Problem Setting in D&T — a Personal View

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Achieving a balance between closed tasks in which pupils learn skills and more open-ended tasks in which pupils may design their own problems can be difficult; a new approach, John Durrell argues, might be the solution

Though there appears to be little research done in the area of problem setting in D&T, there do seem to be two distinctive methods of approach. Traditionally there is the 'handicraft method' which suggests that learning is skills based, and where each child produces an identical artefact and is usually taken through the skills of making that artefact in a step-by-step manner. The end result is normally a number of practical pieces of work all rigidly assessed on the criteria of how well the child has followed the teacher's plan. This method, as it is relies on very basic learning, may be little more than learning by rote. In contrast, the second method is a 'first principle' approach. This is where children are working from the need to solve specific problems, perhaps generating the problem themselves, designing a solution, and using craft skills as a means to an end rather than as an end in themselves.

These views are extreme ends of the spectrum. Some may want to argue that the step-by-step approach should only be used initially to acquaint children with tools and processes to give them a better understanding of the possibilities in construction techniques. When designing and facing problems from first principle, the child needs to be literate in constructional techniques and therefore be able to design with constructional literacy. The danger here, of course, is that the child may fail to link constructional techniques with first principle problem solving, or may have failed at first principle problem solving because of the lack of constructional literacy. This is clearly a dilemma.

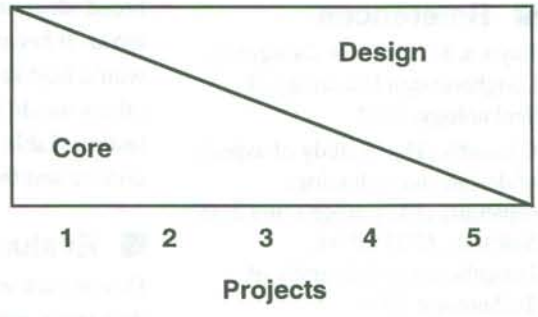
A core-based approach

Learning within D&T needs to be staged so that children are given problems to solve at a level with which they can cope. We do not normally find high diving being taught before the person can swim, yet we do tend to find D&T problems being set to children who have not been given sufficient experience in designing/making skills to allow them to solve such problems successfully. An intermediate approach, which is evident in some schools, moves the children in a structured framework which is aimed towards the ultimate goal of children being able to work from first principles. This method I would call 'core based'. Here the child is given part of a problem already solved, which forms a core; for younger children, for example, this could be a simple string puppet where the child would be given the basic construction and then asked to design the character by decorating and clothing the puppet. The child may also be asked to work in collaboration with others to write a play including the puppet as a character, and then to produce a theatre in which to stage the play.

Solutions to this type of problem can be complex or simple and can marry into and build upon the level of existing constructional literacy with an assurance of success implicit in a well designed 'core'. As the child becomes literate in both the designing process and in constructional techniques, the given core can diminish (as shown in the diagram).

Many children appear to enjoy working in the practical D&T workshop environment and the 'core based' approach encourages this. It can introduce children to making skills in the building of the 'core'. Simultaneously, the design process is begun in the problem-solving part of the project, which allows children to design using, as designer, the armoury of constructional skills learnt from the core.

Although the problem-solving process needs considerable monitoring, particularly for children who are acquiring designing skills, this 'core based' approach allows the teacher to monitor design work within the problem-solving aspect of the project while the children are engaged and motivated in the practical skills acquisition stage — the 'core'.



Core — as children gain in expertise the core is diminished
Design — as the core diminishes the child's design input increases until the children are able to generate their own problem to be solved.

It is the aim of this approach that ultimately the child will have acquired sufficient design and make skills from core-based projects to generating his or her own problems to solve, and thus become an autonomous learner, armed

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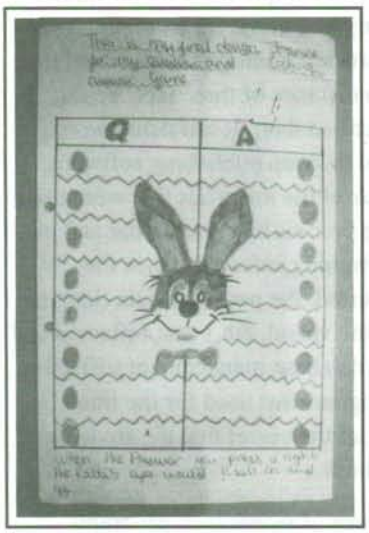
with the practical design and make skills to solve, make, test and evaluate the problem which has been initiated.

