Reviews

Getting Things Right
Design and Realization

Adrian Marden
Oxford University Press £5.50

This new book is offered as a manual for students following GCSE courses in CDT; Design and Realization and as a help to Design & Technology students with their project work. It is one of an expected crop of books, aiming to meet this new demand, which many teachers will be eager to read to judge if the author is, in the words he uses to help explain the work of a designer, 'getting things right'.

In A4 format, nearly 200 hundred pages long and liberally illustrated with drawings and photographs, the author has produced a work whch will be of considerable value to both students and teachers. On balance, although not in every section, he has managed to achieve sufficient depth whilst covering an area which is the subject of several lengthy separate books. Teachers will welcome its practical suggestions, the 'O.U.' style questions and activities at the end of each section and the compilation of questions drawn from the specimen examination papers of the various GCSE boards.

In a very good opening section students are taken through the stages involved in designing and making with plenty of references to the sort of projects undertaken in schools. Through this means the design process, on which thankfully there is no undue emphasis, becomes evident. This approach will help students understand the general pattern of the development of design solutions without giving the impression there is only one formula which if followed will lead to success. The author manages to avoid the use of terms with which the students may be unfamiliar by first explaining what is involved. For instance 'analysis' is dealt with by considering the design brief for a 'cheese cutter'. A series of questions identify each of the factors likely to influence the design of such an item which are then discussed. In this way analysis becomes a recognisable activity rather than an abstract and partly understood concept. The possible pitfalls in writing design briefs are discussed and good reasons are given to support the advice that is offered. This section will further students' understanding and will help them to become increasingly responsible for initiating and sustaining their own design project work. It will also be valuable to teachers who find the designing aspect of Design and Realization the most difficult to manage effectively. It contains lots of helpful advice and hints that could well be adopted.

A large slice of the book devoted to design graphics begins with an explanation of the range of equipment that can be used and ideas for producing a design folder including layout sheets to aid presentation and organisation. Nine methods of drawing, three each from the oblique, axionometric, and perspective groups, are discussed in some detail though most students could well ignore the lesser known methods such as dimetric projection to concentrate on others. The explanations of each system, how each can be used to advantage and how they relate to each other are interesting and informative and are given in sufficient detail for Design & Realization students.

There follows various rendering techniques by which realism and special effects can be achieved. A whole section is given to working drawings, methods of projection, detail drawings, sections, parts lists, symbols and conventions. The freehand drawings which are used throughout the book and which may lack sufficient precision in some minds but which nevertheless are used to good effect, perhaps because of their 'childlike' quality. However it is incongruous that the same style is used in the section entitled 'precise working drawings' when the examples given are anything but precise. Modelling techniques are given good treatment and the rather brief section on CAD shows the advanced applications of powerful computers in an industrial environment and refers to the possibilities of using micros in school. However teachers and their students need more than a mention of the equipment that is required if they are to make progress in this vital area.

Many CDT teachers will find the chapter which explores the visual factors of design i.e. shape, proportion, pattern, texture and colour interesting and helpful. Each topic is introduced briefly then returned to in order to explain how and why the visual impact of a design is important and how each element contributes to the style, image and attractiveness of a product. Lots of ideas and examples are given with key questions to test pupils' understanding and activities to support their learning, as elsewhere in the book.

The last section of the 'design' as opposed to 'realization' part of the book concerns gathering information. It suggests sources of information, methods of depicting and analysing information through graphs and charts and gives a selection of anthropometric and ergonomic data to show how it can influence designs.

