

Technology Order — first impressions of the revised proposals

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Background & context

When Vic Green took up his post as Technology supremo at the DES (now DFE) he brought to the task a particular set of strengths and weaknesses. On the credit side he was universally regarded as a 'nice chap' and a canny politician. On the debit side he was (and still is) a scientist — and I have yet to meet a scientist that really understands and respects the subtlety and significance of the designing activity. In very short order he was passed the hottest of political potatoes as the radical 1989 Technology Order came under fire. I do not have space here to analyse the sources of that fire, though much of it was specious and partial and some of it well-meaning. The central question for this paper is how the revised Order measures up to the original. How is it different and are the changes for the better?

Overview

Inevitably perhaps, the outcome of the revision is a careful political compromise — between the radical 1989 Order and the reactionary pressure groups seeking change. It is a less imaginative, less designerly, less entrepreneurial, less intellectual, less challenging Order. It is a more straightforward, more constrained, more scientific, more precise and hence a more safe Order.

The original Order inspired the literati of design and technology and frustrated or confused many more. The revised Order has been written as a blueprint for journeyman and apprentices. It will probably raise the general level of performance — but it will by the same token lower the sights of those who understood the original.

Attainment Targets and Statements of Attainment

The two attainment targets demonstrate the compromise quite clearly. On the one hand they retain the *active* designing/making core of D & T. The scale of this victory should not go unrecognised — for there were many who were arguing for a knowledge-based AT to enable us to test what pupils know (as opposed to what they can do with what they know). This would, in the medium term, have been the end of D & T as we know it. A knowledge-based AT would sooner or later have become the major focus of testing

(because its easy to test) and the active designing/making would have become marginalised. The revision group stepped back from the brink of this precipice and retained the active ethos of the original. They are to be commended. Being able to recite Ohm's Law is still no substitute for being able to use it effectively as an aid to designing.

On the other hand there is no doubt that this core of designing/making has become far more constrained. There is, for example, a greatly reduced awareness of the notion of a user or client. All designing must of necessity have a recipient — even when that recipient is only ourselves. The original Order placed emphasis on understanding the needs and values that the client holds in order to design more appropriately for them. This notion has — largely — disappeared to be replaced by a bald emphasis on products and outcomes. The 'needs' of 'users' do not now explicitly exist until level 5 — though the imaginative teacher will be able to read them in from the start. The danger we must all beware of in this new regime is the old (and we remembered) scenario of solutions looking around for problems. Modular Technology programmes in the 1970's developed this *modus operandi* to a fine art. Pupils could be relied upon to generate alarms — and buzzers — and flashers — bleepers all controlled to switch themselves on and off with ingenious systems. The systems were of course stock 'answers' from the book (multivibrating circuits I remember causing some interest). The challenge for these pupils did not lie in finding solution, there were dozens of them lying around. The challenge lay rather in defining the problem in such a way that they were able to use their favourite stock answer. It was very like British car design of the same period; based on the ethic that users should be grateful to get the inspired products we choose to give them. It took the Japanese in the 1980's to show that good car design starts by understanding the values and needs of the user.

We had a concept car (inspiring but not very practical); we now have a Morris Marina. I imagine the Engineering Council will love it.

Another difficulty in the ATs is the clear result of the conflation of the four originals into the two new ones (essentially the old 1 & 2 become 'designing' and the old 3 & 4 become 'making'). This is no sense of iteration between the origination and the evaluation of

ideas in designing. The APU data proved beyond all doubt that a pupil who is able to reflect critically on their developing ideas is far more likely to derive a successful outcome than one who is not. Evaluation and origination are the two faces of successful designing. Again the imaginative teacher may be able to read this in to the new ATs, but far more will be able to ignore this central fact of designerly behaviour, restricting their 'evaluation' to dealing with judgements about the outcome — by which time its all too late anyway!

Technological balance

D & T properly lies at the interface of Science and Art and a well balanced technological programme would be drawing from both. I welcome therefore the references to both the Science and Art Orders in the new Technology Order. But I also recognise a significant bias towards science, moving the centre of gravity of the subject too far towards an 'applied science' version of technology. The PoS categories demonstrate this shift; including 'construction' materials, components, control systems, energy, structures, ...and eliminating graphic media entirely except as a means for the 2D exploration of ideas that will subsequently become 3D.

The PoS categories (and the specified tasks that flow from them) again remind me of the old Modular Technology courses. Oliver and Boyd are back in business when I had hoped they would be well past their 'sell-by' date.

Looking forward

It is important to see educational change as a long term exercise. Where would we want to be in ten year's time, and will this new Order get us there? I just wish the two Orders had come the other way round; this one in 1989, and the 1989 one for 1994 (when the new Order will come into effect).

