Colin C. Tipping
Middlesex Polytechnic

Technology Across the Curriculum

Discovery and enquiry based education has a broad base of acceptance in Primary Education. Some institutions and courses in Higher Education even emphasise the value and importance of learner directed study.

The mainstream of secondary education, on the other hand makes very little concession to heuristic methods. The examination system which is probably the greatest inhibitor of change, has an iron grip on the secondary school curriculum and, if anything, it is getting tighter. Most of the discussion about core-curriculum for instance is couched in quite reactionary terms.

Ironically it has found comfort (not that it was actually looking for any) in the writings of the developmental psychologists, especially Piaget. He had outlined his hierarchical stages of cognitive development with each of the preceding ones being, and remaining, of a lower order than the next; though of course vital for proper progression. The simplified writings of Piaget and his followers all suggested that most children reach the stage of 'formal operations' or abstraction of thought, at around eleven years of age.

The impression was given that every developmental stage prior to that had existed only to assist in the achievement of abstract thinking and that once this was achieved, all previous types of thinking strategies, like concrete thinking and iconic thinking (which uses imaging), became redundant.

This view looked attractive and very convenient since secondary school began for most children at about that age. Before Piaget came along there were no educational justifications for age eleven being the age of transition between primary and secondary. It had happened that way for historical and administrative reasons. Indeed there has been pressure to change it for other developmental reasons to include an intermediate stage from eight to thirteen.

The Piagetian model of intellectual development was embraced as a justification for no change in the structure and form of the secondary school curriculum. It continued to concentrate on a single mode of cognitive functioning; the abstract and symbolic mode, expressed mainly through written language and number. It continued to ignore all other forms of mental functioning. It considered concrete, iconic and non verbal systems of thinking as relevant only for those who had not, and perhaps never would have, achieved the stage of formal operations. It was O.K. for the remedial children but not for the bright ones.

It became legitimate to encourage Primary Education and Remedial Education to deploy methods which would extend children's ability to think in images; to think in practical concrete terms; to think intuitively and non-verbally; while Secondary Education proceeded much as it had always done, with little concession to any form of mental functioning other than the symbolic. Therefore while primary method and remedial strategies have embraced more practical and enquiry based learning procedures, Secondary Education in the main has not. It remains thoroughly academic and didactic in its method.

Other less popularised theorists like Vygotsky, Bruner and Werner, agree with Piaget about the stages that have to be reached before development to the next one can begin. Unlike Piaget however, they all emphasise that the modes of thinking that characterise the earlier stages remain available to be developed and used at the very highest level of mental functioning. Exploratory, practical, imaginary and symbolic thought can, in many situations, be in a state of mutual dependence.

Bruner refers to iconic thought, which uses imagery for mental representation. Einstein was said to have conceived the Theory of Relativity pictorially; developing a whole series of images to which he then applied objective reasoning to confirm their validity. In a letter to Jacques Hadamard (taken from the Creative Process, edited by Brewster Ghiselin), Albert Einstein said; 'The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be 'voluntarily' reproduced and combined'.

Much of science has come into being through practical iconic and intuitive thinking which made things work first, and then proved that they might after the event. Technology very often has preceeded scientific understanding, whereas the term 'applied science' which is given to technology, suggests the opposite relationship.

In this connection it is interesting to note that Vygotsky refers to a stage of cognitive development which is of a *higher order* than the symbolic. This has to be reached in order to move from the theoretical to the practical; to be able to apply knowledge in the physical world.

The case being made here then is that the secondary education system values cognitive styles which use objective and symbolic reasoning and the memorisation and recall of facts. It all but ignores imagining, sensory perceiving, subjective and intuitive thinking, divergent thinking, and the practical application and testing of thought. It gives scant attention to emotional development and all but ignores one half of the brain.

For at least a century and a half it has been known that the function of language, and language related capabilities, is mainly located in the left hemisphere of the brain of most individuals. Because speech and language are so closely linked to thinking and reasoning, the left hemisphere became known as the major hemisphere; the right as the minor hemisphere. The common view was that the right was less evolved, less advanced and entirely under the direction and control of the left hemisphere.

