Putting Design in CDT

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Over the past decade or so, design and technology education has tended to become a 'design-led' activity replacing the older more craft centre approach. This has resulted both in a greater emphasis on the acquisition of design skills, and in a distinction between 'designing' on the one hand, and 'making' on the other. This is not to deny that design had a role in craft and technique centred approaches, since design considerations have always been at least implicity present. However, the explicit focusing upon design as a distinct activity has lent a new dynamic to CDT which promises to put the subject in the vanguard of curriculum development.

I propose to discuss some central aspects of the relationship between design as an activity, and the teaching of design in a CDT context, since I believe that this relationship exemplifies the role that pedagogic skills play in a design centred approach to CDT. I will conclude by attempting to place the 'design' element in CDT into a wider cultural perspective.

I

Design activity is frequently taken to be a kind of 'modelling' process, where the aim is to produce a (more or less) complete set of graphical, written, and other (such as a computer programme) specifications laying out in detail the function, construction, and performance of an artefact or system. I will call this modelling process 'M' (simply for convenience). A study of M may help to bring out some interesting general characteristics of design activity. M will be structured by the designer (or design team) who will employ what we can call a *design vocabulary* which will be drawn from a wider *design language*. It will be useful to distinguish between the design vocabulary employed by the individual designer or team, and the design language they draw upon (ie, in the same way that English is the wider language that individual English speakers draw upon). I will refer to this design vocabulary as D_v and the design language as L.

Having established this framework, I would suggest that we can distinguish in quite a general way, between *different levels* of design activity. Thus, at one level, a designer may simply be re-arranging elements in his/her D_v in order to produce a solution to a design problem. For example, an architect's design may be novel or creative only in the sense that it brings together a standardised set of components to suit the customer's requirements. Certainly, much designing amounts to no more than this.

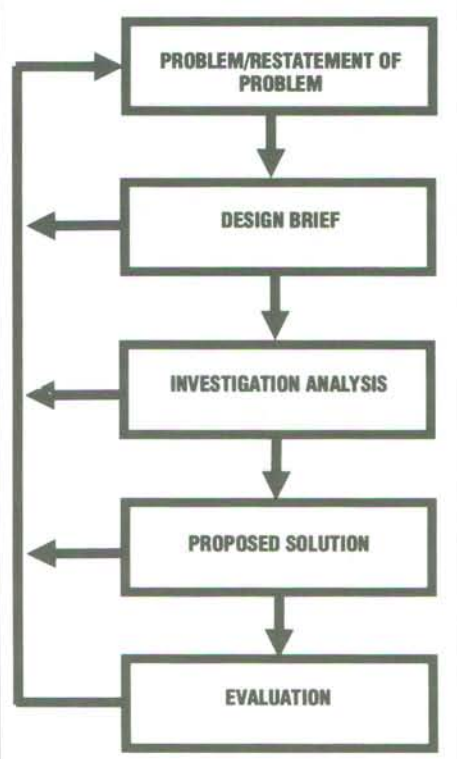
However, there is another level of ' design activity' which may involve the designer in the need to assimilate new data, or even new concepts, and thus *extend* his/her D_v. These 'new' elements may of course only be new to the individual, and may already be present in L. But nevertheless, they represent a genuine extending of the individual's D_v.

Beyond this we can identify yet another 'level', where designers may have to introduce *entirely new data or concepts into L* in order to provide an effective solution to some design problem. It is interesting to note that in this latter case, designers are forced to try to bring about an enrichment not merely of their D_v but also of L itself. There is a tension in L which is always present to some extent, and new design problems may increase this tension to the point where the need for enrichment of L becomes crucial. There is a close analogy between this situation, and the situation where students of design attain conceptual enrichment of their D_v; the 'creative leap' is similar in both cases. Identifying and characterising such crucial points is an interesting exercise for historians of design; and for teachers of design they represent points at which real growth in understanding may occur. Looked at another way, these are nodal points which represent the intersection of design as *a process*, with design as a *learning activity*.

The relationship between M, D_v, and L is an essentially dynamic one. It is the individual's grasp of D_v which facilitates development of M in a particular problem situation. But this grasp is itself a function of the wider design language L which in turn is contributed to by the total community of designers and other professionals working in the field of design.This leads to a consideration of the relationship between design as an activity, and the teaching of design. Fig. 1 illustrates what has become known in current jargon, as the 'design process'. It is fairly typical of the way in which design, as a problem solving activity is presented in many currently popular textbooks on designing in a CDT context. It aims to 'model' designing activity by illustrating in general terms what a given design solution M may do in specific cases. I will refer to this generalised 'model' of design activity as M_g. A closer consideration of M_g will allow us to unravel some of the complexities surrounding the pedagogic role of design teaching in CDT context.

We should note first of all, that although M_g allows for feedback between the main elements of the process, and so

Figure 1



introduces a corrective factor, it otherwise shows 'design' as a *linear progression* from problem to brief, to analysis and investigation, to solution and finally, to evaluation.