The major part of the second half of the book covers the areas of traditional craftwork. It contains sections on materials, tools and machines and processes. Unfortunately these areas are not treated in sufficient depth for them to have more than a limited value as an initial reference. The materials section gives a brief run down on the most common timbers, metals and plastics and their properties, though I doubt many children will ever see wrought iron! This is followed by notes and drawings attempting to cover the composition, working properties, uses and methods by which they can be worked. The detail which is necessary to describe how the materials are worked to ensure good quality realization are equally brief and in one or two cases technically dubious. Tools are grouped according to their type which is useful in showing the similarities and differences of say saws which all have the same basic function but which have been developed for different purposes and materials. Machining covers the centre lathe, wood turning lathe and certain abrading equipment but offers little on the drilling machine. The processes section whilst it is fairly wide ranging requires far more detailed information to make this a really practical manual.

A brief historical perspective of the work of early technologists introduces the last section. The reader is treated to a stimulating everymans guide to technology which will remove some of the mystery which makes this a part of the CDT curriculum many avoid like a plague. The author's succinct style makes for easy understanding and

should help to establish important concepts.

The technology section is a curious mixture of brief glances, as with the field of pneumatics, and detailed explanation, as in the case of gears. The emphasis is clearly on those topics, electronics, mechanisms, structures, energy, which schools most commonly pursue. The aim, it would seem, is to give enough insight to stimulate a creative response to a design problem without going into the depth which is required when a student wishes to make use of a particular technology within a design solution.

There is one aspect of CDT which receives an emphasis within the GCSE examinations which Mr Marden does not address directly. Assessment objective 17 of the CDT National Criteria says children should be able to describe the interrelationship between design/technology and the needs of society and the General Criteria encourage awareness of economic, political, social and environmental factors relevant to the subject (para. 19(k)). The response of at least one of the examintion groups has been to set questions which aim specifically to test this awareness. I feel sure teachers would appreciate any contribution to help them prepare students for this aspect of their work.

This book deserves a place in every CDT department's library and is worthy of consideration as a class book. It contains sound practical advice, lots of ideas and will be of great value to teachers and students in their task of 'getting it right'.

Michael Roberts

Visual Messages: An Introduction to Graphics

C.J. Breckon, L.J. Jones and C.E. Moorhouse
David and Charles, £9.95 paperback

The communiction of information by means other than writing or talking commonly occurs by using pictures and drawings. Plans, maps, textbook diagrams, road signs, engineering drawings, statistical graphs and architects' drawings are obvious and everyday examples. This book is basically concerned with introducing upper secondary school students to the problems, pitfalls and potentialities of communication by graphic media. As such, it contributes significantly to the literature on *graphicacy,* describes some years ago in an article in the *Times Education Supplement* as the 'fourth ace' in the educational pack (together with literacy, numeracy and oracy).

Visual Messages, originally published in Australia in 1974, is a delightfully produced book. It covers subjects such as the use of colour, freehand drawing, pictorial drawing, explanatory diagrams, statistical drawing, signs and symbols and maps and diagrams in an imaginative and attractive way. The book is well designed and profusely illustrated; it certainly practices what it preaches with excellent layout and design.

Any criticisms are basically nit-picking. An anglophile critic might accuse the authors of having retained too many Australian examples in this first British editon; a summary of the major map projections fails to include the currently controversial Peters projection, suggesting that up-dating may not have been as thorough as initially suggested. But for a book which includes examples ranging from aboriginal carvings to computer graphics such as criticisms are perhaps unkind. At £7.95 this book is a bargain — and the cover design deserves some kind of graphics award in its own right. *Visual Messages* can be strongly recommended to anyone interested in the communication of graphical information. Undergraduates and upper secondary students studying design *and* the implications of design and graphic communication in a number of other subject areas, will benefit from reading this book.

John Bale

Ergonomics in the Computerized Office

Etienne Grandjean
Taylor and Francis 1987, hb £25, pb £11.50

This is a book which looks at the activity of using and working with computers through the eyes of an Ergonomist.

It examines the needs of human users on a variety of tasks from the very constrained (restricted) like data input, to more conversational and varied activities (CAD CAM) and considers the implications for equipment, machine and office designers.