The 1989 Order was radical, too radical for many teachers who found it very difficult to interpret into their own immediate experience. For these teachers, this new Order will appear a welcome blast of precision and clarity. But it is the clarity of the rule-book and when we have all learnt and understood the rules, I predict we shall look back with longing to the open vistas of opportunity offered by the 1989 edition.

■ John Hanson

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Sitting on Christmas day reading through Technology for ages 5 to 16, December 1992 I get the feeling that I am participating in the establishment of a DfE tradition which may grow to rival turkey and Christmas trees. Publishing major documents on education during holidays and distributing them through the Christmas post or to schools closed for weeks may seem perverse to some but a more benign view would appreciate their attempts to enliven these empty and useless times away from school.

Leaping with one bound out of the depth of philosophy I can say that I feel pleased after my first and fairly detailed read through of this document. The double folding page arrangement of each Key Stage section makes it easy to look at the levels for AT 1 and 2 and compare the details in the core programmes of study and then to open out the flaps and look at the supporting PoS in Business and Industrial Practices, Structures, Control Systems and Energy, Construction Materials and Components and Food. The inclusion of an example of a Design and Making Task (DMT) for each Key Stage helps to illustrate the details. The use of two of these sheets containing two levels each for KS 3 and 4 also helps to clearly illustrate the expected progression. The outer front sheet of each of these sections clearly describes the materials the pupils should use in each Key Stage and the number of DMT's that the pupils should do during the Key Stage.

What then do I welcome in this revised document. I am delighted to find the emphasis on electronics and control technology from KS 2 onwards. The requirement at KS2, level 5 'to use IT to control their product through sequenced commands' legitimates the best of primary practice in control technology and the requirement to use integrated circuits and logic gates at KS 3, level 7 should ensure that all pupils will have some experience of electronics. Hopefully this rewrite may last into the 21 century (only eight more years or so till 1st January 2001) and the pupils who experience its effects will live well into next century. I am only sorry that it will be possible for some pupils who may be the brightest in our schools to minimise their experience of electronics and control by opting for a short course at KS 4.

I am also pleased by the renewed emphasis on drawing as a means of communication for AT 1 and on measuring and checking in AT 2. I like the early introduction of mechanics at KS 1 and the Business and Industrial Practices at KS 3 and 4 which seems to focus more rigorously now on the activities associated with production industries rather than the wider concerns of business in general. I am very glad that pupils taking a short course at KS 4 cannot avoid the work on business and industrial practices.

What are the worries produced by this document. Home economics is one. The food work included in this document is welcome even if the slant seems to be rather more scientific than I am used to. (To my amazement nobody at the Christmas parties I have attended knew what a triangle test was but many were greatly impressed by the word ORGANOLEPTIC.)

Paragraph 64 of the report says '...we recognise that some work with food ...and other aspects of home economics, ..., sit outside the D&T curriculum' It would have been more helpful if a statement about where in the currently crowded curriculum they do sit had been included.

I am concerned by the poverty of expertise in electronics, IT and control technology in schools. This is still the area with the largest demand for INSET from teachers and with the demise of funding for advisory teachers it is increasingly badly supported. Manufacturers of pneumatics kits and electronic components will also welcome this seasonal present as few schools are equipped to deliver these to all KS 3 pupils. I hope that the provision of workshops and equipment is not allowed to provide an excuse for constraining the enthusiasms and abilities of pupils to explore technology.

I also have a number of questions that I would like to have clarified. What provisions are there for future changes in technology to be incorporated into school work? At what point does a knowledge of fibre optics need to be introduced and would Hall effect sensors be more appropriate than reed switches at some time in the future? Is it possible for individuals and groups to come up with DMT's and get them approved by SEAC/NCC so that a bank of tasks of a set standard is available or is everyone on their own?

This is a much needed revision and it has produced a workable solution that can be used in schools. During the consultation period much discussion and hopefully clarification will go on but we must avoid the narrow sectional interests indulging in special pleading and the factional infighting that has done so much to damage technology in the past. When this document becomes the final orders we must get down to involving all technology teachers in establishing a high quality subject in schools which can develop into the next century.

■ Alan Pritchard

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First impressions are always very important, and often quite hard to change. The new proposals for Technology have left favourable impressions with me. I hope that these are not to be undermined as the consultation period progresses and the new orders are finally shaped and delivered to schools.

If teachers in Key Stages 1 and 2 were in need of a simplification of the requirements, then it seems that they may have had their needs identified and, to a large extent, met. This is not to say that D & T work in the primary years is to be in some way marginalised. Throughout the years of compulsory schooling all children will work on a range of 'Design and Make Tasks' (DMTs), which will ensure that all pupils will: design and make, (both of these activities are seen as central to the whole process); work with construction materials and components; work with control systems and energy; work with food, though not at Key Stage 1; and also experience work with business and industrial practices, though not until Key Stage 3.

