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# The Design and Make Task (DMT): some reflections on designing in schools

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## Abstract

*This paper is based on the assertion that the initial phases of the design process in many schools has become a stylised ritual more to do with the production of endless sheets of over decorated artwork than efficient or effective design. This is juxtaposed with the requirements of the new Design and Make Tasks (DMTs). The resulting discussion centres on the opportunities the DMTs offer to look at the way Technology is taught.*

*Points discussed include:*

- *How the asserted 'ritual' of designing has arisen in many schools.*
  - *That childrens' design 'research' should be planned, appropriate, and of value.*
  - *That ideas should be generated and developed efficiently and effectively through appropriate modelling. Inappropriate modelling, such as the use of detailed drawings and colour in initial idea generation, should not be encouraged.*
  - *That children should be helped to reflect on their design work and share experiences in order to gain from the learning potential within the design process.*
  - *That informal groupwork should be used more frequently to assist in the generation and development of ideas*
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## Introduction

Experience visiting many schools across the country leads this writer to an uncomfortable conclusion: that aspects of designing in many schools have become a stylised ritual. This ritual consists of encouraging children to follow an apparently fixed design line, more particularly to produce endless visually attractive 'design sheets': complex borders are used and all drawings worked to a high quality (often after the design process is completed). This is neither efficient nor effective design. This article aims to take this assertion and juxtapose it with the imposition of the new DMTs. The position taken is that this is an opportunity to look at the way Technology is taught.

Firstly the assertion of a 'stylised ritual' is examined. Secondly some aspects of teaching Technology through DMTs are discussed. This is done by asking how this ritual appears to have arisen; examining what a DMT is; and then discussing what existing research in the area of project work can teach us.

### How did designing become a ritual in many schools?

The genesis is obscure and certainly pre-dates National Curriculum Design and Technology. It appears to centre on an incomplete understanding of the process of designing and the functions of modelling, particularly drawing.

The purpose of the design activity is the development of *outcomes* of various types. It should be our aim to show children how to do this efficiently and effectively. The design process is a tool: a means to an end. It should not become an end in itself. Yet many teachers appear to have turned the process of design into an 'art' form divorced from its primary function: they appear to emphasise the visual presentation of the design activity over the primary function of generating and developing ideas.

Modelling is the essential 'tool' of design. This paper focuses on physical rather than cognitive models. The range and applications of these models have been described elsewhere (for example Evans 1992) but could be summarised as a range of techniques intended to externalise ideas enabling manipulation and in some cases facilitating communication. These range from rapid sketches to pictorial presentations and engineering assembly drawings. Other techniques include three dimensional models ranging from simple 'lash-ups' of specific aspects to whole presentation models. Models may employ scale and use various materials to simulate the intended forms. Other models are mathematical and/or computer based. The essential function of any model, however, is only its value in developing design ideas. Most models are used only by the designer or design team and are of no interest to the client, though they are to the teacher as an indication of the child's thinking. Some

models are specifically intended as communications to clients at any particular stage. These models are typically the finely worked presentation drawing or model.

The culture of schools values 'finished' and attractive work in all subjects. Design teachers rightly want to display childrens' work; colourful and carefully done work is preferred. In contrast the initial stages of efficient and effective design work require the rapid development of ideas, using the most appropriate methods of modelling such as rapid sketches and lash-up 3D models. This work does not need to be any more detailed or carefully done than is necessary to advance thinking. Many children, however, appear unable to accept rough sketches and lash-ups and spend time re-working them to a 'better' standard. This re-working in no way contributes to the process of design: by wasting time it lowers efficiency; by slowing the exploration of ideas it lowers effectiveness.

Developing this point further, children are often shown the work of professional designers and exhibitions such as degree shows. This is potentially very valuable educational practice. However, presentation drawings and final models tend to be noticed more than initial drawings and models. Children learn inappropriate concepts of designing through this unconscious agenda.

