

CDT and the Curriculum

The area of the curriculum that is now called CDT has changed, in its conception if not everywhere in its reality, more completely and dramatically in recent years than any other area of the curriculum. In my view this transformation reflects some wider changes in our notion of education, the effects of which can be discerned also elsewhere. And these changes are at certain points in conflict with the view of schooling taken by many people, politicians, industrialists and others, who look at education from the outside. The tensions created by this conflict and by the resulting pressures and constraints under which we, as teachers, work are being felt across the curriculum and across the age-ranges. They are felt nowhere so much, however, as in those areas of the curriculum that are regarded as being concerned to promote what are glibly called 'the basic skills' so that the areas in which I am most conscious of their impact are those of CDT and Primary Education. In fact, the similarities between these two are interesting in a number of ways. In both cases too this tension has, in my view, led to conflict and sometimes a confusion of purposes within the activity itself and it seems to me that what is needed more than anything else is a clarification of these issues as a basis for the continued development of a proper practice.

It is to this that I wish to devote most of my attention here. I want first of all to say a little about what I believe to be the essential features of education. I want then, in the light of that, to look at CDT and to try to demonstrate that the main characteristic of the recent developments in that subject has been an increase in the emphasis on its educational value, perhaps even the emergence of an awareness of this for some people. I then want to suggest that there are several aspects of the approach to both curriculum planning and provision in this area which, albeit as a result of external pressures, are in fact at odds with that general movement. And then, finally, against that background, I shall spell out what I see to be the role of CDT in the curriculum.

What is Education?

It is not my intention to spend time here engaging in a deep philosophical analysis of the concept of education. All I want to do is to make one or two commonsense points about what we mean by education as a basis for what follows.

The first, foremost and most fundamental of these is that from earliest times a distinction has been drawn between learning undertaken for its own sake and learning undertaken for some extrinsic purpose or purposes. Plato and Aristotle both go to great lengths to assure us that their recommendations for the inclusion of geometry (Plato) and art (Aristotle) in the curriculum are based not on their utilitarian value but on the contribution they make

to the development of the individual. The Roman philosopher, Seneca, said, 'I respect no study and deem no study good which results in money-making'. And this view is implicit in the works of the Humanists, in the practices of the medieval universities, in the very concept of a university as a seat of learning and a centre for the pursuit of knowledge for its own sake and in the continuing notion of the value of a liberal education, as opposed to a vocational education. More recently, as a result of the work of Richard Peters and others, it has become the practice to limit the term 'education' to those acts of teaching which are concerned to promote the idea of learning for its own sake and to use terms such as 'training' or 'instruction' for instrumental forms of teaching, a practice which, it might be claimed, reflects the common usage of these terms. However, whatever terminology we use, the conceptual distinction remains valid and is a crucial one, for it stresses a 'process' rather than a 'product' ideology.

It is also the case that traditionally more value has been placed on those aspects of schooling whose focus was education in this sense. This is a major reason why subjects like science and modern languages had difficulty in breaking into the curriculum of the public and grammar schools, that is those schools whose concern was with education rather than vocational training. For that curriculum for many years was dominated by that most non-utilitarian of activities, the study of Latin and Greek. As Heinrich Heine once said, 'The Romans would never have had time to conquer the world if they had been obliged to learn Latin first of all'. The hierarchical structure of subjects that characterises the curriculum of the secondary school is based as much on their relative utilitarian value as on any other factor. It is this same factor that explains the low position in the pecking order that continues to be the lot of CDT.