M_g is produced by designers — that is, those who already competent users of L and who have thus acquired a sophisticated D_v. What we should note here, is that M_g is really just *a convenient shorthand* for designers' 'methodology'. However, as reference to many textbooks on design in CDT will show, M_g is generally slotted into the pedagogic context without further ado, presumably because its advocators regard its role and effectiveness as a pedagogic tool to be self-evident. But is this really the case? What M_g actually attempts to do, is to lay out a sequence of steps in the 'design process' in a maximally perspicuous way. It is intended, one may suppose, to exhibit the logic of this process; and to designer's practical eye, this may well be the case. We can refer to this sequence as the *logical sequence* of M_g. The central pedagogic function of M_g must be to teach pupils to 'design' via this sequence. The most common approach to this is by way of examples. The pupil is given (say) sheets of paper with a number of empty 'boxes' each of which is labelled with the correct sequential step (eg. 'problem', 'analysis', 'investigation' etc.). The pupil learns the 'correct' response by filling in each box in the sequence, often simply copying the teacher (one reason for this approach may be that this layout is used by some examining boards).

Now the danger here, is that even if the logical sequence of M_g is thoroughly covered, pupils subjected to this (or variations of it) may actually be blocked from effective development of a D_v, or grasp of L. The reason for this, is that the logical sequence of M_g tends to mask the *conceptual structure* which underpins design activity.

I can illustrate this point by means of a simple analogy. The production of some artefact (a small box for example) will entail the preparation of the various pieces. We could list the sequence of operations — marking out to length — sawing — planing face side, face edge — gauging and planing to thickness etc. These processes would have to be gone through before undertaking further steps (such as marking out and cutting joints etc.). But the successive steps in the sequence are not by any means at the same level of difficulty, nor even are they neatly graded. For example, planing, which comes near the beginning of the sequence, is quite difficult, and the teacher wishing to develop these skills would avoid this, (ie, by giving the learner prepared wood). The point is, that the logical sequence of operations here is not mirrored by their level of difficulty. Careful teaching of such skills tends to bypass logical sequence in favour of a more carefully planned and structured sequence taking in orders of, and building on the learner's gradually developing skills (eg. only later will pupils actually do all their own materials preparation).

This 'level of difficulty' factor presents itself in all sorts of learning situations. Take, for example, geometry; Euclidean geometry is based on axioms (taken as self-evident) from which are constructed theorems which can be exemplified in various types of geometric constructions. We can regard this as a kind of conceptual 'hierarchy' with axioms representing the simplest components, and various theorems occupying intermediate positions in the hierarchy. Now the logical sequence of steps undertaken in constructing the development (say) of a truncated cylinder does not necessarily mirror the sequence, in *terms of order of difficulty*, of the geometric concepts which may need to be employed. In this case, careful teaching would involve the planning of a course which introduces these concepts in a way which would be structured to bypass the difficulties inherent in the logical sequence of steps 'appropos the development of the truncated cylinder.

We can refer to this structured 'teaching/learning sequence as the *conceptual sequence* in order to distinguish it from the logical sequence we've already noted, and we can now as a first step apply the results of this analysis to the generalised 'model' of the design process M_g. As might be expected, these is no reason to suppose that conceptual sequence mirrors logical sequence here, any more than in our earlier examples. Indeed, when we look at Fig. 1 we see that the first step includes a clear statement of the nature of the problem. But unless the pupil has acquired at least a workable D_v, then the significance of this may simply be passed by. Identifying problems and collecting relevant information may well be the first step to a designer, and may thus be considered as coming first in the *'logical sequence* through the design process. But it may have little bearing on the 'actual *conceptual sequence* the pupil needs to learn in order to make sense of the problem. Without some elaboration of underlying conceptual sequence, this is merely an exhortation, as is the whole of M_g. Indeed, I would suggest that M_g as typically presented in design textbooks cannot by itself serve as a suitable vehicle for the teaching of design.

Problem definition, analysis, and collection of relevant data, are all skills fairly well up the learning hierarchy. It is far sounder in the initial stages in the teaching of design, to get pupils to evaluate existing artefacts. This eliminates the more sophisticated conceptual elements — just as the more difficult elements in box making may be eliminated — at least while the learner is going through these early stages in the development of a D_v.

What M_g requires is careful scrutiny with the objective of arranging the relevant design skills in conceptual sequence. Thus verbal and written evaluation of familiar items will introduce pupils to the notion of analysis encapsulated in M_g, and also help to develop and consolidate note making and data collection skills. Items familiar to pupils and relevant to their interests are likely to be most effective; this helps them to establish meaningful evaluative criteria, and we can then take these as starting points from which to work towards more sophisticated conceptions of analysis.

Again, pupils as beginners in the discipline of design studies, tend to collapse 'investigation' into a proposed 'solution'. A frequent response to a conventional design brief, is for the pupil simply to produce a 'drawing' of the proposed artefact etc. We might say here, that all the investigatory stages are, in a sense, suppressed since, the pupil has not as yet developed a D_v rich enough to allow of the explicit laying out of those elements which could be called 'problem analysis', 'investigation' and so on; they remain buried in the pupil's initial 'drawings'.