But research in the 1960's by Sperry, Myers, Trevarthen, Levy and others in the U.S.A. established that both hemispheres are involved in higher cognitive functioning, with each half specialised in complementary fashion for different modes of thinking, both highly complex.

While the left hemisphere is:– verbal, abstract, analytic, logical, symbolic, digital and linear.

The right hemisphere is:– Non-verbal, analogic, intuitive, synthetic, non-rational, holistic, concrete, spatical.

It is quite clear that the secondary school curriculum and educational system is designed to nourish and cultivate the left hemisphere while the other half of the brain of every student is neglected.

In the way that education is organised it is not well equipped to cultivate the right half of the brain which is not, after all, under verbal control. You cannot reason with it. It doesn't sequence things and is not good at categorising, analysing and abstracting salient characteristics. It *is* good with imagination, visualisation, intuition, spatial reasoning and perceptual skills. It is quick at seeing connections, overall patterns and structures, and tends towards divergent conclusions.

Educators do clearly value these skills and attributes, but have done little to develop them other than to hope that they would develop as a natural consequence of a training in verbal analytic skills.

While it may be true that half a brain is better than none it must be true that we are losing a vast proportion of our potential ability by ignoring the right side of the brain.

Design Education has the potential to nourish *both* sides of the brain; to have each hemisphere work in its specialised way at some times and at others, to have them working together in harness, each contributing their respective qualities to the total intellectual effort.

This complete range and complementary set of mental abilities, to which each hemisphere contributes, are vital to the development of a design capability and a designerly way of knowing. In designing, a person has selectively to be able to operate objectively and subjectively; to imagine and dream as well as analyse; to perceive and be sensitive to patterns, values and moral issues as well as fact and information; to think divergently as well as convergently when each is appropriate. In short design is necessarily a holistic activity which is broadly educational for those engaging in it.

It has further advantages in that it lays no claim to be a 'subject' in the sense of it being a 'form of knowledge' or even a field of knowledge; rather it is a process which uses knowledge operationally in the problem solving context. It is essentially therefore, an integrated, enquiry based learner centred and open ended form of education. It demands personal involvement and is likely therefore to have a more humanistic dimension to it making it far less external and alienating than other conventional forms of education. Nothing of the sense of the word *education* is lost if the word *design* is substituted for education.

The case for this type of education based on design activities has been well advanced in general by people like Professor Bruce Archer, Ken Baynes, and others.

The real effort in getting it launched however has gone into attaching it to what was Handicrafts, on the quite reasonable assumption that workshops and studios are ideal environments in which to locate problem solving activities. From the viewpoint of someone making the case for a general project centred curriculum development based on design, this may turn out to have been a tactical error.

The argument has taken place almost entirely around the need to bring Woodwork, Metalwork and Technical Drawing into the second half of the twentieth century, and to add some kind of intellectual component to these workshop activities. Because of their low status and emphasis on operational 'skills', these subjects had become the dumping ground of the school for those children who could not cope at all with the academic curriculum. Handicraft, or Technical Studies, therefore, needed to become a sound practical education with a broad intellectual rigour, creative opportunity and inventive challenge. Design education seemed to offer that very opportunity.

It must be said however that the teachers did not see it that way: neither did they embrace it. The principal Teacher Training Institutions were not prime movers of it either. In some respects they remain confused and ambivalent towards it even now, though they would not admit it.

The support for Design Education has come from the top rather than from the grass roots, the consequence of which has been the development of a strong rationale for the change but a distinct lack of understanding of the organisational and procedural problems that were likely to impede it.

By any standards, the aggregate of all the kinds of support this movement has had; from the DES, the Design Council, the Schools Council, LEA's, Royal College of Art, etc., during the great years of educational expansions, adds up to a massive campaign. Yet its effect has been minimal.

In most schools, Woodwork, Metalwork and Technical Drawing is taught much as before with an element of design added as a 'concession'.

The teachers, most of whom were trained as craftsmen, have found it difficult to embrace Design Education. Yet the fault does not lie with them; rather it lies with those who expected that they would.