The DMTs are set out in what appears to be a fairly prescriptive way. This might not rest easily with some teachers, but it seems a reasonable way of ensuring coverage of the wide area of work contained in the document. For example, during Key Stage 2, (four school years), pupils will be expected to undertake eight DMTs, five 'core' and three 'supplementary'.

The core DMTs will be concerned with:

- i. Control (electrics),
- ii. Control (mechanisms),
- iii. Control (energy),

- iv. Structures,
- v. Food.

The three supplementary DMTs which must ensure coverage of the Programmes of Study, and are to be 'determined by the school'.

The PofS is well set out and helps put all of the necessary information for teachers who will be planning and working from the document neatly in one place. The PoS is detailed and helpful. It describes skills and knowledge at each stage which I am sure will help enormously. The need to teach skills apart from the main DMTs arises and seems to be a reasonable way forward if the DMTs are to be as successful as they need to be.

Throughout the proposals an emphasis is laid upon producing 'good quality' end products. This almost implies that this has not been an aim of teachers working in D&T, but the stress given to this and to producing products 'fit for their intended purpose' is not an insult and should be welcomed.

The proposals do not ignore the principles of good primary practice. The section on the 'General Requirements for Design & Technology' says that pupils should, for example, be given the opportunity to:

- take increasing responsibility for their work,
- work independently and in teams.

The proposals also show that there is a place for first hand experience in the way of examining products and establishing things like 'the way that they have been put together, and the way that they work'. The idea of using visits as a starting point for designing and making, which is not new but often overlooked, is put forward. The example given is of a visit to an old people's home as a preliminary to designing and making work dealing with alarm systems and other warning devices. This type of visit puts the D&T work firmly in a context which can be understood by young children. It is gratifying to see this example is actually for children in KS 3, where the constraints of the timetable, and the number of children involved may well cause great difficulty, however, there are ways around this. Other contexts for the DMTs are suggested too. History Study Unit One — Settlers and Invaders, is used as a context for designing and making secure exit/entry points to a settlement or encampment. The possibilities for research

and innovation are immense in this particular case. The powerful suggestion of this sort of illustration is that designing and making can, and should be integrated as a cross-curricular component of the whole experience of the child. This will please many primary practitioners. It has also been possible to cross-reference other National Curriculum Orders in these proposals which is a really helpful addition for hard pressed teachers who need to know quickly and easily if statements of attainment from other subject documents are 'implicated' in work planned in D&T. The cross-referencing is limited to Maths, Science and Art, but is a very helpful start.

Overall the document is more accessible and certainly more manageable. The reduction to two Attainment Targets, and the corresponding 50% reduction in the number of statements of attainment will certainly be welcomed. The language is more helpful and the requirements seem somehow more straightforward. Perhaps this is a real change, or perhaps, and it is hard to tell, it is due to the fact that the conceptual framework for D&T remains, and many teachers are happy with this and have become increasingly *au fait* with the ideas and the language over the last three years.

The structure, content and layout of the document is good. Those who saw the use of food and textiles as an important element of the old orders will be disappointed. They are not excluded completely though, and this was always a possibility.

The problems of progression, which has presented itself to schools, will still exist. The danger of children working at the same 'level', with the same materials with no extra challenge, must be met. There is a chance that any illustrative DMTs can help with this problem, but it is something that those planning work for the classroom must take seriously. It cannot be taken for granted that older children will work at a higher level simply because they are older. Expectations need to be raised and opportunities set up. It is not clear from this document that this will necessarily be the case. There does seem to be a progression in the development of skills, but there also needs to be an unmistakable development in the use of materials and the complexity of the task.

It is pointed out, both in the document itself, and in the accompanying letter addressed to

John Patten, that there will be an enormous need for inservice support, and also written guidance which should include such things as:

- illustrative DMTs;
- drawing up schemes of work;
- the use of materials.
- progression and differentiation.

Children will, under these proposals be working towards learning skills and acquiring knowledge, they will be evaluating and improving products, they will be coming to appreciate the impact of technology on everyday life. They will be investigating, researching, modelling, communicating, planning and making. They will use a wide range of materials and components and they will learn to use tools and equipment safely. Finally they will undertake the testing, modifying and evaluating of their own products. The balance has certainly moved towards a more 'industrial' model. Personally I do not see this as a bad thing, as long as all that has been good about primary children's working with all sorts of materials in all sorts of creative contexts is not lost. Planning, and therefore children's work, will now fit into a much more tightly organised and carefully designed structure. This should help teachers to work towards the quality of experience which has been sought after. I hope that it all works as smoothly as it needs to for teachers to stay sane, and for children to reach their D&T potential.

