of geography) or even that there is an automatic transfer between different forms of graphicacy, (such as between map-reading and reading architects' plans), there is no doubt of the value and distinctiveness of this form of representation. We ought to educate children to be graphically literate. Through modelling one is able to conceptualise in design things which do not yet exist. On these grounds, M.J. French sees the prime justification of design education as lying 'in strengthening and uniting the entire non-verbal education of the child'.⁴¹

Historically craft was regarded as illiberal because of its supposed cognitive narrowness, as well as its practical and vocational element. But CDT is a diverse area of activity, and in the design and making process one may draw on a multitude of disciplines. In a sense far from being illiberal CDT may form the core of liberal studies. The elements of design and technology can be taught across the curriculum. They can be studied within a historical and social context, in which moral and political questions are raised. Technically appropriate mathematical competence and relevant scientific concepts are necessary for the solution of several types of design problems. At the same time design involves aesthetic elements. Because of these factors there are those who see design as integrating the sciences and humanities,⁴² or as defined by its ability to synthesise discrete areas of knowledge.⁴³ Lewin assuming that design is the core of engineering criticises CDT as paying undue

attention to making — the craft aspect of an artefact. Nevertheless he maintains that in schools engineering through problem-solving provides the basis of a liberal education.⁴⁴

In various ways such as these, writers have tried to show the educational value of some model of CDT — particularly one emphasising design or technology. However these arguments do not take us far in the issue of the core curriculum, for they make it clear that the degree to which such a variety of knowledge will be experienced will depend upon the actual situation in school. All design or technological problem-solving does not provide the basis of a liberal education. Furthermore, one must recognise the obvious point that time is limited and even if it were desirable CDT at best, would have to assume other knowledge rather than teach it.

Conclusion

This leads us then, finally, to ask what model of CDT, what core skills, knowledge and concepts, and what kind of general conditions operating in schools, are necessary to justify a key position for CDT in a national common core curriculum. Scanning the literature on craft, particularly on woodworking, one cannot help but see a virtual consensus of doubts about its intellectual value, because of its product rather than process model of education, its failure to fully stretch the mind, and because it is thought to be economically less relevant than design or technology. The virtues implied by 'craftsmanship' are often forgotten.

There are those who would want CDT to be more theoretical either by concentrating on design modelling or by offering technological packets of information. However, surely making constitutes part of the uniqueness of this area. Also children learn something about the practicality of their design by making and evaluating the artefact.

Design, nevertheless, must occupy the key role in CDT, because it can help to develop an awareness in the pupil of the way that human needs, social concerns, aesthetic factors as well as technical data and skills affect the final product. It also employs non-verbal models of graphicacy and helps to develop aspects of non verbal thought. There needs to be some agreement about the ideological emphasis, the aims and appropriate model of CDT necessary for common core teaching. If the child-centred ideology is stressed it would be difficult to prescribe in detail what skills, concepts and knowledge should be taught to all pupils, since a total commitment to problem-solving assumes that what is taught is primarily the general features of problem-solving and the specific craft skills and items of knowledge necessary for solving the particular problem. However, some acceptable minimum of craft skills, technological know-how and graphic skills to be attainable by most pupils by the age of 16, may need to be recognised if CDT can become part of a genuine national common core curriculum.

All cannot be put right merely by prescribing an acceptable programme of studies. In the end, as the *School Curriculum* recognises, everything depends upon the teacher and the facilities he/she has. A high percentage of teachers within this area are skilled craft teachers. They have not all had the opportunity to acquire the relevant technology or design skills. All are not necessarily sympathetic to the changes they see being advocated. Consensus cannot be forced. In the meantime individual departments are gradually winning their right to a place for CDT in the school compulsory curriculum.

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