All of these sections are concisely written, in an easy to understand style. The layout of the book is such that the reader can easily identify the area and level of interest. Each paragraph is sub-titled in the margin enabling the user to enter at a level that they can understand and quickly progress to more specific knowledge and recommendations.

The section on seating is a typical example where it is easy for the reader to find their way from the basic principles of dynamic and static work, to the body sizes of users, to research evidence on the musculoskelital problems of users, to a contrasting of what the ideal theoretical seating position should be and the actual position that operators adopt, and the implications for the design of seating.

The areas covered are

— the computer and operator, the layout of the workspace, the seating and comfort.
— the design of the jobs that computers do, with reference to job satisfaction and performance.
— the examination of the evidence on the alleged health hazards to VDU users.
— A summary of the recommendations to designers.

My impression is that this book will be equally accessible to school student, product designer, researcher and office manager, and for many of them will become an essential part of their reference material.

T. Lawley

Teaching GCSE Craft, Design and Technology

David Rees
Hodder and Stoughton, £4.50

This book is one of a series dealing with GCSE in a range of subjects and aims to provide the practising teacher with a comprehensive guide to the three GCSE syllabuses in CDT — Design and Realisation, Technology and Design and Communication. In endeavouring to cover these, the author has necessarily had to make compromises in terms of a detailed breakdown of each syllabus title in favour of giving general guidance for all syllabuses in each of the six examination groups. For this reason, the book is a useful resource for CDT teachers who are unfamiliar with, or unsure of, the new examination and begins to address some of the issues presented by GCSE.

Five areas are considered: assessment criteria and techniques; comparison of syllabuses in terms of assessment; organising and resourcing project work; developing schemes of work; course work assessment. The section on developing schemes of work is particularly welcome and points to the importance of working to detailed teaching programmes rather than the syllabus only. Teachers will also find the details on assessment of coursework helpful and the emphasis on using records of achievement and profiles as an aid to pupil learning is especially useful.

The book, therefore, provides the teacher with a framework on which to build detailed schemes of work, plan appropriate teaching approaches and develop realistic and relevant assessment procedures. It is, though, a basic framework and individual schools and teachers will need to give considerable thought and work to developing courses which are relevant to the needs of their pupils. They may need, too, to make decisions about which of the examination boards provide the most appropriate syllabuses and the book provides some guidance for this selection process, although I feel that more emphasis should have been placed on the need to choose the strand which the teacher feels most able to cope with. It would, for example, be difficult to offer CDT: Technology without detailed and specialist knowledge of the syllabus content and the recommendation that selection could be left until examination entries are due, could present considerable problems.

A further concern is the lack of guidance in selecting between the three CDT strands. The author feels that this is not a problem since pupils will know which area of CDT they most enjoy and that although this may not be a well informed decision it is reliable. What has not been emphasised, however, is the need to base this selection process not only on the interests of pupils but also on the ability of the school to provide the necessary expertise, equipment and resources for a particular strand. In this context, it might also have been helpful to have explored the notion that GCSE is a five year course and that it is important for teachers to ensure that their 11-14 courses provide a coherent and balanced experience, which can contribute towards GCSE.

Despite these concerns which, as I have pointed out, are a necessary compromise, the book has much to offer the CDT teacher starting GCSE. It is succesful in presenting its information in a straight-forward and easily accessable form and teachers will welcome the absence of jargon and practical advice on managing and resourcing project work, preparing schemes of work and assessment.