The second feature of education that I wish briefly to draw attention to is its conceptual connection with the development of understanding rather than the mere acquisition of knowledge. As Alfred North Whitehead once told us, 'The merely well-informed man is the most useless bore on God's earth'. Again this reflects common usage and is a distinction that even the man in the street or the 'pub' is regularly drawing. The notion of the educated man as someone who has rather more to offer than an encyclopaedic knowledge is not really disputed by any but the most ardent fans of 'Mastermind'. Again too it is a distinction that dates from earliest times, at least from the time when Plato distinguished between the form of education that would enable his rulers to think and thus to make decisions and that of the rest of the citizenry which would teach them to accept and obey and to carry out efficiently their vocational concerns. More recently, it has been cogently put by Gilbert Ryle (1967, p.27); 'in the special business of teaching we are much more concerned with people's competence than with their cognitive repertoires . . . we are interested less in the stocks of truths they acquire than in their

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capacities to find out truths for themselves and their ability to organise and exploit them when discovered'.

Both of these aspects of education — its concern with learning for its own sake and with the development of understanding — need to be borne in mind whenever we consider the curriculum but particularly when we are concerned with those aspects of it that appear to lend themselves most readily to a different kind of approach or treatment, that is those areas, again such as CDT and the Primary curriculum, where emphasis can most readily be placed on the teaching of skills for extrinsic purposes.

Both of these too draw our attention to a general feature of the concept of education, namely that it cannot be defined in terms of its content but only in terms of those processes that are essential to it. From the time of Plato onwards, we have attempted to define education by reference to certain areas of knowledge or curriculum subjects and have then lost sight of the fact that its central features are not particular bodies of knowledge that it is concerned to transmit but certain forms of human development that it endeavours to promote. This simple proposition, once accepted, leads to a recognition that any area of study can have educational validity since it entails the total overthrow of that subject hierarchy we noted earlier.

In summary, then, the central concern of education is the development of certain capacities, such as the ability to examine things critically, to explore them with understanding, to solve problems by the application of knowledge, intelligence and understanding and to reach one's own informed conclusions. If this is so, then no one area of study can claim to be the Royal Road to these goals nor can any subject be dubbed necessarily an educational blind alley. It is the approach that is crucial. For the wrong approach to the teaching of Latin and Greek proved all too often to be counter-productive to these kinds of development and the right approach to CDT can, in my view, contribute as much as any subject to their attainment.

Recent Developments in CDT

It seems to me that the salient feature of recent developments in CDT has been a move towards an approach that would provide it with this kind of educational validity, so that it may be that we should see it as giving the lead to other subjects. There are several aspects of this that I would like to pick out for brief comment.

Firstly, there has been a move away from the vocational, instrumental image, the product ideology associated with Handicraft as a school subject. It is not that the potential relevance of the subject in vocational or utilitarian terms has been rejected; it is rather that the scope of the subject has been extended far beyond the narrow boundaries or horizons that conception of it creates. It is now recognised, although still perhaps not universally, that this kind of activity can have value in itself and the main thrust of recent developments has

been towards establishing it in the curriculum on these grounds.

Secondly, the move has been towards demonstrating the contribution that this area of the curriculum can make towards promoting those educational processes we referred to earlier, the development of those capacities that we suggested are the essential characteristics of what it means to be educated. (And we might note as an aside here that it might be a particularly useful route to the development of these capacities in pupils who do not respond as readily to more abstract forms of study). Thus the stress in recent years has come to centre increasingly on the development of creativity, design awareness, problem-solving techniques and so on, in short on the provision of a perspective that goes well beyond the confines of the activities themselves.

Lastly, it is worth noting that this has been achieved in spite of several attempts to give the subject a different role. It is interesting in this connection to remind ourselves of why the attempt to develop technical education as a separate element within a tripartite system of secondary education never got off the ground. It was not just that pupils with this kind of talent or propensity are not easy to identify at an early age; it was that the whole conception was a mistaken one. Technical education is not different and therefore separable from academic or intellectual education; it is itself a form of academic or intellectual education. And recent trends have been towards demonstrating the truth of this.

Similarly, those simplistic interpretations of the Newsom Report which seemed to encourage teachers to provide pupils of average and below average abilities with a practical education, which would be rooted in the concrete and thus not an education in the real sense at all, have been resisted by those teachers in this area who have recognised what I believe was implicit in that Report, that these concrete experiences and activities are to be seen merely as starting points for the development of those capacities education should be concerned to promote in all pupils. It is my view that the transformation of Handicraft into CDT is a considerable step in this direction and thus represents a bigger contribution than most subjects have made towards what Working Paper No.2 called 'the bringing of the best traditional view of what constitutes a liberal education within a grasp of ordinary people' (Schools Council 1965, para. 48).