We arrive at a situation in which 'the design process' may become a ritual. Firstly a disproportionate amount of time is spent in 'research' which is often no more than the collection of catalogue cuttings. This 'research' (more correctly, information acquisition and collation) is often seen by children as a sequential step in designing; done at the start only. Children should be helped to develop a plan of what they need to look for and have some means of analysing their findings. Research is an activity which is constantly called into play throughout any design process as elements of need are recognised.

Moving to the process of idea generation, design sheets are often overworked with colour, detail and copious neatly written notes. This slows the process at the very point where ideas need to be fixed and manipulated with speed. It is common to see 'design sheets' obviously produced after the initial stages have been completed and probably based on earlier sketches which have been discarded. This is not to say that well worked drawings or quality drawing at any stage is not important, it is a question of when such drawing is necessary.

The original National Curriculum Design and Technology Order (1990) has added to this apparent

confusion. They sensibly call for children to experience design mainly in a holistic form. However, the multitude of outcomes required (artifacts, systems and environments to be produced in five different contexts: ie 15 combinations) has been translated, by teachers who often report being confused, into confusing schemes of work. Evidence for this comes from a wide range of personal contacts with teachers and to some degree from HMI (1992) who considered only '59%' of KS3 Design and Technology lessons as satisfactory or better. They observed that AT1 was causing 'confusion' and teachers were often insisting that pupils spend too much time on written work. Teachers appeared to presume that the four ATs (identifying needs and opportunities; generating a design; planning and making; evaluating) required equal time. They reported that projects had often become 'model orientated' and that these were difficult for pupils to evaluate. The HMI report does not use the term 'model' accurately; by definition any design output will be a model even if realised in the intended materials at full scale - what is more properly termed a prototype. The point being made by HMI is that children are not taking designing through to such prototyping and because of this they are not able to properly evaluate design work.

### What is a DMT?

The Proposals (1992) suggest that the main means of delivering PoSs should be DMTs. These should be '*set in a context that allows pupils to appreciate the significance of their work*' (p3) and they should be orientated about '*good quality products*'. The range of named contexts and outcomes is removed, but teachers are specifically required to focus DMTs on certain areas of the PoSs: control (pneumatics/mechanics; control (electronics); structures; food; textiles and four 'supplementary' at Key Stage 3 (ages 11-14).

Many teachers may be alarmed at this apparent rigid requirement but despite the narrow focus it does mean that teachers have specific objectives. Delivery will be principally via DMTs; ie project work, which teachers are well used to. The word 'principal' means that other means are allowable. The use of short 'inputs' of various forms and at various times could be very efficient in getting over various aspects of the PoS. Specific amounts of time for DMTs are not given, allowing teachers more flexibility to react to matters such as progression in childrens' abilities to manage project work.

DMTs have two functions: teaching and assessment/evaluation. Looking at assessment, the Proposals suggest two ATs: Designing and Making. It is

recognised that making requires more time and is, therefore, weighted at 60%. This may help teachers limit the paper-chase of 'design sheets'. As a vehicle for teaching the DMT still assumes a great deal. It presumes that it is possible to 'teach' through holistic project work and that the integration of the multitude of knowledge and skills within such work is straightforward for teacher and children. Similarly there are assumptions on differentiation of abilities and backgrounds. These questions will be addressed below.

## Discussion

The APU (1991) showed that children did more work in short, test conditions than in regular project work. This may appear to have little relevance to day to day teaching and DMTs. If we relate this to the design process, however, we may see opportunities for teaching strategies. Certain stages of design could be approached more efficiently and possibly more effectively by limiting the time available for them and making this clear to children. For example, aspects of research and idea generation could be made into tightly limited exercises. This may appear to limit creative potential but in fact it may do exactly the opposite by encouraging children to use more appropriate design strategies such as rapid modelling and drawing rather than over-worked techniques. Encouraging speed in getting down ideas may help children to juxtapose ideas and so encourage efficiency and effectiveness.

Efficiency and effectiveness may also be developed in these contexts by techniques such as the use of informal groupwork in the initial stages. This and the use of short deadlines can also promote motivation and possibly the generation of ideas (Denton 1992).