Brian Oppenheim

Computers at Work

H. Scott, B. Frost, S. Alexander and G. Bowie
Bell & Hyman, £4.50

This is a book produced by a committee, two of whom are mathematicians and one a scientist, and it bears the unmistakable stamp of the mathematical camel; irregular and uneven progress. It is arranged in short chapter topics, designed to be studied in any order to allow flexible use by individual children, or teachers who may not be computer specialists; but there is no guidance to which of the topics will prove easy to tackle and which will make considerable demands on children's time. This problem is accentuated by the very variable level of difficulty. The book is supposedly aimed at 10-14 year olds, but some tasks (such as an exercise in logic which involves rearranging pictures of a picnic disturbed by a bull) are almost at preschool level; this example is immediately followed by an activity (translating from a story to references on a grid to a two-column coding system) the function of which is likely to be obscure to even brighter fourteen-year-olds. The same chapter, on logic, illustrates other problems which recur through the book. Topics tend to be inadequately introduced — for example the coding activity. Frequent use is made of short programs in BBC BASIC, and these too are generally inadequately explained. Both the use of BASIC, rather than more structured languages, and the advice that children should laboriously key the programs in (although the longer ones are available separately on a disk) would be criticised by many educators. A number of these programs deal with graphics and sound, and therefore involve the more technical aspects of BBC BASIC; a considerable amount of work in the computer's own manual would often be needed to understand what was happening. Finally the chapter ends with a page of puzzles which has little relevance to what has gone before, or to computers; in one case (a straight algebraic problem on tigers and ostriches) the answer given in the back is wrong.

Another set of interrelated problems with the book are its lack of coverage of many applied topics, and its lack of reference to existing programs which give a good coverage of the topics it does cover. For a book which claims to concentrate on applications rather than programming, there is an excess of the programs already mentioned, and little on many important applications. There is a promising start with a very interesting chapter on bar codes (though this poses the question of why some users prefer 8-digit to 13-digit codes, and provides no answer — how many teachers will be able to help?), which includes a discussion of the social implications of this technology. Only one later chapter — on the ISBN system of book numbering, and its use of check digits — fulfils this promise. Bank cash

machines are only mentioned briefly, and there is no discussion of the PIN system or the implications for security in this or other computer-based systems. There is no mention of the Data Protection Act, though some of the suggested activities, involving keeping records of classmates' performance, may involve pupils in its provisions.

The area of data is treated superficially, and there is no treatment of databases, despite their increasing use in a range of classroom subjects as well as in business life. Here the teacher who is not a computer expert would benefit from guidance to the range of database programs which are available for the BBC micro and which children can use successfully and critically. The principles of word processing are somewhat better covered, but again pupils would gain more from critical use of one of the wide range of processors for the BBC, and no attempt has been made to cover some of the more sophisticated features of word processors, or their social implications. It seems downright contrary to attempt to stimulate a few of the features of LOGO in a BASIC program when the real thing is readily available. Many of the general features of computer programs could also have been explored more readily through LOGO than through BASIC, and LOGO also offers real robots instead of children relying on pretending to be robots as suggested here.

Overall this book cannot be recommended, although there is a need for books to cover this area. Both its omissions and its commissions make it better for teachers to achieve its coverage by better means.

S.R. St.J. Neill

Science Report for Teachers: 10 Metals at age 15

Available from Assessment of Performance Unit

This booklet describes the responses of 15 year old pupils to APU questions based on the properties of metals. It has important messages for both science and CDT teachers.

The first section concerns the identification and properties of metals, non-metals and alloys. The main point to emerge is that pupils do not readily adopt a chemical perspective. They distinguish metals from non-metals on grounds of appearance and physical properties although their idea of a metal is much clearer and more immediate than a non-metal. The APU comments that pupils might be confused by the different contexts in which they meet metal uses and properties and that a handicraft context might be responsible for a pupil writing, 'Metals are strong, easier to work and they last longer. Non-metals are all right but not as strong and cost less'. The notion of alloy caused some problems and the use of 'metal' and 'non-metal' to refer specifically to metal element and non-metal element was clearly not appreciated by many pupils. Again context in which these terms are used with a non-specific meaning will add to pupil confusion. In CDT lessons it is common practice to talk of the advantages or disadvantages of replacing a metal component (usually an alloy) with a non-metal equivalent (usually a plastic). Small wonder that the fragments from different contexts that remain in childrens' minds confuse them! Clearly there is ground here for considerable cooperation between science and CDT teachers in introducing the notions of metals and non-metals and developing them so that pupils are not mystified by the same words having very different meanings in different lessons.

