# From T.D. to technology or ... Does Design and Communication have a future?

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In the HMI publication 'Design and Communication' Her Majesty's Inspectorate states that there have been significant changes in CDT Design and Realization and CDT Technology in recent years ... *"But there has been less curriculum development in courses such as Technical Drawing, Geometrical and Engineering Drawing and Graphical Communication, and there is often still a wide gap between the courses that have been mounted in schools and the requirements of CDT Design and Communication"*. This 1987 publication then progressed to detail possible coursework illustrating likely outcomes of D&C activity. It did this in light of the demands of that year and showed how D&C could be a powerful agent for curriculum development.

In the changed environment of 1989 (just two years!) and ... having adjusted to the demands of GCSE ... !!! ? we are now preparing to confront a new set of problems, these being the proposals for National Curriculum, and in particular, the details of possible Technological activities which our children will be expected to undertake during the next few years.

This article seeks to address these requirements and proposes a model for classroom activity within a CDT complex which responds to them. It shows that D&C can become more than a third runner, and looks forward to the development of it as a powerful force within the new agglomerate of Technology subjects.

**One subject or three?**
But will there still be Design and Communication when the proposals are implemented at key stage three in 1990 or examined/assessed in year 11 in 1995? after all the Design and Technology Working Party final report talks of *'avoiding the plethora of course titles and content currently available'*. Although we are lead to believe that the GCSE will become one final attainment target for key stage 4 the National Curriculum Councils report 'Technology 5-16 in the National Curriculum' states that *The council welcomes the broad approach to GCSE in design and technology but considers that the relationship of this to examinations in existing contributory subjects will need further consideration. SEAC proposes to consider the extent to which it will be necessary to revise subject criteria and to develop new criteria for design and technology with additional dimensions"*.

**What does this mean?**
What this actually will mean is difficult, as yet, to predict. But, judging from the reports from the D&T Working Party and the NCC. It would appear likely that the criteria will be generalist rather than specific. This would certainly have to be the case if HE, A&D, CDT, BS and IT students are all to eventually sit a GCSE examination in Technology. A consensus taken from a random selection of 'informed' opinion appears currently to favour the notion of a technology certificate which is linked to the particular area of study perhaps this will be a GCSE in Technology (CDT) or Technology (A&D), etc. Extending this argument, one could surmise that any CDT examination syllabus will allow for a wide and varied pupil involvement, one in which D&C could offer a significant range of classroom activities.

D&C is, after all, capable of adapting easily to the study of the design of 'artifacts', 'systems' and 'environments' as illustrated in the 1987 HMI report. It can further provide pupils with challenging opportunities within the four NCC Programmes of Study, by:-

1 Developing and using systems
2 Working with materials
3 Developing and communicating ideas and
4 Satisfying human needs.

**Why D and C?**
The significant difference between Design and Communication and the other two CDT's is, has George Hicks (Staff Inspector, CDT) stated in a schools TV programme some while ago, that *'D&C is not bound by the constraints of the workshop but is free to look more widely for their subjects of study"*. This implies that D&C can operate within a much wider range of contexts. It can do this without the loss of the essential 'design and make' aspect of CDT but, at the same time, it can engage the pupils in a different level of designing with many advantages.

**Teaching strategies**
There are a number of possible methods which teachers can employ in designing NC coursework.

**Class work**
Class work, or "Focused Tasks" as the Design and Technology Working Party refer to them in their final report, can be built around separate activities, each designed to illustrate and explore a single topic from the syllabus. Sometimes this may be the only way to include a particular item in the given time. Therefore, short, sharp tasks will remain a valuable teaching tool. Single topics of this kind, however, do not appear to fit easily within the concept of design centred activity which appears to be the model of NC Technology. Further, it is SEAC's view that *"standard assessment tasks will be based on the longer tasks undertaken in the summer term at the end of each key stage"*.

These *'longer'* tasks could perhaps be differentiated into two forms, which could be referred to as 'Integrated' or 'Extended' projects.

**Integrated projects**
Integrated topics could involve a number of the criteria listed in the programmes of study. If you are teaching D&C at the present time you are probably already running this kind of activity for GCSE and are aware that project work of this type can combine many syllabus items into one integrated activity.

**Project designers**
In this sort of D&C project pupils can be engaged in the role of consultant designer

to good effect. They can be involved within the context of the study of separate artifacts, environments or systems as many teachers are already doing. From this standpoint, design work will generate material which will meet many of the requirements of the NC.