■ The National Association of Advisers and Inspectors in Design and Technology

Bob Carter — President

Bob Welch — Honorary Secretary

There is much to welcome in the proposals. The HMI review group were set a formidable task in a short time scale which demanded not only a review of the content of the current Order but also a requirement to tackle the pressing matter of Key Stage 4 courses. Given such a remit it would hardly be surprising however if some items did not require further consideration. The period for consultation will provide ample time for analysis and discussion of the proposals and it will be vital for *all* who have an interest in the future shape and content of the subject to make their views known. This can be through completing the questionnaire

which accompanied the proposal and contact with professional associations.

Although it is always tempting to concentrate on areas of concern there are many positive features to applaud. Particularly welcome are;

- *the presentation and format of the proposals.*

The fold-out layout of the ATs and PoS is particularly effective and will ease the use of the document. The concept of core and supporting programmes of study is also felt to be helpful.

- *the inclusion of the particular requirements for each key stage.*

The summary of what pupils' work at each key stage will involve represents an aid to planning for progression. It also is a more straightforward format than the present Order which combines key stage and level related programmes of study.

- *the two attainment target structure.*

This retains the conceptual approach found in the present Order and was included in the submission made to the HMI working group by members of NAAIDT. The stranding of the ATs is also helpful.

- *improved manageability for schools.*

This is in part due to the removal of statutory contexts and forms of outcome such as systems, artefacts and environments.

- *the emphasis on products of quality.*

Designing and making tangible products of quality which can be tested in use should be the central aim for design and technology. This is a strong component of the proposal.

- *the introduction of Design and Make Tasks (DMTs).*

These serve to reinforce the practical nature of the subject and are intended to help teachers to structure a scheme of work. By making only some DMTs prescribed allows schools flexibility to meet particular interests, needs and circumstances.

- *increased emphasis on knowledge.*

This is welcomed in being clearly defined as a support for pupils' designing and making. There is far less ambiguity than at present about what knowledge, skills and understanding pupils ought to achieve at each key stage.

There are, of course, inevitably a number of issues which will need further consideration.

Some of these are;

- *the specific nature of some of the content of the Programmes of Study.*

The content of the PoS will require close scrutiny as some of the higher level statements in control systems, energy and food lack rigour. Is there sufficient detail to be confident about what needs to be taught in relation to each material? This is more pronounced in construction materials where some statements lack specificity. The terms of reference for the review of the Order required an emphasis to be given to construction materials and related components and systems and it will be important to be explicit about what is expected, particularly as construction materials now includes textiles.

There is a need to review the core PoS as some statements, particularly in 'making', are specific only to food. This would cause difficulty for those pupils who do not choose this particular material as a route through the range of key stage four options presented. The footnote on page 15 suggests that some statements are optional. This requires clarification.

The link between the supporting and core programmes of study must also have greater emphasis as it would be inappropriate to teach any of the supporting PoS without reference to the base provided by the PoS for Designing and Making.

- *the links between the attainment targets and the PoS*

Although a major improvement on the existing Order some more work is required to ensure clear compatibility.

- *the nature and number of the DMTs.*

The omission of separate core DMTs using construction materials is puzzling, especially so given the remit to the working group. The only opportunity pupils will have to explore the use of a full range of construction materials (including textiles at key stage 2) will be in conjunction with the DMTs on control and structures or as a supplementary task. If pupils are to gain a full and meaningful understanding of the principles of the control systems identified and extend that understanding to applications in design situations, there will be

little time to develop an understanding of the properties, working characteristics and manufacturing processes of a range of construction materials. This is most unfortunate.

There is also no indication of the number of hours required to cover a DMT. It is expected that some will take less time than others and it would be an error to assume that the nine DMTs in key stage 3 would each occupy a whole term. There would obviously be a need to examine the relationship between the DMT structure and the current statutory assessment arrangements for pupils in year 9. More examples of DMTs are needed and will no doubt form a strong element of the non-statutory guidance.

- *the nature of a short course in Key Stage 4*

This is one area which will generate much debate. The authors of the report acknowledge that this was a particularly difficult aspect of their work. Whilst the proposal will allow pupils some element of choice it inevitably raises the issue of comparability between courses. The artificial split of control technologies, where pupils will have to choose either electronic or mechanical/pneumatic control is an unrealistic division of related technologies. Computer control also seems to have been marginalised. Many will question whether a pupil who chooses to work only with one material (eg. food) on a short course and combines this with a short course in IT should be awarded a GCSE in technology, given the apparent lack of breadth of such a course.

These, and other issues, will make the period for consultation of vital importance. We now have an opportunity to shape the subject based upon our previous experiences and a concern to achieve work of the highest quality in our schools. Whilst applauding the good features contained within the proposals, and there are many, there is a need to look in more detail at the fine detail. Members of NAAIDT will be active and keen to enter into debate with others to ensure that this time, in good technological fashion, we seek the optimum solution to the task which has been set.