The second section concerns pupils' understanding of the everyday aspects of metals. Being able to name objects made from common metallic substances; (Note the use of the term 'metallic substance' not 'metal' in the summary table because one of the substances is steel and steel is an alloy, not a pure element — subtle stuff eh?) being able to identify metals in objects and give reasons for their use; being able to identify metal samples and understanding corrosion and its prevention were all tested. In giving reasons for a metal's use the testers experienced some difficulty in interpreting pupils' answers because of pupils imprecise use of language. The diversity of language to which pupils are exposed is a source of great confusion.

Not only do the same words have different meanings in different lessons at school but there are a host of other meanings for these words in the 'real' world outside school. The report comments on the difficulty pupils have with distinguishing between hardness and strength. A glance at a pop song from the late '70's shows clearly that hardness can have a wide range of meanings within a single song:

25 tons of hardened steel
Rolls on no ordinary wheel.
Inside the armoured car
Ride two big armed guards.
In a bullet proof vest,
Shatter proof glass,
Both drive — we're gonna pass!
25 tons of hardened steel
Rolls on no ordinary wheels.

The hardest part
Of the armoured guard
Big men of steel
Behind the steering wheel.

I came up with tough, fierce, capable, strong, aggressive as possible meanings for hard in the song. So not only do teachers have to be clear on the meaning they and colleagues assign to such words by others outside the class room. Of course the best way to find out what children mean when they use words is not to give them tests but to LISTEN to them explaining what they mean. While the APU cannot do this teachers can if only they would. Pupil perception of corrosion as a chemical reaction was weak, many seeing it as a physical break-down. Interestingly most pupils saw the involvement of air or water in rusting but only a minority in the more general process of corrosion. Here the decisions taken by pupils on finishes for materials in CDT lessons could be informed by AND inform the work they do on the reactivity of metals in science lessons.

The third section concerns the chemical properties of metal elements — their order of reactivity, their extraction and their reaction with commom reagents. These are at first sight perhaps of less interest to the CDT teacher. Pupil understanding is generally poor and this should not really surprise us. The questions are deceptively simple and unless the pupil has a highly developed picture of the particle nature of matter involving

atoms, ions and molecules it is unlikely that he or she will be able to make any sense of the displacement reaction between iron wool and aqueous copper (II) sulphate solution. Think what we want them to believe — an uncharged iron atom bumps into a charged copper ion; two little bits of electricity jump from the iron atom to the copper ion; this turns the copper ion into an uncharged copper atom; the iron atom having lost two negative charges is now a positively charged iron ion and can 'go' into solutin. The sulphate part of the copper sulphate does nothing — it just sits and watches so it's called a spectator ion. Copper atoms aren't soluble in water so the copper 'comes out' of solution and appears as a reddish deposit on the iron wool. Iron ions are soluble in water so if you put enough iron wool in the copper sulphate solution, leave it their long enough with the occasional good stir — which they didn't do in the test — the blue colour due to copper (II) ions disappears and is replaced by the pale green colour of iron (II) ions. In the test all you see is the iron wool go a pinky/brown colour with little if any change to the blue colour of the copper sulphate solution. Small wonder the pupils find it difficult to interpret. The conceptual structure they need is very complex as it is for all the exercises in this section. As far as the CDT teacher is concerned there are two activities currently used within CDT that can help to improve pupils' understanding. John Cave has written clearly about electroplating and anodising in Technology in School (RKP 1986). These processes have electrochemistry and chemical reactivity at their heart and the cooperation between science and CDT teachers here is to everyone's advantage. Similarly the notion of colouring metals by corrosion techniques has been explored in The Colouring, Bronzing and Patination of Metals by Richard Hughes and Michael Rowe (Crafts Council 1982). A GCSE Design and Realisation Project having research into useful and safe chemical reactions as a first step is clearly possible here. The final section deals with higher order chemical understanding of more theoretical concepts — the Periodic Table, Electronic Structure and Electrochemistry and Reactivity. The first two are probably of least direct relevance to CDT teachers but as has been indicated the last area could be of significance.