This is a brief description of what has been happening in this field and certainly does not do justice to what has been a major change of direction. I hope, however, that I have been able to pick out the major features of that change.

Some inner contradictions

I want now to look briefly at some elements within both the theory and the practice of CDT teaching in recent times that seem to me to run counter to the

developments just described, to contradict the principles underlying these developments and thus to represent on the one hand the pressures and tensions to which it is subject but on the other hand a certain lack of clarity in the thinking about it.

It is worth noting first of all what precisely those pressures and constraints have been and continue to be. A vast and continuing shortage of suitable teachers is certainly one of them, not only because to do a job properly requires a work-force that is numerically adequate but also because in times of shortage there is an inevitable lowering of quality. Not all the teachers in this area of the curriculum – nor, indeed, in any other area, if it comes to that – are capable of teaching the subject in the way we have just described since not all of them have a clear perception of the principles involved.

Secondly, as I hinted earlier, strong pressures are inevitably brought to bear on a subject whose vocational and utilitarian dimension is prominent to emphasise that vocational and utilitarian dimension perhaps to the exclusion of any other. This was brought home to me very forcibly when I read a recent article in 'Studies in Design Education Craft & Technology' (1978) by Joseph Moon of the Engineering Industry Training Board (EITB) in which he says at one point, 'It is an intention of the proposals to encourage the wider development of broadly based programmes of education with an increased emphasis on applicability to vocation'. There is no doubt that society needs people with technological skills of all kinds; there is equally no doubt that the schools, especially through subjects like CDT, must endeavour to meet those needs. In doing so, however, they must beware of losing sight of what recent developments have revealed, namely that there can be and should be far more to the study of CDT than forms of vocational training, or even of vocational preparation, no matter how broadly that is conceived.

Both of these factors go some way towards explaining the inner contradictions within the teaching of CDT that I want now briefly to explore – at least as far as practice is concerned.

The first of these is the use of instructors for teaching in this area. Clearly the shortage of teachers is a factor here but the very term 'instructor' implies a narrow conception of teaching and almost invites a rejection of those wider principles of CDT education we discussed earlier. In fact, it represents a return to the practices of the days when the intentions of craft teaching did not go beyond the development of craft skills. The same problem is reflected in the philosophy of the shortened course of teacher training for this area. Again we need the teachers and again many of these courses do a fine job, but their basic premise is that the essential ingredients for successful teaching in CDT are technical skill and industrial experience. Here too there is an interesting parallel with Early Childhood Education. For often there it is assumed that all you need to be a teacher is to have given birth to one or two children and to have brought them up – skills

and industrial experience again – or that it is enough to have been trained as a children's nurse. To possess appropriate skills is clearly important, but to provide educational experiences for pupils of any age is to go far beyond these and requires a depth of understanding that only a properly planned form of teacher education can provide. The role of those who have not had this in the teaching of CDT should, in my view, be more that of the Nursery Assistant or even the science technician, as it was at the end of the last century when those who came into teaching as experienced tradesmen were required to work as assistants to the experienced and properly qualified teachers. This is the only way in which we can attempt to ensure that a proper emphasis is placed on the intrinsic value of this kind of study.

It is this which is also at risk when we adopt an approach to curriculum planning in this area through discussions of curriculum objectives, which is the second kind of contradiction I want to highlight. Lack of clarity about the implications of the use of objectives in curriculum planning has been a feature of much of the theorising about CDT and education. One does in fact find views expressed that go right across this particular spectrum. For, on the one hand, there are attempts, such as those in the article by Joseph Moon (1978) to which I have already referred, to analyse or break down teaching in this area into a hierarchy of closely defined behavioural objectives and, on the other hand, there is the approach of Project Technology which contented itself with statements of broad principle and has been criticised, in my view wrongly, by such as David Tawney (1973) for not providing a clear statement of objectives as a basis for subsequent evaluation. In the middle of these extremes we have the Keele project which appears to adopt an objectives approach, stresses the importance of this for planning (Schools Council 1969, p.9) but then sets out a 'classification of curriculum objectives' (*ibid*, pp.37/8) which turn out to be of a kind which are neither behavioural, on the one hand, nor purely procedural on the other.

