

The Design of Design Problems

The title of this article is an absolute nonsense. How can a problem be designed? Asking children to 'design' when the only introduction to this complex process has been rudimentary sketching techniques is even more absurd. How many children have been asked what they would like to make by a Craft, Design and Technology teacher, only to hear their idea is 'impossible' or 'beyond your capabilities'? It is universally accepted by CDT teachers that the teaching of skills involving the use of tools and equipment is an essential part of a scheme of work, yet teaching designing skills is often neglected and in some cases ignored completely. If your children are introduced to the design process through carefully 'designed' projects then eventually they are able to recognise problems, write their own design briefs and of course solve them. Once the framework of the design process is firmly established in the pupils' minds it gives them the opportunity to explore and develop their creative abilities. Children of all abilities should be given the opportunity to make design decisions, the least able can do this more successfully within a design framework. More able children will find a design framework gives them the platform from which they can jump into problem solving situations confidently. A well planned scheme of work in CDT during the early years of secondary education or even earlier can introduce the process by using and experiencing it through projects, carefully planned well designed projects.

A second justification for the title can be found on analysing many of the 'O' level and CSE syllabuses with a CDT title. The inclusion of a coursework assessment as part of the examination gives credit, or otherwise, to the projects completed in the fourth and fifth years. If this is desirable then so too is the teacher's responsibility in ensuring that projects set as part of the teaching produce responses which do justice to the pupils. Ill-conceived design briefs at this stage can be counter-productive both to the pupils' learning experience and of course their final coursework mark in a public examination. Returning to the CDT teachers' question of 'What do you want to make?' surely in the latter part of a stimulating course in design or technology the majority of pupils should be able to recognise a need and write an appropriate design brief. Some may need prompting, or even direction, but these should be the minority.

As the design process is established in the minds of CDT teachers, it seems reasonable that it could be used to help solve the problems of 'a project for the third year' or a scheme of work for 'first years on a roundabout system'. It can be applied in the following way —

1) The Brief

Design a design problem for a group of twenty children aged twelve with approximately 1½ hours per week in a multi-media school workshop.

2) Research

This can be considered as a question and answer situation. For children learning the design process the questions may be

- a) What part of the design process is to be emphasised during the project?
- b) What previous work has been covered by the children concerning
 - i) design skills?
 - ii) graphic skills?
 - iii) practical or realisation skills?
 - iv) evaluation skills?
- c) Has the previous work concentrated on
 - i) Technology?
 - ii) problem solving?
 - iii) aesthetic development?
- d) What level of ability pupil is the project to be designed for?

The answers to questions of this type will give an indication of the area of the design process needing an introduction or perhaps a familiar area requiring reinforcement. Such answers lead towards the next stage of the design process.

3) The Specification

This is rather like formulating the aims of a project, that is, a statement of what the project is intended to teach the children. For example:

The project is used to introduce the children to working in acrylic with a particular emphasis on:

- a) Using the colours and smooth texture of the material in an environment appropriate for its use.
- b) Explore the aesthetic qualities of the material.
- c) Explore the working properties of the material such as:
 - i) bending and forming using heat
 - ii) fabricating using solvent adhesive.

4) Ideas Generation

This must be the most difficult part of solving the problem. The preliminaries lead into this stage of the process and should prove to be a stimulus. There are many methods of generating ideas but ultimately the best projects for children come out of some particular need. If this is the case consider the material needs of a twelve year old throughout the day. Draw up an outline of a daily routine and at each stage examine it in detail.

Getting up, washing, breakfast, cleaning teeth, dressing.

Collecting requirements for the school day.

Transport to school, time, carrying equipment.

Equipment required during lessons, sports equipment, books, pencils, etc.

Lunch time activities.

After school activities.

Returning home, preparing food, eating food.

Homework, hobbies.

A similar list could be produced for a weekend day or a day on holiday.

This detailed analysis can throw up a suitable project. A traditional but worthwhile project could be the storage of a dressing gown in an individual's room. Answer — a coat hook, but for an eleven year old this could be a realistic problem involving realistic research into —
 the decorations in the room
 correct height from the floor
 attachment to the wall or door
 size of loop on the dressing gown.

All these points involve genuine research for the pupil and the number of valid solutions are numerous, so an old problem becomes a sound design exercise for an eleven year old.

5) Development

The development stage of designing projects involves considering how the project will be introduced to the children. Looking at the organisation in the workshop, the materials and the equipment required. One major difficulty facing teachers in the more traditional workshops is the provision for design activity. One solution may be to remove vices from part of the bench space and provide a clean surface for the children to work on their designing.

Designing can be a practical activity and during the development of a project modelling in card, plasticine, plasticard or even clay can be considered as alternatives or additions to sketching ideas.

6) Realisation

For the teacher this will be preparing for the teaching. Work-sheets are very useful when dealing with mixed ability groups so their preparation would come under this heading, as would preparation of OHP sheets, graphic materials and of course the three dimensional material to be used in the project.

7) Evaluation

This would be the teacher's own assessment of the project which is easily done by giving answers to questions such as —

- Did the children complete the project?
- Was the ability of the most able children in the group exploited to the full?
- How did the least able children cope with the project?