Many teachers attempt to gain as much time in design lessons by starting project work immediately and then finishing a lesson with only the time to quickly clear the workshop. Teachers may appreciate the value of reflection but many are not practising it. At the start of a lesson a few minutes reflection on the previous lesson can have value in 'bridging' key points. Clear objectives should be set as much as is possible. Lessons should end with enough time to clear away and still have five to ten minutes of sharing experiences and reflection. Project work is, by its nature, individual. We lose opportunities to learn from each other by failing to explicitly share and reflect.

Again the above may appear counter-productive in that it loses valuable working time, but it may help by improving the quality of the learning and design

experience. Parallels can be drawn with the CASE project (Adey, et al. 1990) which looked at science project work. This showed the importance of reflection and bridging. It also showed the value for 'cognitive conflict', that is the presentation of ideas to children in such a way that they sometimes conflict with existing concepts and promote thought. We could use cognitive conflict in reflection by carefully chosen questions which make children think about what they are doing.

An example of this may be in helping children integrate aspects of any design process. The NC Technology Proposals suggests we teach via holistic work but this assumes that children can integrate the various aspects of the work or the cognitive skills required. Some may assume that holistic approaches are integrative by definition but this is not so. Hesketh et al (1989) indicated this and pointed out that teachers need to be explicit in attempting to integrate aspects of learning.

To some extent NC requirements appear to present a dichotomy between open ended projects and the structured acquisition of knowledge but this need not be the case. As indicated above DMTs are not the exclusive method of teaching Technology. The use of more formally structured teaching such as the old Control Technology (1975) courses could be used specifically to develop the knowledge base. These could lead into DMT type exercises which exploit that knowledge and reinforce it. Effective reflection, lead by teachers, can be used to integrate existing learning with new knowledge. Similarly we can now break away from the misconception of work 'starting' at AT 1 (generating ideas). It may be more appropriate to start by evaluating something in order to make proposals on how it may be made better.

HMI (1992) observed that the most successful Design and Technology was where staff planned work together but work was taught separately by specialist teachers. HMI do not indicate why this should be so. It may be a reflection on staff confidence and competence within their specialism. It does, however, indicate that many teachers have attempted to manage and teach through open ended projects which may take children far beyond staff experience. In theory there is nothing wrong with the principle of joint exploration: teacher and children together. In practice such techniques demand a great deal of all parties and require careful development of design skills. DMTs are going to be more focussed. This may help many teachers and children though it does open the depressing prospect of design work which only explores well understood territory and does not

equip children to venture beyond their immediate experience. One of the principles of design teaching should be helping children realise what they need to know and develop the skills to research appropriately. These are high level skills and need to be thought of in relation to long term progression. If each DMT had areas, small at first, which were not covered by staff 'inputs' but required 'research' children could progress in this aspect.

### Conclusions and some points for teachers and examiners

The DMTs and particularly their focussed nature, may offer us a useful guide in developing better structured learning contexts. There are two areas to consider:

- a. The nature of the design process itself and particularly the development of effective and efficient design ability; this is performance orientated.
- b. The use of the design process as a teaching/ learning experience; this is pedagogically orientated.

We should be able to handle the 'dichotomy' of gaining specific knowledge against open ended project work. We should attempt strategies, some of which are suggested above, to focus childrens' attention on various aspects of design work and particularly the recognition of the need for effective use of time.

Childrens' 'research' should be planned, appropriate, and of value rather than simply pre-design pasted-up catalogue sheets. Ideas should be generated and developed through appropriate modelling and drawing which should be rewarded. Inappropriate modelling, such as the use of detailed drawings and colour in initial idea generation, should be discouraged. Similarly examiners and those interviewing for higher education need to look beyond the overall impact of a design sheet to the quality of the ideas beneath rather than just at the quality of the images used to convey them. The ability to produce high quality images is important and must be taught and rewarded but we must never lose sight of the range of modelling options open to us or the need to develop their use in appropriate ways.

Finally we must help children to reflect on their design work and share experiences in order to gain from the learning potential within the design process. This takes time and considerable teaching skill but failure to do this restricts childrens learning to immediate personal experience and then only at a superficial level.

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