The problems of this lack of coherence and consistency are twofold. Firstly, it leads to teachers picking up the idea of the need for objectives without being able to acquire a clear concept of what an objective is and what, if any, is its role in curriculum planning. The ideas of theorists filter only slowly and in diluted form to the teacher in the classroom and the term 'objective' is only now beginning to be used extensively by teachers and in a confused way. (Again there is an interesting comparison to be made here with Primary education). Secondly, the fundamental impact and import of the use of objectives in curriculum planning is again to emphasise an extrinsic, utilitarian approach, for essentially it suggests that we begin our curriculum planning by asking what it is for rather than by recognising that it ought to have some intrinsic value. It would be possible to discuss this issue at some length but I must content myself here with drawing attention to that one basic feature of this kind of curriculum

model. It will, I hope, be clear from that why I see the adoption of this model, even of this kind of terminology, as contradictory to many of the newly stated principles of the teaching of CDT.

One attempted solution to this difficulty has been to suggest that there are certain areas of the curriculum or certain aspects of school subjects that lend themselves more readily to this kind of approach than others and this brings me to the third point I want to make in this section of my discussion. For it is often suggested, or taken for granted, that while there may be difficulties in setting out a clear programme of objectives for certain aspects of CDT, especially those that fall into Bloom's affective domain, in other areas, such as the teaching of 'basic skills', such an approach is not only justified but necessary. It is certainly the case that where attempts have been made to spell out the behavioural objectives of craft teaching, as again in the article by Joseph Moon (1978), those objectives have taken the form of statements of 'basic skills', largely of a psycho-motor kind.

Again, I believe this represents a fundamental contradiction of those principles we referred to earlier and there are three points I want to make to explain why I see it in this way. The first of these is that I do not believe anyone is sufficiently clear about what a skill is for us to be able to draw such a line with any confidence. Of the many things that happen in any transaction between teacher and pupil in a workshop, can we be sure which are to be classified as 'skills teaching or learning' and which as something different? Our current concept of technological education is far too complex and sophisticated to be treated in this fashion. The skills that are discussed in the HMI paper, *Curriculum 11-16* (DES 1977), are such highly complex kinds of performance that I find it unhelpful and confusing to call them skills, that is to use a word which has a more simplistic connotation in common usage.

Secondly, even if we could draw this distinction with accuracy, of how much help would it be to separate out the teaching of these? Do pupils really learn better if they are taught the skills first and their application later? Is this not one of the fundamental errors of Bloom's taxonomy? There is no evidence that they do. In fact, there is some contrary evidence offered by Working Paper 26 (Schools Council 1969, p.31):

Where 'all-together' methods of introducing handicraft have been abandoned there is evidence to suggest that pupils do not suffer so far as craft skills are concerned. For example, teachers who no longer teach the rules of planing at a set time, but allow pupils to learn to plane as the need arises (this may be after two, three, four or even more months of work), find that they are as skilful at planing after two years of practical work as pupils who have followed an 'all-together' approach. Initial approaches based on individual exploration and free expression appear to result in more prolonged interest and stimulation of

pupils and give great opportunity for pupils to release creative abilities, thus giving a wider approach to basic design.

Skills must be learnt but the distinction between this kind of learning and other kinds may be more useful in the teacher's mind than in his practice. Again the parallel with Primary education is close and interesting. For Primary teachers are under the same pressures to emphasise in their teaching the 'basic skills' and there is evidence there too that 'the teaching of skills in isolation, whether in language or in mathematics does not produce the best results' (DES 1978, para.8.23). However, in both cases confidence is needed to adopt the other kind of approach. But again, there is evidence that the other kind of approach leads to no loss of skills learning and to a considerable advance in other kinds of learning.