The vast majority of craft teachers do not relate strongly to design. Their awareness of it is no more developed than any other 'lay person'. The assumption that a capability in craft leads to an appreciation or understanding of design is quite fallacious.

To be able to develop a curriculum subject properly and teach it effectively surely demands that people be suitably immersed in and initiated

into the whole area in question. They should feel themselves to be something of an authority on the subject and part of the academic community identified with it.

Because of their background, training and experience, they do not feel like this towards design. Neither, it must be said, do many of the Advisors, HMI's, lecturers and others who push the subject hard, yet have never been practitioners of it themselves. Few teachers imagine themselves to have the authority to teach design, so not surprisingly they are tentative. Though the numbers of pupils entering for Design, and Design & Technology exams is slowly increasing, they remain small in relation to those being entered for Woodwork, Metalwork and Technical Drawing (See Table 1 The Design Education Myth. C. Tipping. Studies in Design Education Craft and Technology, Volume 12, No. 2, 1980).

The process of changing from Handicraft to CDT has, in spite of the great mass of support it has had from the top, been so painful, slow and shambolic that the idea must be entertained that the overall strategy is seriously flawed in one or more respects.

The subject is now called *Craft Design & Technology*. In this there is an implicit assumption that these three belong naturally together. No-one seems to question whether they are compatible disciplines and whether there is any logic in the way the subject has developed.

Too little time and energy has been spent on any conceptual analysis which might have established what we understand by each of the three terms, and the ways in which they might interact in an educational situation.

The historical context in which the subject has developed is a crucial factor in determining attitudes and approaches to this form of education. The model of it which talks of design as problem *analysis* and *synthesis* and craft as problem *realisation* fails to understand how far away this conception is from the traditional understanding of the term craft. It is far too naive and simplistic to serve as a logical justification of the changes suggested.

This article makes an attempt at analysing the meaning, of the terms, *craft, design* and *technology* as they relate to common practice in schools and the shared understanding of the people who teach them.

We have progressed from Handicraft through Craft and Design to Craft, Design and Technology. Technology has come lately and appears even in the title to be something of a bolt-on extra. Whether this is fair or not we will try to establish later. First we will examine what is often presented as a strong, almost self evidence, relationship between design and craft.

As distinct but generalised activities, craft and design are at opposite ends of the pole in terms of the degree to which people engage in them. Craft is by nature a specialised human activity which has to be learned through a great deal of practice, and implies at least a minimum level of skill and standard of work. Few people therefore become craftsmen. In contrast, everyone is a designer to the extent that all people are decision makers and planners to some degree, in all aspects of their lives. Few people become professional designers, but everyone designs.

So where craft is highly specific, specialist and a skill to be acquired, design in contrast is a very generalised and natural human activity in which everyone engages.

This in itself does not make the two concepts incompatible but we are only interested at this point in differences. The way they interact and how they should be interpreted in the educational context is a further question.

Craft is not only specific to a select group of people, it is also usually to a *material*. We speak of woodworkers, leatherworkers, glass blowers, ceramists, etc. It can also be specific to a *process* like spinning, weaving, turning, carving, etc., or to a *product*, like violin maker, lacemaker, clogmaker, potter, wheelwright, cabinet maker, etc. It can also be a combination of some of these implying a greater degree of specificity. Wood turning and wood carving, are examples of this.

To this extent craft operates in a conceptually very restricted field with stictly defined limits. It means something much more specific than a general practical ability that would be useful in terms of design realisation. This needs to be a much broader notion. The orientation of craft is not towards problem solving at all but towards tradition and known practice. This is how it has been taught in schools and most colleges up to now and though perhaps more obscured this approach is still dominant. It is in the very nature of craft that this should be so.

In contrast to craft practice, design is not material specific at all; rather it is *problem specific*. It is dealing with theoretically new problems all the time and therefore does not operate within a defined field.

This is not to say that designers do not specialise in certain areas where they are likely to meet similar types of problems. But there is no *requirement* inherent in the concept that they should do so.