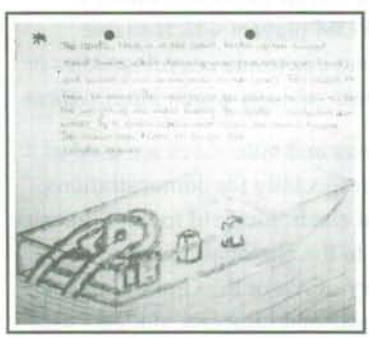


Some examples of 'core based' projects

Question and answer games

Children were asked to build a container (the core) to hold a Question and Answer game. While the children were working on the skills involved in making the container, they were simultaneously asked to build a game, to fit the following design criteria: it should be played by two children while on a long journey, and fit into the container; when the question is answered correctly, a light comes on. The emphasis of their design problem was to ensure that the child answering did not just get the correct answer by memorising the circuit positions. The circuit must be able to be easily altered to overcome this. The game was also required to have a theme.

With this approach, children can be involved in workshop activities, while also being engaged in design work. The children's designs can be monitored by the teacher before they are acted upon. At the same time an armoury of constructive skills and constructional design literacy is being built up by the child.



Boat — a double-barrelled core

In this task the children are asked to design the hull of a boat. This could be material based, i.e. to teach plastic skills such as vacuum forming. In the example shown, working in sheet metal with the use of developments, was the main constructional skill.

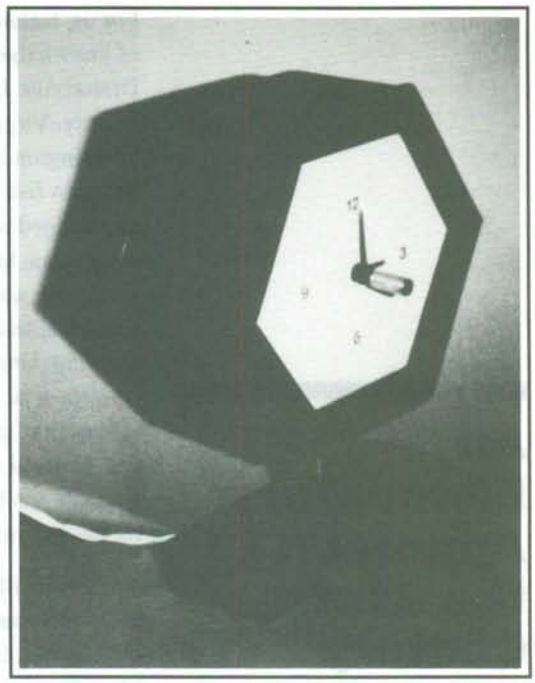
While working on the hull, the second part of the problem (which would need careful task setting and monitoring by the teacher), is for the children to design a means to power the boat.

Two approaches to boat design

Clock Project

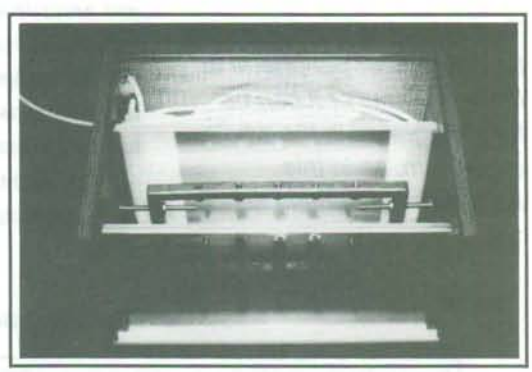
With this task, the core is now diminishing, relying on much more design work from the child. The project could be set after children have built up a range of constructional literacy from previous 'core base' projects.

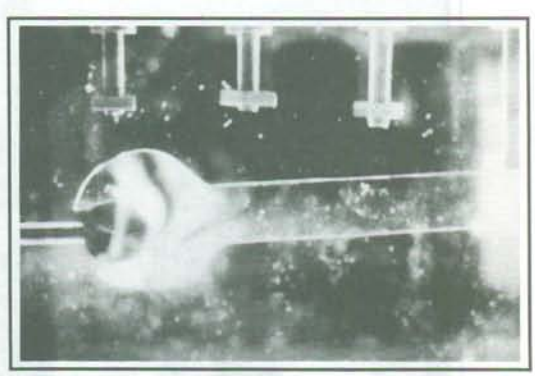
The core for the clock project was the clock mechanism. The children had to find their own context for the clock and to then develop their own design brief, after initial research. The amount of design input and problem definition is much greater, with the core input being correspondingly smaller.



Photostress Analyser

The Photostress Analyser was a project where the child identified the problem: the need to test shapes for stress. After identifying the problem, the child had to design, make, test and evaluate a successful solution based upon the previous experience gained with earlier 'core based' projects.





The photostress analyser and a picture in action

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