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# A Critique of the Design Process

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My experience as a practising CDT teacher spans fifteen years — a period of rapid development during which the notion of ‘the design process’ has remained central to the teaching of CDT. The idea is that there exists a systematic ‘design process’ and that such a process can be learnt by pupils and subsequently applied to solve particular problems of design. The purpose of this article is to examine this notion.

First let us consider two cases where pupils may be said to have engaged in ‘successful’ design. Pupil A was a sixteen-year-old girl whose experience with the original choice of topic for her final project in the ‘CDT: Design and Communication’ course had come to nothing. However, I discovered that she was interested in looking after hamsters in the Science department and that in her spare time she had been attempting to improve their environment by redesigning their ‘home’ which included making models of objects for them to play with. I suggested she might consider continuing with these experiments as part of her coursework for the CDT examination. Her reaction was positive and resulted in the successful design of a new ‘home’ and the construction of play objects for hamsters.

By comparing pupil A’s process of designing with the generally recognised stages of ‘the design process’: Problem — Research — Development of Ideas — Making — Evaluating, it is possible to identify a number of discrepancies. This pupil’s experience of designing came as a result of an interest, or an opportunity to pursue an interest. She developed her first ideas in cardboard models, tested them out with the hamsters, modified them and remade them from plastic (they thought the cardboard models were food!) and then retested them. During this process she gradually formulated her own specific design brief and generated her own ideas. The communication of her ideas graphically and the gradual formulation of a brief evolved ‘naturally’ as it were. The concepts of ‘problem’ and ‘solution’ did not seem to be helpful tools

in organising her ‘design’ experience. It is true that the identification of a problem in this case could have been the hamsters’ ‘home’. However, this problem had been considered some time before by a member of the Science department who had solved that problem by constructing the current hamster ‘home’. In other words, this ‘solution’ was also a ‘problem’.

What has changed is the perspective from which the situation is viewed. Context is dynamic and non-linear — problem and solution may coincide; linear models may therefore be inappropriate. A cyclical model may be more realistic since it suggests greater flexibility. Pupil A’s design experience, rather than being a step by step systematic approach, revealed a more complex interaction between some of the ‘design process’ stages.

Pupil B was a sixteen-year-old boy who took and passed the ‘O’ level Technology course between the years 1983 and 1985. He had become interested in learning about computer control and decided to pursue this interest by constructing a model of a crane which he could operate using his own computer programme.

When he had overcome some initial design problems and completed his initial construction of the crane, he began his testing procedure. This highlighted further design problems, the main one being the rotation of the turntable. Initially he thought that a single geared DC motor would operate the turntable successfully, but in the end he made several modifications before finally deciding upon stepper motors which gave him the precise control he wanted. During this process of investigation/evaluation and modification of ideas he was also teaching himself more advanced programming skills which would enable his crane to simulate more complicated manoeuvres.

The time spent in learning the necessary programming skills and modifying the crane meant that the meccano model had to be his final ‘solution’. As the weeks

passed he had been spending most of his time building his model, only doing the minimum of communication of his ideas on paper. I had been concerned because I knew that the assessment procedure was formulated around the stages of ‘the design process’, marks being allotted accordingly. Being aware of how well motivated and engrossed this pupil was in his work, and of how much and how quickly he was learning, I felt that to have tried to enforce a rigid procedure for satisfying assessment criteria might have been counter-productive. However, I insisted during the last few weeks of the course that he prepare notes and sketches in a manner acceptable for examination assessment.

Both case studies are typical examples of CDT design projects I have been involved with over the years. While it has to be agreed that some pupils follow a process model inflexibly, many others do not, often changing their minds and making modifications and improvements in a seemingly ‘ad hoc’ manner. Although many of the stages of the design process used by pupils A and B corresponded with those common to many of the models portrayed in CDT literature, their appearance in the projects seemed to be more complex. Indeed, some of the authors of the CDT literature that I examined (none of whose models are precisely alike) do acknowledge that their models are simplifications of the process of designing.

A small survey I conducted into how heads of CDT departments use the design process models, strongly indicated that many of their staff and they themselves follow the stages of the models and expect their pupils to learn them.<sup>1</sup> However, from my own experience of working with CDT colleagues, I am aware that in practice some teachers do interpret these models as being simplifications of design processes, and use them more flexibly as a structure for teaching CDT.