The summary given provides a useful overview of the difficulties that pupils face, as revealed by the response data, in reaching an understanding of chemical ideas. I am always slightly concerned about pupils' motivation when carrying out APU type tests. What is their incentive to think really hard and get it right? Perhaps the main point that comes out is the difficulty pupils have in moving from recalling and perhaps understanding a particular instance to a more generalised understanding. This process takes time and requires a backdrop against which the pupils can come to terms with difficult ideas and the language needed to deal with them. If science and CDT teachers can work together in planning and implementing a curriculum that deals with among other things — Metals — then there is the possibility that there will be the time for pupils to develop such understanding. I have a vision of a science and a CDT teacher working with a class of third year pupils where they start with several kilogrammes of green rock and end up with jewellery that the pupils have designed and made from the copper extracted from the green stuff. Such a scenario would provide the time, the teacher expertise and the motivation. Any takers?

David Barlex

The Anti-Colouring Book

Susan Striker & Edward Kimmel
Scholastic Publications, £2.75

I have always been strongly opposed to children's colouring books or indeed any publication which reduces 'Art' to the level of tracing, colouring or painting by numbers. Children are given these books which contain drawings by professional artists and are then asked to abandon their own adventurous attempts at creativity in order to stay within the lines. Soon, the only thing children have learned is that adults draw better, by adult standards, than they do.

The 'Anti-Colouring Book' presents projects which are the antithesis of such sterile and imitative activities. They are designed 'to stimulate the imagination and spark creativity, to generate fantasy and expand a child's frame of reference'. This is done through 45 one-page projects, presented on A4 paper in partially-drawn format. These include such things as designing a trophy, illustrating newspaper headlines, inventing machines and robots, drawing dreams and nightmares and graphically predicting forms of transportation in the year 2001. As with most good design based work, there is no uniform solution or 'correct' answer to any of the projects. Each child's individual finished drawing should therefore be both personal and individual.

The level of simplicity or sophistication with which all the projects may be tackled means that they are equally suited for use both in the primary or lower-secondary school. Assignments could be used on a one-off basis or as 'cover lesson' design exercises but would perhaps be of more value if incorporated into a basic design/graphics course. Some of the projects are totally open-ended and this could be seen as a drawback by those who prefer design briefs to be more tightly defined. However additional constraints can easily be added by the teacher, if required, to create a harder or less difficult problem or to dovetail the work in with other topics.

At £2.75 the 'Anti-Colouring Book' represents excellent value not only for the projects it contains but also for the further (copyright free!) ideas it should generate in the enterprising and imaginative teacher.

Marshall Hughes

Understanding and Using Technology

A. Todd, C. McRory and D. Todd
Davis Publications, Worcester, Massachusetts. Distributed in Britain by Lewis Books Ltd, 2 Blagden Road, New Malden, Surrey, KT3 4AD. 3 volumes, £15.20, £10.50 and £10.50

Coming from the United States, this set of books display an approach to technology education which is significantly different to those commonly found in Britain. Having just read the following in the recently

published HMI report on British Schools Technology it would seem that comparing these ideas with ones we are familiar with would benefit us:

> . . . none of the LEAs had a clear working definition of 'technology' and, at best, most had no clear policy for the introduction of technology in schools.
>
> (para 8.1)

The set consists of three books, a text book 'Understanding and Using Technology' and two smaller supporting books under the same overall title subtitled, 'A Guide for Teachers' and an 'Activity ACT Manual'.