Design is a decision making process which is essentially open ended, broad and dynamic. It is an activity in which a person can be called upon to apply design thinking in areas where he is quite without prior knowledge, understanding or skill. In general it is most unlikely that he/she will be a craftsman at all. It is certainly not a prior requirement. (A designer-craftsman is a very special hybrid animal whose pedigree we'll examine later).

A professional designer, who has extended his natural design faculties to a greater degree than required for every day living, and has become an 'expert' in it, is an ideas man, brought in to look at situations, and to make recommendations in the light of all the information he can find which has any bearing on it. He is hired because of his width

of vision, his ability to handle large problems by breaking them down into smaller sub problems which are more manageable, and to employ certain design strategies and procedures in their solving. Designers are in all walks of life and are not restricted to the world of products and buildings. Company managers, are designers in much the same way as architects are. Only the content is different.

There is a sense in which it can be said that a craft has its own inherent design dimension to it. It is however highly specific to the craft in question and in the last analysis resides more in the practice and imperatives of the craft and its methodology than with any individual designer. The designer-craftsman is distinguished not so much by the problems that he solves, which are usually ones of a standard generic kind (such as seating; clay vessels; jewellery; etc.) but in the finesse and vision with which he introduces aesthetic qualities into his solution as he works. What perhaps marks him out from a designer without craft expertise is that these particular aesthetic factors arise because of his special understanding of the material and of the processes involved in working it. The designer-craftsman is thought of more as an artist than anything else, for his work tends to be fairly esoteric in kind and rather idiosyncratic.

Nevertheless this seems to be the only context in which the concepts of craft and design are mututally supportive. In any other situation they seem to be quite unrelated, even incompatible. The attitudes, supportive abilities, and the general approach towards them that each requires are entirely different and to a large extent antithetical to each other.

It is a logical absurdity therefore to claim that the generalised capabilities of design can be taught in the context of craft *as we understand it in schools*. The only time that craft and design as a joint subject can have any valid meaning is when the design element is clearly related to craft in question. This is the way most teachers have interpreted it and put it into practice and it seems the only way possible. But we must not imagine that we are doing much more than introducing a much needed intellectual component to craft, sharpening the aesthetic requirements of the outcome and fostering a greater visual awareness.

We cannot claim that we are fostering general problem solving capabilities, divergent strategies of thought or any of the other broad educational objectives which are associated with the general notion of design. The educational objectives associated with craft are quite different to those associated with design (other than that directly related to the craft), and they are also, in the main, mutually exclusive.

Let me be quite clear. I make no value distinction between craft or design. I wish only to point out that conceptually and procedurally they are radically different and that while the assumption persists that craft is the base on which to build Design Education, little progress will be made.

Indeed to have confused the aims of bringing so much needed improvement to Craft Education with that of trying to introduce a more holistic approach into the secondary curriculum based on design awareness, has proved fatal to both.

As far as the improvement to Craft Education is concerned, teachers have found themselves on a base of shifting sand and have become confused and very unsure about their objectives. Where they have used design only to extend the cognitive and affective aspects of the craft work in order to improve the educational value of doing it, there has been a significant improvement.

Where they have tried to 'piggy-back' a broader problem orientated design approach onto craft without a loosening of the commitment to craft practice, procedure and technique, in favour of a different kind of practical capability, the worst of both worlds have resulted; bad craft and bad design.

In the second case where the concern was for a move towards a more holistic education, to have attached the broad notion of design education to the Arts and to Craft Education in particular was enough to ensure that its effect upon the curriculum would be minimal and its impact neutralised. Design at once became unimportant and optional; part of the rag bag of subjects that are given low status, priority and reward. It would have little impact on the brighter pupils. It was seen to belong to a subject area. The implication of this was that it had nothing to do with others, particularly the 'important ones' like Maths, Science, History, English, Geography, etc.

If design does not belong exclusively with Technical Studies, Art or Science for that matter, neither does it have an exclusive place anywhere in the curriculum as specific content or knowledge. Rather it is a way of approaching all types of knowledge and applying it in all sorts of ways. It facilitates at the Secondary level the kind of learner centred education which IDE and Guided Discovery method facilitated at the Primary level.