Writers of CDT ‘official’ guidelines and criteria aimed at teacher education have, over the years, expressed in progressively

strong terms the notion of general areas of design skills. In 1979 the DES referred to these as 'seldom achieved in isolation';<sup>2</sup> in 1983 their expression was 'It is the quality of the pupils' unified experience of designing, making, testing and evaluating that is of fundamental importance rather than any ability he or she may acquire in a specific competency'.<sup>3</sup> More recently the AACDT said 'CDT is an holistic activity-based subject that integrates cognitive and manipulative skills through designing, making and evaluating'.<sup>4</sup> It seems, therefore, that the thinking is moving towards broader concepts.

When I examined the question — How effective is the use of the design process model in learning the skills, knowledge and desirable attitudes associated with CDT? (as portrayed in the statements above) — my attempts to match CDT learning experiences with discrete stages common to various design process models were unsuccessful.<sup>5</sup> While it was possible to identify some of the skills and attitudes relating strongly to specific stages (for example it is highly likely that a pupil will experience manipulation during the making stage), it was impossible to pair up many other skills and attitudes with specific stages. Materials can, for example, be manipulated during investigation, solution and modification stages. The skill — discussion — as a means of communication is likely to percolate throughout the design experience, particularly in a group exercise. The same applies, for example, to discriminating, evaluating, observing, commitment and determination. (This is consistent with the 1979 DES statement that 'CDT is more concerned with the development of desirable attitudes than with an end result or with the acquisition or the retention of a body of knowledge'.)<sup>6</sup> In particular, it seems evaluation cannot be reduced to a single stage which comes at the end of the design activity; it is systemic and all-pervasive — how could we progress otherwise?

Designing is a creative activity. Attempts to equate design with science have been

unsuccessful due to the ineffable ingredient of craft knowledge gained through non-scientific experience. Ryle's concept of 'knowing how', like Polangi's 'tacit knowing', cannot be made explicit. It is only 'knowing that' which can be made explicit and formulated into rules. They argue that since 'knowing how' and 'knowing that' are mutually exclusive and interfere with one another, knowledge of the explicit rules of design can actually inhibit practice.<sup>7</sup> Since designing involves making decisions and judgements to bring about change from the existing to the new and uncertain situation, following rules is inappropriate. It is contradictory, then, to suggest that one can be creative by following or learning rules.

But while the concept of design is developing, as already shown, CDT teaching is still hampered by current GCSE assessment procedures. Although pupils at this level are encouraged to identify and tackle problems themselves, there is a tendency for what should be a creative experience to be diluted by attempts to satisfy the assessment criteria (hence the 'artificial' means by which I ensured that pupil B gained appropriate reward for his coursework). The case studies indicate that some pupils, given teacher guidance and encouragement, can develop their individual process of designing, and it ought to be subsequently possible to develop a more valid means of assessment which gives due credit to the development of their design skills and achievements.

Would we, as CDT teachers, not be better employed focusing our attention for assessment purposes on the characteristics of the learning experience, rather than attempting to satisfy stages of 'a design process'? One possible way of doing this would be to replace the notion of 'stages' (which implies a particular order) with 'aspects' of designing. This would still provide us with the necessary structure to aid learning while shifting the emphasis towards the development of individual pupil profiles.

In the foundation years where the context of a design experience is often provided

by the teacher, I would suggest that design briefs need to be rigorously articulated to identify the possible/probable design skills learnt from each experience. This would facilitate pupil-orientated assessment, contribute to the preparation of further teaching packages, and provide some opportunity for continuity, progression, reinforcement and differentiation through the age and ability range. The 'aspects' of designing would provide the essential framework for lower school work.

It is unlikely that 'a' or 'the design process' exists, and that even if it did, the learning of a systematic approach to designing would assist pupils in developing the necessary skills for solving particular problems of design. Instead, a more flexible framework based on 'aspects' of designing, adopted to assist in developing the skills, attitudes and knowledge associated with CDT, may encourage teachers and pupils to concentrate their thoughts and efforts towards the design activity itself while providing the essential structure to aid and monitor progress. At the same time, exam boards and assessors should adopt a more pedagogical approach to monitoring and recording pupils' progress in designing in CDT.

## References

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