This brings me to the last point I wish to make here. For I want to claim that while there is no evidence that to allow skills learning to develop as part of a more widely conceived approach to teaching is to put such skills learning at risk, there is evidence to suggest that to do the contrary, to attempt to teach skills in isolation, does put those other things at risk and can be counter-productive to the development of those competencies I am claiming constitute the educational dimension of CDT. Again, a comparison with Primary education is helpful. For it is clear that children can be trained to 'bark at print' without ever becoming readers in the true sense of the word, for often the process of so training them will put them off reading for life, even though the 'basic skill' may be highly developed. Similarly, pupils can be taught to compute with accuracy in such a way that they not only do not develop real mathematical understanding but that they may find the process of acquiring this competence a positive barrier to such understanding. Lastly, — a comparison with my own teaching subject, Latin, — the approach to the teaching of Latin which assumed that one should struggle with basic grammar and syntax first and, only when that was mastered, should one enter the world of classical literature, destroyed more Latin scholars than it ever created. Comparable dangers lurk here for CDT and they must be avoided. As the section on CDT in the HMI document, *Curriculum 11-16*, (DES 1977 p.33) told us 'the aim must be to develop skills as they are required during the progress of designing and making'.

These are the areas, then, in which I believe we need to improve the clarity of our thinking and of our practice if we are to resist the pressures to reduce teaching in this area to vocational, instrumental, utilitarian concerns of a narrow kind and if we are to create scope for the attainment of the full educational potential of CDT.

CDT and the curriculum

I want finally to turn to a consideration, against the backcloth I have tried to paint, of what that

potential might be and of the role of CDT, as I see it, in the curriculum. I shall first make a general point and then outline three specific kinds of contribution that I believe the subject can and should make.

My general point is that in an age characterised by the rapidity of its technological progress more than by any other single factor, no subject should have a greater claim to inclusion in the school curriculum than technological education. It is this, rather than a simplistic demand for vocational training and a raising of 'standards', that should have been stressed in James Callaghan's Ruskin speech. Future generations will be right to marvel if, when looking back on what I am sure history will one day dub the technological age, they discover that in that age CDT was so low down in the pecking order of curriculum subjects. This would be the 'sabre-tooth curriculum' (Benjamin 1939) writ large and comparable to man in the iron-age teaching his sons how to make tools out of stone. This could happen and that is why I feel one should establish that kind of perspective at the outset of this discussion.

If we accept that kind of *prima facie* case for its inclusion in the curriculum, what form or forms should it take, what should its main concerns be? As I have said, I think there are three. For, firstly, it should recognise its duty to contribute to the production of the continuing supply of technologists that society needs; secondly, it must help to prepare everyone to live in this technological society; and, thirdly, it must recognise and make its contribution to the overall processes of education itself. I want to conclude by saying something about all of these but I shall place special emphasis on the latter, not because I think it is necessarily the most important (although I suspect that it might be) but because it is the most neglected aspect of CDT teaching and because I believe it is towards a recognition of this role that recent developments in the subject have been groping, so that it forms a natural climax to my paper.

It is quite clear that schools have an obligation to produce the skilled technologists that society demands and equally clear that CDT must play a major role in this. It is this fact that is the source of those temptations towards instrumentalism that I commented on earlier. However, questions must be asked about the kind of technologist society needs and answers to these questions are by no means self-evident. To assume that one can readily list the skills that they must be assisted to develop is naive in the extreme, for when one begins to list them they soon reach such a level of complexity that, like the skills listed in *Curriculum 11-16* (DES 1977), they begin to transcend the normal meaning attributed to the word 'skill'. Society does not just need technologists, it needs the proper kind of technologist and to define that one needs to go far beyond any list of skills. For they need what the Crowther Report (1959) called a 'general mechanical ability', so that they will be adaptable to continuing

development; they need to possess that flexibility that only a depth of understanding can bring; they need not only technical and manipulative skills but also those cognitive abilities that must underpin the design process; and they need not only those cognitive abilities but also the affective abilities, design awareness and aesthetic discrimination, that must play an increasingly important part in technological advance, for there are serious implications in the possibility that, in becoming more efficient, technology may make our environment uglier, as the Industrial Revolution undoubtedly did. In short, society needs technologists but it needs educated technologists.