The Design Council recently circularised a consultative document, 'Design Education at Secondary Level' (1979). The response to that document by the National Association of Head Teachers is interesting in this context. 'We believe that the concept of Design Education . . . should feature in our core curriculum, both because of its importance to our economic prosperity as an industrial nation and also because of the need for education for later life and non-work activities required by this coming generation of young people. We welcome the document in as much as it crosses departmental boundaries which we believe is much needed in Secondary Schools today. Having said this however, we do have reservations about the advisability of looking at Design Education as one single independent aspect of the curriculum, and would rather see it fully developed as an element of other subjects'.

Design Education then, if looked at as the broad holistic activity that we have described, would

become an agent of curricular change *in method* if it were implanted into the subject disciplines. It would enable the learner to become cognitively and affectively more personally involved in the subject through a more problem or project orientated approach. The extent to which this would allow or encourage workshop based activities to grow out of subject centred, but learner directed, project work is a further question.

The fact that the word design can mean either a plan for an intended artifact, the artifact itself or the process by which it comes into being, accounts for much of the misunderstanding about its meaning. While design education will certainly be concerning itself with plans, and products, its main educational claim lies in its value as a process and an activity rather than as content.

Technology on the other hand is 'content' rather than process and it can enter most academic subjects as an element of content. Its exclusivity to craft education, with a sideways glance at science, is an even greater absurdity than was the attachment of design to craft and will serve to ensure that it remains out of the mainstream of education if it stays this way. It has little or nothing to do with craft other than in very specific ways relating to the material and the techniques associated with it.

The relationship between design and technology on the other hand is extremely close and mutually dependent. One is process: the other content. There is a strong interactive relationship between society and its prevailing technology. Designing is the decision making process at the interface between society and technology. In this sense both design and technology are absolutely central to human affairs.

While technology draws a great deal of its reference from science, much of science has come about as a result of technological development. Neither one necessarily leads to the other, but clearly there is a relationship between them.

In developing teaching material around the concept of technology we have unfortunately gone the route of packaging instances of 'applied science' as modules of Technology. This helps us to teach things like Electronics, Mechanisms, Structures, and Hydraulics, etc., which is fine if we consider that to be desirable; it does little to develop the kind of mind which might one day generate new forms of technology.

The applied science approach to technology is, by its nature, knowledge centred and restricted to the scientific viewpoint. This bounds the concept far too much and tends to remove it from the context of creative design. It does little to promote creativity and the designerly way of thinking which is implicit in the objectives of Design Education.

The kind of technological creativity promoted by my colleague John Cave and illustrated in a series of articles in this magazine, retains its link with creative design. Though simple and 'low tech' it exemplifies all the concepts and principles that more expensive and 'high tech' equipment and theoretical material would demonstrate. Its very simplicity, cheapness and versatility makes it very flexible and adaptable. It enables it to be applied to work of a highly individual creative kind. The results are still able to be unpredictable, surprising and innovative in non scientific terms. Instead of becoming ossified as a fixed body of knowledge, technology taught in this way remains fresh, innovative, dynamic and free from any one form of knowledge.

It counters the idea suggested by the modular approach that technology is something that is separable from design context and human affairs, and that it is an extension of science.

Indeed in as much as design and technology are inextricably linked, technology belongs every bit as firmly within the Humanities as with Science and the Arts. While *'Language Across the Curriculum'* was a cry to free verbal communications from the context of English lessons alone, so *'Technology Across the Curriculum'* could suggest valid content for English, Environmental Studies, History, Science, Social Science Art & Maths.

Bronowski showed us through his television series and book, the Ascent of Man, how man's cultural development is punctuated, accented and indeed only facilitated by significant technological achievements, crucial to the next stage or phase in the evolution of civilisation and mankind. History, and archaeology particularly, makes constant reference to forms of technology as indicative of a way of living and an inferred set of cultural values, just as the social sciences of today infer prevailing norms, ideologies, values and habits from the technology of today. Consider any contemporary scrap heap for example. But technology and the design procedures that give rise to it, also illustrates prevailing concerns, even by its very non-existence at times. It often represents conflicting interests, compromises and moral dilemmas. Technology is almost always controversial and problematic and provides both the opportunity and the context in which pupils can deal with real controversial issues in a dynamic, evaluative, open ended and designerly way.