Getting pupils to render these explicit in their design work can only be done by laying out the hierarchy of conceptual skills implicit in M_g — the conceptual sequence. As the learner works through this conceptual sequence, so the role and function of M_g should gradually became clearer. The resulting change, we might say, represents a subtle shift in the learner's viewpoint; the learner acquires the ability to *explicitly* articulate the concepts involved in the 'process' of designing.

This replacement of the logical sequence of M_g by a conceptual sequence appropriate to the needs of the learner yields what M_g alone cannot give. It holds out as it were, a conceptual ladder

via which the learner may ascend to view the design 'process' as a logical sequence (ie. as the designer has learned to see it), and consequently to make explicit use of it as a design tool.

As a conventional model of the design process, M_g also tends to suppress the often very different approaches required of differing design activities; it compresses a great diversity of activities into the same format. Focusing on conceptual sequence rather than logical sequence helps to free design activity from the constraints imposed by M_g; careful attention to conceptual sequence can help the learner to focus appropriately on the different levels of D_v, since these may impinge on the design process M_g at *any stage* — for example, the formation of the problem/brief may itself only be possible by extending the designer's D_v, as we have already noted.

II

I would like now to draw attention to an issue that relates closely to the above discussion. To possess a D_v which is rich enough to provide solutions to real design problems, the designer needs to able to do more than articulate the conceptual and logical sequence in M_g. The 'grammar' of the designer's D_v (and of design language L) needs enriching if it is to serve as an effective conceptual tool. That is to say, it needs enriching with just those elements which are most likely to slip through the net of the designer's D_v if we restrict our analysis to logical and conceptual sequence without some further consideration of how they interact with the wider vocabulary. I refer to those qualitative elements which might be described as aesthetic, psychological, social, and cultural, and which (although part of the vocabulary we all share) fall quite specifically within the designer's D_v and design language L.

These elements are difficult to give concise expression to, and their role in design activity is similarly difficult to assess (as, for example, is evidenced by the uneasy way they are tacked on to many current examination syllabuses). But failure to acknowledge their place in the vocabulary of design can lead to depressing results. Consider (for example) the failure of architects and planners to understand and appropriately articulate a design language adequate to model the total environment when developing post-was high-rise dwellings. The programme was flawed because of the acceptance of an impoverished design vocabulary; but this is a recurring tragedy in the history of design. There is an urgent need for designers, and those involved in design teaching, to develop models of a design vocabulary that will succeed in incorporating these qualitative factors.

This is a task for elaboration elsewhere, but some idea of its scope and nature may be indicated if we consider the conceptual framework within which the vocabulary of design (both D_v and L) takes shape. It draws its life from this wider framework; indeed it is inherently a part of this framework. We cannot fully understand the artefacts that surround us without referring to this wider cultural context. Yet design in CDT is frequently presented without reference to this context; the characterising of design as merely a 'problem solving' activity in response to some immediately perceived 'need' is both narrow and artificial, and leaves out of account the very factors which link design activity to this wider cultural context.

The result is akin to seeing an automobile as merely the 'solution' to the 'problem' of providing personal transport from A to B. It may be this, but it is certainly many other things besides — an expression of status, of individuality, a sex symbol etc. — and no designer who failed to take this wider cultural context into account could expect to stay in business for long.

This problem arises in part, because conventional analysis of the vocabulary of design in models of the design process we have been referring to, tends to *compartmentalise its elements*. Thus, for example, 'form', 'function', 'style', 'aesthetic', 'economic' etc. are identified as elements which are then taken as independent free- standing concepts with a life of their own. Now while some such method of analysis may well be useful in explicating the notion of a design vocabulary, it is disastrous to imbue such elements with this kind of autonomy.[1] They only properly attain meaning by virtue of their relationship to one another; they form an inherently holistic network. An acknowledgement and understanding of this holism should be a fundamental starting point, both in our analysis of the vocabulary of design, and also in our teaching of design.

It is worth bearing in mind that pupils, when coming to a study of design under the auspices of CDT, generally bring with them an intimate sense of the function, form, image, style, and fashion of a wide range of artefacts, particulary those which are targeted at them by advertising of various kinds. They are to some extent users of the vocabulary which surrounds and defines these artefacts, just as they are users of the wider vocabulary of their natural language, of which this 'implicit' D_v forms a part. And, just as they can be users of a natural language (such as English) without being able to explicitly formulate its grammatical 'rules', so they may be able to use this implicit D_v (think for example of the 'street' jargon of style) without being able to formulate explicit 'rules' for its employment.

Looked at in this way, the teaching of design becomes in part, a teasing out of the relationship between this 'implicit' design awareness, and the more explicit 'rules' of a fully articulated design language L.

We may be inclined to dismiss this 'implicit' design awareness factor as simply the resultant of commercial manipulation; but we should also bear in mind that introducing pupils to an impoverished critique of the design process via M_g might itself fragment, or even destroy, their own grasp of the natural grammar of design. This would indeed be a tragedy.

1 *Books on 'basic' design popular in the 1960s aimed at 'deconstructing' the vocabulary of design into foundational elements such as 'shape' 'form' 'colour' etc. and treated them in ways which suggest this kind of autonomy. A typical example is* Basic Design *by Maurice De Sausmarez*