They were produced under the direction of Ron Todd, Professor at New York University and one of the leading figures in New York State's rapidly developing Technology Education Programme. These books were written for the teachers training for this new venture, hence the detail in the smaller two.

Unlike the criticism above of our LEAs, New York State has a clear working definition of technology, and in essence this textbook is it. The state also has a compulsory curriculum and they are busy with a plan stretching over several years to make Technology a part of the 11-13 year olds' stage.

Like most school textbooks the main book addresses itself to the students and also like all good ones the teacher gets a lot of value from it as well. The real thought-provokers in this one are the way in which it is divided into units on 'the elements of technology, the activities, changes, and impacts of technology', and the contents of those units, which are sometimes surprising.

For example the elements are identified as 'Tools/machines, Materials, Processes, Energy, Information and Humans'. I bet that last one surprised you.

Some areas of technological activity are referred to which are frequently overlooked in British approaches, one being the study of humans as 'information processors and convertors'. This also illustrates the way in which Todd sets every topic studied in a sense of context and reason, which is something I often find missing in British technology courses. (Why are we making little buggies? the fourth former might ask).

Also included is some speculation on the future, and some concern for the consequences of technological activity, personal, social and ecological without which I consider any technology course to be inadequate. The nice thing here is that this section draws the conclusion that those following this course will be contributing to the technological decisions of the future, if only in the ways they choose to spend their own money.

If all this sounds heavy stuff, remember the two supporting books. They are there to give ways of dealing with this material in active, sometimes problem-solving ways. Here is where the British scene excels, for our practical design work is second to none, thanks to our tradition of teachers developing their original approaches.

The 'ACT' in the title of the third book stands for Activities-Concepts-Technology. This book is a compilation of 179 tear-out pages of projects with worksheets for students which are models of detailed planning and tight structuring. Therein is their greatest strength and greatest weakness, but they are what you will make of them, and the material is certainly stimulating for some ideas fresh to British schools.

Anyone concerned to work-up original approaches will certainly find some material in here to stimulate ideas. Each project, some of which are not what we would regard as 'practical work' but are short activities such as investigations with tabulation of results, includes suggestions for 'in-depth study' giving a list of proposed further project work. Also a short bibliography is appended to each so the starting points are there for you to develop these topics.

The Guide for Teachers provides some instructional material for the teacher and clear and explicit directions on how to conduct the activities, of the type which in Britain we may for the time being choose to follow (some of the tips are excellent) or ignore. One statement in the introduction, however, I found a little chilling:

> Most teachers are technicians . . . they are not normally the architects nor engineers of the school plan. They must work within the system to do what they can . . .

This of course is meant to apply to the American context.

Again this book provides ideas and challenges assumptions, and is most useful in my view for its use of 'concept categories', its suggestions for teaching strategies and its obvious pedigree in drawing on real teaching experience.

My only serious reservation about these books is that 'Design and Problem Solving' is relegated to a separate section, and what is more it is the last of the forty activities, being the final chapter of the textbook. This parallels the 'Modular Technology' blunder of producing a separate module on 'Problem Solving'. Fortunately these two approaches both save themselves from ridicule by allowing and sometimes promoting technological design activities throughout their project work. As if it could be any other way. The last chapter of this one is simply the place where in this book they choose to draw attention to the design decision-making process and support it with a little theoretical study. I still think it would have been better for all the attention to technology to refer constantly to the fact that its growth is the product of the process we call designing.

New York and New Jersey states are making rapid progress in the development of their initial Technology Education programmes and some of their personnel are in Britain every year to draw on our experience. Ron Todd was widely reported in the British press last year when he said that Britain was ten years ahead of the States in this area. That might not be true for long unless we are prepared to examine their thinking and recognise where it is ahead of ours. I recommend these books to all teachers interested in technology education for just that reason. There should be a copy on every CDT department's bookshelf.

And perhaps there are some others in the LEAs who should be reading them?

David Perry