Secondly, schools have a duty to prepare all children for the society in which they live and will continue to live and this means they must educate everyone for the technological society of today and of tomorrow. Again the important thing is that we do this in the right way. For again, we are too often offered a naive view of what this means. Often it is taken as requiring no more than teaching people to operate the machinery they are likely to come into contact with in their everyday lives.

There is far more to the notion of education for a technological society than that. Many of the social problems of recent years have been the direct result of the failure of many people to come to terms with technological advance. For technological change invariably leads to social change; a technological problem solved is often a social problem created. And people may well be better able to cope with the social problem if they can understand its causes and origins. A good example of the failure to do this was the difficulties created for many dockland communities by the automation of cargo-handling procedures and that failure resulted in much loss of trade for this country. And how many strikes are caused by attempts to introduce advanced techniques and processes which are seen, usually correctly, as putting men's jobs at risk? I think it was De Bono who said, although I cannot find the reference, that 'a person who flees in horror from technology flees from the future but does not thereby prevent it'. Problems of social adjustment have acted as a brake on technological development and those problems are likely to get worse rather than better as developments in robotics and the introduction of the microprocessor into industry and commerce lead to an acceleration of this process. It is good to see Fiat cars produced without being touched by human hand not only because they will be more hygienic but also because the process contrasts so favourably with the awful conditions experienced by workers in the car factories of old, so poignantly illustrated by Chaplin's 'Modern Times' and other films and novels. On the other hand, one knows of the social problems that this very advance itself is creating.

There are important problems here for society and important implications for education. For we need to educate everyone not only to understand technology but, more importantly, to live with

technological change and this means helping them not only to understand and make the choices that technology makes available but also to recognise that there must be major social changes to match technological advance, that the two must go hand in hand if the worst kind of industrial friction and loss of productivity is to be avoided. As Frank Musgrave (1973, p.28) said, 'It really is a folly to produce great armies of second-rate engineers who will spend the next 40 years resisting the computers which could make them redundant'.

One of the main features of these social changes is the creation of increased leisure time for almost every member of society. It makes no sense to demand an increase in the vocational emphasis of the curriculum in a society whose citizens are likely to work less and indulge in leisure pursuits more — some because automation will reduce their work load, others because they will be unemployed. A recently published OECD Report predicted a rise in unemployment to 2 million in the UK next year, mostly centred on the 16 to 24 age-group. That figure has already been reached. 'Education for unemployment', then, seems more appropriate than vocational education in the context of present day society. Again, therefore, the emphasis must be on education, on the intrinsic rather than the instrumental value of activities, on the development of personal capacities rather than soon-to-be-redundant skills.

This brings us naturally to an examination of the third and last major contribution of CDT to the curriculum, its role in promoting education itself, a role which takes us beyond the confines of technology. I suggested earlier that the only useful definition one can give of education is one that is framed in terms of the processes that are integral to it rather than the subjects that it must include, the capacities that are displayed by those we call educated rather than the bodies of knowledge they have assimilated. We must, therefore, ask what CDT can contribute to these processes, to the development of these capacities. To find an educational justification for the inclusion of any subject in the curriculum one must hold it up to this kind of scrutiny. We must attempt for CDT what Elliot Eisner (1979) has done for painting. As Tom Dodd has said, 'any subject wanting to claim a curriculum place for the future needs to present evidence of having 'means' and 'ends' which can contribute to the overall aims of education' (1978, p.74). It has been a major theme of this paper that recent advances in CDT have been towards the development of this kind of evidence and I want to urge that at least as much attention should be devoted to these questions as to considerations of its social utility.