If, for instance, a class were working on the design of a new hand torch they could be involved in a number of relevant activities. They would embrace a full range of exercises throughout process in line with AT's 1, 2, 3 and 4 as proposed by the D&T Working Party. This implies *'Identifying needs and opportunities, generating a design proposal, planning, making and appraising'*

Apart from a careful analysis of the perceived need, of the primary and secondary functions which the product must perform it could also include the exploration and investigation of existing products, making cutaway drawings and explosions to show what is going on inside them. Or drawing graphs to compare the size or price of goods found in the shops. Market research could easily be undertaken to establish preferences, the findings could be charted in an appropriate fashion.

**Model making**
Making sketches and models of new designs often progresses from working with easily shaped materials such as card, foam, plaster or papier-mache to work with more rigid materials, most usually MDF or perhaps Jelutong. this is used to produce a 'Block Model'. Although this is no more than a solid piece of material and does not 'work' in the strictest sense it does involve the pupils in "working with materials" and producing fine finishes which helps them to realize *"that the making of quality products is important"* (NCC Report 4.4).

Model making of this type is about manufacturing a number of separate components, these are best painted, decorated and finished before they are assembled into the final artefact. This involves considerable planning and work scheduling which can easily be documented to meet the NC requirements relating to work organisation.

Formal drawings and colour renderings are often best used in these projects to present design alternatives once the main features have been established on the model. Drawing then can be used to illustrate design variations, changes of colour scheme for instance. As such, they often fit easily into the evaluation stage of the project rather than being solely the tools of idea generation.

Working drawings are also an essential part of this design process. They often need to come at the end of a D&C product design project where they can be used to accurately describe the proposal to a prospective client or manufacturer. In this way the general assembly drawing and the renderings are used to explore and explain the details of the design in same manner as a consultant product designer would.

Too often in CDT working drawings are seen by children to be barriers erected by teachers to prevent them from getting on with the making activity. In the craft tradition, which has dominated much school workshop activity to date, there can often be no real need for formal working drawings. After all, craft workers have little need to communicate with themselves. But a product designer, on the other hand, does have to explain detailed information to the manufacturer/client and so has to use a formal engineering drawing in accordance with BS 308 and all that implies.

**Product graphics**
This design activity can also be easily linked to the graphics elements of product design which could mean working on product logos, or ideograms and pictograms for control panel icons. It could also involve the production of technical literature, the assembly and operating instructions being obvious possibilities.

This approach can be adopted with almost any type of design related to a consumer product, be it a hair dryer, record player, radio or calculator. Work on redesigning of any of these items would involve a similar set of classroom activities.

When we compare this range of work with the requirements of the NC we discover that we have included items from across most of the programmes of study.

We have not however encountered much activity which could be considered as 'Developing and using systems'. There are also many other areas of the NC check list which this product could encompass if we considered it as an Extended rather than a integrated project.

**Extended projects**
The range of work encompassed within one project could be organised to include a majority of a NC programme of study at levels 8, 9 or 10. So that with one, two or perhaps three well chosen projects undertaken in the fourth and fifth years the complete programme of study could be taught. Further, this work would appear to offer scope for work with other departments from within the school in the search for meaningful cross curricular activity.

**Aesthetics**
Rather than relying on the rather glib 'I like it, it looks good' studies of aesthetics which many of us have engaged in in our CDT project work the D&C Product Design approach allows the study of style in consumer goods. Pupils are well aware of the subtle messages (or the semiotics) which product designers and advertisers build into their products. This sort of project allows us to explore and debate these issues. We can borrow here from the work of Peter Green "Design Education, Problem Solving and Visual Experience" (Batsford 1976) and make some meaningful studies of visual prejudices.

This work can provide a sound link with Art and Design departments who might like to adapt the study, knowing that it could be a method of developing the childrens' aesthetic awareness, as well as being a meaningful piece of NC course work.

**Energy**
The extended product design approach could involve making greater use of the investigation and research stages of the design activity. The touch design project for instance could also include the study of the sources of the energy supplied by the batteries. The question where does the energy come from? would involve drawing an energy flow chart and a chance to debate the issue from a realistic standpoint.

If the science department were able to co-operate, they might also be interested in the exploration of the question as to how this energy might best be used? This work could engage the pupils in a series of simple experiments to see which type of cell really does last longer. Does the Duracel battery fulfils its advertised promise? Do large batteries contain more energy? Which is the most cost effective?

Setting up and interpretating these tests could not only help to explain the illusive nature of energy but it would also involve the children in drawing all manner of graphs, charts and diagrams to explain their findings.