A curriculum development movement suggested by the idea of Technology Across the Curriculum is timely. We are now educating for an age which will be dominated by technology to the extent that it will alter social relationships and the way of life that we know. The human dimension to Technology is every bit as important if not more so, than the scientific facts that underlie it. A curriculum which made more effort to raise students' perceptions of technology and its effect would be very valuable in this respect.

If the concept of design and technology are released from their narrow association with craft and with science, they become agents for general change in curriculum content and organisation. They can provide a focus for study in all the disciplines which would help to relate the subjects more to the real world and current concerns, and

would create the situation in which a more problem based, learner centred education could operate.

Though this does not imply specialist teachers in CDT to teach in each discipline, since we all should be aware of developments in our subject and general interest area brought about by technological change, teachers with good backgrounds in Design and Technology might be key figures in this movement. They might be needed to act as 'consultants' across a wide range of subjects. The role of workshops and studios would also be crucial. They would have to provide 'Hands-on' practical experimentation, modelling and design realisation opportunities – whenever the situation demanded it.

If this strategy were adopted, and if it began to work in this way, the real value of practical education would become more apparent to everyone.

A study of 14 year old's attitudes to Technology and Industry, made for the Standing Conference on Science and Technology by Dr. Roy Page and Ms. Melanie Nash, shows that a curriculum which emphasises technology, project based science contact with Industry, etc., has direct as well as indirect pay-offs. As reported in the Guardian 23.10.80, it showed, for instance, that from schools with the most positive attitudes towards this kind of emphasis:

o All pupils either went on to Higher Education or obtained employment, in spite of being in areas of high unemployment (Employers apparently saw the value).

o Pupils were fascinated and excited by modern electronic and mechanical technology and became particularly disposed towards a career in these areas.

o Discipline in all the schools was good and pupils were stretched to their limits academically, with exam results well above the norm for 'ability intake'.

Curriculum innovation is however most resisted when it concerns change in attitude, or focus, in the fourth and fifth year examination work; and this is understandable. Many people would cite the examinations as the reason for not doing anything at all in this direction.

The situation, even in this respect, becomes dramatically altered once the pupils move into the sixth form. In a great many schools 6th form pupils are obliged to do some General Studies as an antidote to A level specialisation.

John Fairhall, Guardian 20.1.81 showed that General Studies, in a number of forms, accounts for a very significant part of the curriculum.

It has a great deal of general support from the teaching profession, and the mere fact that it is 6th Form work makes it high status. It has no rigid academic structure to be defended by subject 'priests'; no bureaucratic organisation barriers and systems of evaluation which might prevent it being open-ended, flexible and learner centred. There is no HMI with responsibility for it; no LEA advisors, and no courses in it at Teacher Training Establishments. There is however a General Studies Association, run by enthusiasts, which acts as a focus of enquiry for teachers who may have been landed the job of organising General Studies in their school; usually either a very junior, or very senior member of the staff. But as things stand, it is a form of curriculum development which is happening fairly organically within schools, and organised by the teachers themselves.

The point is however that it offers the teacher who believes in a designerly approach to education the ideal opportunity to take the lead in this area of 6th Form work. Through General Studies, these teachers might have a significant effect, of a kind already shown to be possible with fourteen year olds, on the very people who will one day be the leaders in all walks of life.

Such teachers might generate returns of a much greater order than if they had reserved all their effort for the single subject of CDT.

Most of these General Studies 'courses' are taught by teams of teachers drawn from the disciplines, the 'creative subjects' and subjects which already have an integrated approach, such as Environmental Studies, Rural Studies, Social Studies. Usually the timetable is unable to release the scientist and the mathematicians, but as I have already pointed out, design and technology draws heavily upon the Humanities as well as science and maths, though these could not be excluded obviously. A teacher with a good background in design and technology, who was able to apply his/her designerly approach to wider issues, could give a strong lead to a General Studies team, and ought to be in a position to know when a mathematical contribution, or a scientific interpretation was necessary, and to ask for it to be made available.