The following is an example of a project developed using the system outlined above.

Age of children — 12 — second year of a comprehensive school.

Mixed Ability

Previous 'designing' experience — sketching techniques, representing 3D objects, using coloured crayon, research into logos used by companies.

Previous 'making' experience — cutting, shaping, gluing and polishing acrylic. Cutting, shaping and finishing timber. Use of drilling machine. Use of coping saw.

Situation — A CDT lesson followed by a Home Economics lesson within a department co-operating with each others' projects.

Design Brief

Biscuits can be made to look attractive to young children by their shape and surface patterns. Design and make a kitchen tool which will mark out the shape and put a decorative pattern on the surface of rolled out, uncooked biscuit mixture.

Of course a professional designer has more to offer than just a knowledge of the design process, he has an ability to create which can only be developed through practice. The teacher practising using the design process to produce sound design briefs for children can also develop techniques and creative skills which can best be described as 'wrinkles'.

For example, a design brief can be given a theme

Design a badge to be worn by people attending ONE of the following —

a) a BMX rally

OR

b) a roller-disco

OR

c) a holiday investigating the sea shore

This type of project would give the opportunity to develop graphics skills but in each case the theme gives the pupil an area of research. Backed by a resource of pictures and possibly questions such as —

What does BMX stand for?

What are the particular features of a BMX bicycle? — the pupil is given direction and can move into the 'designing' confidently.

A second example of this approach is — Design an exciting and stimulating game for children between the ages of 8 and 12, using one of the following as the theme —

a) Go-Kart championships

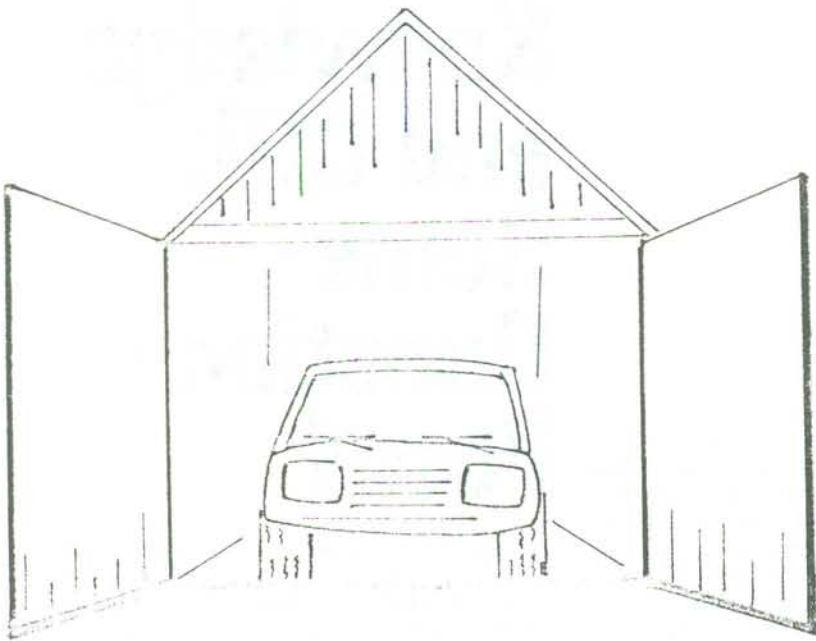
OR

b) Fell walking

OR

c) Gymnastics

Choosing themes attractive to children is the 'wrinkle' however, a greater sophistication is required for projects suitable for fourth and fifth year pupils pursuing examination courses. Examination syllabuses can be a restraint but the rules of designing can still apply with one addition. A CDT teacher may need to structure a brief tightly to suit a syllabus item or alternatively give several choices within its broad outline. By making a small addition to the wording of a design brief the whole problem can be altered to create new areas of research and a new range of solutions. This addition could be said to 'add mileage' to a problem. The following brief is an old problem with very limited solutions, in fact it is probably more of a craft problem than a design brief.



The diagram shows a garage with the doors in the open position. Design a device to hold the doors in the open position so the car can be driven out on windy days when there is a risk of the doors blowing shut.

Added mileage versions could be —

a) The owner of the car has a back ailment preventing him/her bending

OR

b) Design a system of converting this type of door to a powered system of opening and closing (this gives the problem a more technological flavour)

OR

c) Design a system of opening and closing the doors by an automatic system triggered by the car driver (the problem now takes on an electronic flavour).

Problems b and c would have to be realised as models but this does not detract from the validity of the problem.

The following is a fourth or fifth year problem with four methods of adding mileage and so making it a suitable problem to be set to a group to consolidate the design process.

Design a target game which involves one of the following —

a) moving targets

OR

b) automatic resetting of the targets

OR

c) a scoring system

OR

d) a remote resetting of the targets.

This very wide brief provides opportunity for pupils to choose the type of target game followed by an instruction into an area of research. It is a varied problem suitable for a range of abilities and the solutions are numerous. After realisation a genuine evaluation can be carried out.

Finally, if we look at the Design Council's definition of design — 'To design is to prescribe some form, structure, pattern or arrangement for a proposed thing, system or event', — it is clear that applying the process to 'designing design briefs' is valid and should provide children in schools with better, varied and well planned design briefs for their work in Craft, Design and Technology.

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