

One Term In Service CDT Courses for Teachers

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1. The Background

The publication of DES circular 3/86 provided an opportunity for staff based in the Department of Design & Technology at Loughborough University of Technology to submit proposals for a series of six One Term In Service (OTIS) courses for teachers of CDT, to be funded through the existing central pooling arrangements. The proposals were accepted, and the first of six eleven-week courses began in October 1986. These courses were under continuous development during 1986/87, each one building on and refining the experiences and lessons of its predecessors.

Circular 3/86 stressed the need for partnership between establishments offering such courses and those local authorities who were likely to submit candidates, and Loughborough staff invited CDT and Design Advisors and Inspectors from all the adjacent authorities to participate in the forming of a steering committee. This committee was involved from the very beginning with the drafting of the initial proposal, and met at the end of each of the six courses to review the work and projects covered, and to provide feedback from the authorities involved on the longer term effects of the courses on the teachers involved.

2. Target Population

The target populations for the course were initially seen as being in three broad categories:—

- a. Teachers who were trained in traditional 'Craft' subjects, possibly some years ago, and who needed some fairly radical upgrading in most aspects of CDT.
- b. Teachers who had developed interests in, and possibly begun to teach, certain aspects of CDT but had initially been trained in other areas of the curriculum.
- c. Teachers who were generally quite cognisant with many of the new developments in this area of the curriculum, and might be seen as department heads and those holding posts of special responsibility.

It became clear very early on that so far as the candidates themselves were concerned, a further division existed — between 'those who jumped, and those

who were pushed'. A proportion of the candidates for each course were volunteers who wished to update or broaden their personal knowledge base, or their 'marketable skills', or both. By comparison, a significant proportion of the teachers involved were candidates for compulsory redeployment, or were supernumary to their county's present requirements. These teachers had generally been advised, or directed, to attend by their County Advisors or Inspectorate to update or develop their knowledge and skills, and equally their understanding of, and attitude towards, CDT in the curriculum. The age range of teachers involved was therefore quite wide, ranging from younger teachers in their late twenties and early thirties to craft teachers of between forty and fifty with fairly lengthy teaching careers already behind them.

3. Course Structure & Philosophy

The essential core of each of the courses was that the teachers involved should be exposed to an environment where the normal school routines and usual distractions were minimised. Course members were involved in eleven weeks of intensive and continuous experiences, without bells, lesson changes, or interruptions, and were encouraged to take part in various carefully planned and related tasks and projects.

One very important point to be considered was that the working environment and the course tasks offered should be as 'non-threatening' as possible, since a large proportion of the course members were likely to be suffering from a sense of inadequacy in some or more areas of their professional development.

Part of the time was allocated to visiting speakers from various areas of education, industry, and research, and further inputs were offered covering areas where existing knowledge might be slightly lacking or out of date. These included Computing and Computer Control, additional Maths, Structures and Mechanics, Graphics, and Electronics, amongst others.

A major part of each course was associated with problem-solving activities and with designing and making solutions to various course tasks and problems. Some teachers chose to

work in groups while others worked in pairs or alone, and whilst some course tasks were set, others developed from the interests and learning of the course members themselves as each course progressed.

The teachers regularly began each week with a short briefing which covered the previous week's problems, goals to be met, and areas of general or individual concern. Timetabled weekly discussion periods allowed course members to examine and share problems and progress, and to respond to issues raised by staff and by other members of the group.

The philosophy behind all the courses was that teachers should be encouraged to develop their own self-learning patterns through identifying, with help, their individual learning needs.

All too often one can see limitations placed on both teacher and pupil development by the limitations of a timetable-led curriculum, where logistics controls what is taught rather than the needs of the pupils. Added to this, the limiting effect produced by overly prescriptive labelling of bodies of knowledge inhibits and limits teacher and pupil perceptions of the content of bodies of knowledge, and also therefore limits the learning process. One only has to look at the signs and labels on many classroom doors to see obvious examples of this.

'Think of a limitation and be sure it's yours.'

Each course member was required to make a seminar presentation to the rest of their group, and the range of responses to these presentations varied considerably, as did the depth and quality of the presentations themselves. In most cases the teachers involved found the exercise difficult but stimulating, and by the end of each course the relevance of good presentation style and techniques was more clearly appreciated and understood, through a combination of individual presentations and a range of weekly visiting speakers.

All course members were required to put up an exhibition of their work at the end of their course, and their advisors and inspectors, as the steering committee, were invited to visit the

department to see what had been achieved, and to discuss the course and the work done with the course members.