As argued before, this would make workshops and studios available as learning resources, thereby bringing back some high level 6th Form work into this area, and even in some cases, preventing their actual closure, which some schools are considering because of staff shortage. Workshops would be essential to this work, to provide the environment in which to make real the connections between practical problem solving (as opposed to craft) and the rest of the curriculum.

Some very fine people enter the profession to become teachers of CDT. Many have been designers or members of industrial project teams, or have similar valuable experience to offer. They embrace the philosophy of Design Education, as it is presented to them in the books and through their courses at College, because they can so easily appreciate how well it relates to the world of work and real life that they have just left to become teachers.

But they become frustrated and disillusioned by the reality of the situations they find themselves faced with in the schools. Daunted by the enormity of the problems associated with bringing about significant change, especially in attitudes, they leave the profession, or simply acquiesce.

An alternative strategy for them, and for many of the very fine teachers who are retraining in CDT, might actually be able to apply for a post of Head

of 6th Form Studies, or to suggest to the Headmaster that he creates a post like this for them. They might just find that this gives them far greater opportunity to teach design and technology in the most meaningful way than ever would have been possible from within the CDT department alone.

It might even work out that the influence such a teacher might exert at 6th Form level would begin to percolate down to other levels in the curriculum, eventually perhaps giving some semblance of reality to the notion of Technology Across the Curriculum.

Post-script

By way of a post-script to this article which tried to set out the relationship of design and technology to the development of a more holistic and humanistic curriculum, I feel that it is necessary to say something more about craft in education. The run of the argument did not leave room enough to take care of some of the implications for craft which arose, nor to explore the nature of some of the choices which might become available to teachers of CDT.

I tried to indicate that in broad general terms neither design nor technology is compatible with craft in the specific sense. I have also argued that design as an educational activity should not only pervade curriculum subjects as a form of holistic method, but also occur as a specific kind of practical activity in workshops and studios.

I also put forward the view in my article in Vol. 12, No. 2 of this magazine that it makes very little sense to try and teach the rigour and discipline of craft when children are young. Even in early adolescence they lack the necessary strength and control to achieve any level of skilful performance in crafts like Woodwork and Metalwork. Yet at age 11 or 12 they are in their prime as far as their imaginative and creative abilities are concerned.

All this may have left the impression that I would support the idea that crafts like Woodwork and Metalwork should be left out of the school curriculum. I definitely would not. Indeed I would argue for a strengthening of craft education and for a separate identity for it. I am not however suggesting that we return to the status quo that existed before the shotgun marriage between craft, design and technology was arranged. Mine is not a reactionary position and anyone looking for a justification of the old Handicraft will be disappointed. (I believe that the desire to find a reason to return to the 'old days' is known to be so strong that people in a position to influence the subject have been reticent about criticising recent developments for fear of being quoted as advocating this. Bandwagons are more difficult to get off than to mount).

What I am suggesting is while creative design activities should begin as early as possible in a child's education and should be seen as a proper extension of Primary method into the secondary curriculum, craft might be reserved for the senior years of schooling; offered as a special non-examination option in the 5th and 6th years.

In this context it would be offered as something special, challenging and intrinsically worthwhile. It could help to provide a balance in a student's work programme which might otherwise be exclusively academic. A commitment to a high standard in both design and workmanship ought to be demanded of anyone who opted to do it.

Teachers do it seems then have a number of choices open to them in terms of the way in which they wish to develop their subject and their personal contribution to it.

Some of those choices I have suggested in the above article; integrated design teams, 6th form General Studies, etc. But whatever happens in the wider school curriculum there are choices open to the teachers within a department to make changes in their own schemes in the light of this kind of analysis. Little need change except attitude.

The apparently radical move to take craft to the top end of the school and to establish its identity as distinct from Design and Technology requires only that the teachers redefine the nature of the design based practical activities that would replace it. This would enable Design and Technology to develop properly from the first year upwards, and provide a consistent and logical route to the Design and Technology exams. Then we might begin to see a dramatic improvement in the numbers of entrants for them, but not at the expense of craft education.