 

**Electronics 1**
It could also embrace the use of simple electronic circuits, which are realistic items to use in such tests. An LDR could be used to detect the dimming of the bulb, a multi-vibrator circuit to switch the circuit on and off in a test to see if switching or continuous running effects the life of particular type of battery. A relay circuit could be made to switch off an electronic clock when the battery output falls below an acceptable limit.

**Mechanisms**
A study of switching the torch on and off could also give rise to work on miniature mechanisms such as levers and cams (which might be better studied by making large scale models). This work might look at the control system and develop ways of preventing the torch from being wrongly switched on in the daylight by making it respond to more than one input.

**Electronics 2**
The exploration of secondary functions might give rise to the question "What else could it do?" This might mean working with electronic circuits to explore flashing lights for a warning device or sound generating circuits for a personal torch/alarm. These could be explained on a large display panel which forms part of the 'other' course work. This could be used to indicate the function of each component and show how a miniaturised version would work in the actual torch.

**Materials and components**
Designers have to select suitable materials and manufacturing processes for the production of the product. If your pupils were to explore the design features of existing torches they would soon discover that changes of parts are the major design features in many products. Joint lines are important, separate parts allow the introduction of additional colours. This form of detail is best established with an appreciation of the most likely manufacturing processes. It therefore, becomes necessary to investigate injection moulding, extrusion, die casting, etc in what would appear to be a potentially meaningful context. The pupils do not have to gain a detailed understanding of these processes but would need to see the importance of the components and appreciate the ways in which they fit together. This kind of study could also explore the uses of different materials in existing product, pupils could note changes from one substance to another, postulate reasons for this and so widen their appreciation of materials science.

**Structures**
The structural properties of the manufactured item is also an important consideration, a comparison of frame and shell structures can be explored by analyzing the products in structural terms. The position of joint lines and their relationship to the forces which are placed upon them can also be undertaken at this time.

**Business and economics**
Working with components could lead naturally onto a study of factory assembly. Industrial activity can be discussed and the business context explored within a Business Studies environment. Here, flow charts would need to be drawn to conduct a systems analysis of local firms. The links between component suppliers and this manufacture could be explored. Warehousing and distribution systems would need to be understood and detailed.

Designing a new small manufacturing company to make a new torch would also mean having to itemize each stage of the manufacturing and distribution processes for a simple product and so involve the children in the design of their own system. The relationship between price and cost could be established as marketing and sales policies are developed. Visits could be made to local companies or industrial personnel might be brought into the classroom to discuss points of interest.

**Health and safety**
Health and safety practices and regulations could then be summarized and debated in the context of the new designs.

**Packaging**
The product packaging could involve all manner of cardboard engineering. The old TD standards of solid geometry and measurement become important issues, as well as links with the Maths Department.

Graphic Design would be necessary for the design of the pack. This could be either D&C or A&D work.

**Energy 2**
If it were undertaken by the art department either you, or science, could explore a new series of problems, because packaging is more than graphics, it could also involve a study of energy. If we drop a prototype moulding in a box onto various surfaces from a number of different heights are we studying pack design or dealing with potential energy? If we look at the secondary packaging inside the box which supports the product are we exploring properties of materials or energy absorption?

**Displays**
Displays are good examples of simple frame or shell structures where everyday lightweight materials such as card and string are used as struts and ties. Display designers build beams and cantilevers which support the product in a prominent (and often structurally difficult) position. In this activity structural design can be introduced and explored in a manner which integrates it into the overall study as opposed to seeing it as a disconnected set of lessons as is current practice.

**The computer**
Throughout this article I have carefully omitted any reference to computing and to the ways in which the computer could be used in this kind of work. If we have sufficient numbers of screens in our classroom to allow reasonable class access and are able to run good *professional* quality software, (which is not, as yet, a very usual combination but one which new NC funding could rectify it if applied wisely). Then we can envisage many ways in which the computer can help us improve our presentation, manipulate or display data, catalogue addresses or simply write a report. These machines are also good at helping us to organise and manipulate graphic images which can be used in packaging or producing professional quality data sheets and display materials.

We can produce our working drawings on the screen which allows us to change and adjust our details and produce records of each step in the process. There are also a number of 3D modelling packages on 16 and 32 bit machines which will seriously involve our students in the appreciation and manipulation of the properties of a design proposal and it will enable them to change and record their design decisions in a manner that has no precedent in traditional practice. All work which will generate class activity in line with the proposed IT attainment target.

**Conclusion**
This article describes a model of a project which includes every item which could be expected to appear on any CDT NC programme of study, but I am not advocating that one project should be taught throughout the fourth and fifth year. I have, however, used a single theme in this illustration because it makes the argument easier to develop.

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