I want myself to make two comments here. The first is that, in my view, CDT, if properly conceived and taught, has more to contribute than most subjects to these overall aims of education. And this is true however one views these aims. If one sees it as the main purpose of education to

initiate young people into the several forms of knowledge or understanding postulated by Paul Hirst (1965) or those realms of meaning that Philip Phenix (1964) writes about, CDT seems to me to offer access to all or most of them. It involves logical thinking; it must include scientific study of a kind that is perhaps more appropriate to the needs of education today and to the development of truly scientific thinking than much that is taught under that specific heading; it embraces history and social studies; it requires the development of aesthetic awareness; it even raises moral questions. What is more it does these things in such a way as to invite their integration and to provide a theme or focus around which they can all cohere.

If, on the other hand, one prefers to view education as development of a more individual and personal kind, areas of experience to which pupils need to be exposed, CDT can again provide experiences of a wide range and variety. The approach to curriculum planning of *Curriculum 11-16* (DES, 1977) seemed to me to be an enlightened and progressive one. For the first time an official publication attempted to define education in terms of kinds of experience, of processes rather than of subjects. It listed eight adjectives 'which identify 8 broad areas of experience that are considered to be important for all pupils' (Supplement). Those adjectives are — aesthetic/creative, ethical, linguistic, mathematical, physical, scientific, social/political, spiritual. The section it contained on CDT, while good, did not in my view do justice to the range of contributions that CDT can make to most, if not all, of these areas of experience, although it did point out that 'design problems may be selected to promote a real involvement with mathematical, scientific, social, political, ethical and even spiritual issues' (p.33). Why it omitted the aesthetic I cannot understand.

Whatever processes one sees as central to education, then, CDT appears to have more than most subjects to contribute to them, provided that we approach the teaching of it in the right way. For it is our approach that is crucial. And again it is worth stressing the additional advantages it offers of doing this in a coherent and integrated way.

The second point I want to make about the contribution of CDT to the general processes of education is that it may offer a particularly valuable route to education for the less able pupil. A characteristic of the less able or slow learning pupil in the Secondary school is that he is still at the stage of concrete operations, still more at ease with an enactive mode of learning. This means that the starting-points for his education must be concrete and material experiences of a kind that CDT can provide more readily than most other subjects. There are, of course, dangers here. For this kind of activity is often viewed as a means of keeping such pupils quiet and out of mischief and there are dangers for the subject itself too, since it is in part from such clientele that it acquires its low status tag. We must beware, therefore, of appearing to

suggest that it has value only for such pupils; the whole thrust of my argument is towards claiming that it has great value for the most able of our pupils too. We must also resist the temptation to accept a lower set of educational standards for the teaching of the less able, of joining with those who interpreted the recommendations of the Newsom Report as suggesting we should merely give such pupils productive and absorbing work to do with their hands. As I suggested earlier, all pupils are entitled to be assisted towards the maximum of intellectual development and the role of CDT in the education of the less able pupil is to forward that and not merely to keep him quiet at school and turn him into useful fodder for industry.

CDT, then, has a contribution to make not only towards the attainment of a wide range of educational goals but also to their attainment for pupils of a wide range of ability.

Summary and conclusions

I have tried to show firstly that recent changes in that area of the curriculum now known as CDT have been towards recognising and, indeed, asserting its educational validity. I then went on to consider some elements in both its theory and its practice that seem to me to militate against this development. Finally, I argued that its place on the curriculum of schools in a technological society is to be justified on three counts, firstly because of the needs of such a society for expert technologists, secondly because of the need for all children in such a society to be given a technological education in the full sense and finally because it has more than most subjects to contribute to the overall aims of education.

The subject must be permitted, indeed encouraged, to develop rapidly in these directions. For it is vital for society that it should do so. If it is to succeed, however, there will have to be a change of heart and of attitudes not only by people outside it, but also by many within.

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