By agreement with the steering committee, no formal assessment scheme was implemented in these courses. However, progress and effectiveness was monitored by pre-, mid-, and post-course questionnaires, and by continuous discursive evaluations between course members and staff. Teacher requests and responses to the various course elements were acted upon whenever points were raised which needed attention or alteration.

4. Major Points of Note

The most noticeable factor across all six courses was the widespread need exhibited by a majority of the teachers to be given answers, or a series of work-packs and 'instant teaching resources'. This need for answers was often manifested in questions about how various aspects of CDT 'should' be taught, or how a curriculum 'should' be developed, and almost always hard data was requested and expected.

The main problem therefore, early in each course, was the need exhibited by many of the teachers for some form of formal taught input. The philosophy behind the courses meant that until each group of teachers had begun to form working groups, and to establish their own individual learning patterns and strategies, progress was quite slow, and some frustration was evidenced during this phase. Once past this hurdle however, almost all the teachers involved became intensely involved in closely focussed and highly self-motivated periods of work on the various projects, and the cry of 'there's not enough time left!' became quite common.

As with any new area of learning, teachers were attracted to what were often seen as the 'novelty areas', such as electronics, computing, and graphics. The benefits of exploring such areas was maximised by the flexible nature of the course structure, together with the provision of extra inputs from University staff where teachers existing knowledge was not quite adequate, or indeed hardly more than rudimentary. Clearly, in such areas one of the most important factors was to ensure that teachers managed to complete work

which needed tutor support before the end of the course. Where more major projects were undertaken that obviously would need to be continued or completed after the end of the course, staff went to great pains to ensure that the projects selected were within the capabilities of the people concerned.

5. The Key Factors

These can be described most succinctly as a series of headings by which some of the major course objectives could be described:—

- a) *Combination of Individual & Group Work* — this also encouraged a synergistic approach to group working skills and the sharing of knowledge.
- b) *Co-operation* amongst individuals *within* the Group.
- c) *Delegation & Devolution* of tasks *across* the Group.
- d) *Personal & Group Responsibility* for all aspects of the day to day running of the course and the tasks and projects undertaken, and the help and support for and from fellow members of the group.
- e) *Communication Skills* were exercised at many levels, including the sharing of knowledge about materials, tools, equipment and processes which course members brought with them to the courses. Early discussions became lively, and often quite heated, as ideas and opinions began to develop, and the various individuals rapidly became more and more involved in the tasks ahead of them. As the course progressed, the enthusiasm and the tension mounted, with the need to finish all the projects before the end of the ten weeks and get everything to as high standard as possible. Many of the teachers, on all the courses, made comments such as:—
 'There's so much more to this than I thought . . .'
 'We could all do with another term to get finished.'
- f) *Generating Solutions to Problems* — individuals were encouraged to develop their ideas by sharing in the combined knowledge of the group, in a form of 'brainstorming'.
- g) *Group Dynamics* — no attempt was made to minimise the influences of

group dynamics on individuals although careful note was made of the effects, as it was felt that generally 'leader characters' were less likely to inhibit individual responses in a profession such as teaching, where such personalities often prove beneficial to the rest of the group.

- h) *Using Relevant Knowledge* — individuals were helped to respond using their own experience knowledge and skills, and in addition to examine and consider other relevant problems, strategies, and ideas generated by other colleagues in the group and the staff.
- i) *Planning and Self-Development* — the members of each group were enabled and encouraged to negotiate and hierarch their own ordering of factors and considerations, and to understand and facilitate their own learning curve situation, as the courses developed.

6. Summary

The immediate effect of the courses on the teachers who took part varied, but was for the most part extremely positive and promising. There was also a clear 'delayed action' effect which was reported by the various county advisors, where the teaching and attitudes of their teachers underwent a continuing and positive developmental change after their return to the classroom. The OTIS experience therefore appears to have provided a most exciting and effective set of strategies for both teacher and curriculum development.

Part of the reason for the level of success was due to the range of experience and knowledge of the staff involved. This was aided by the establishment of a clear and integrated approach to the whole range of problems and technologies examined. In the later courses, when structural work was completed, an effective and integrated working environment also began to have an impact on how this area of the curriculum was perceived by the course members.

A major consideration was the requirement for group interaction and corporate decision-making, and the pooling of knowledge and skills. Time-management was another important

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colour should be restricted to one of the books escapes me.

I find all of the content explicit and well presented, and the authors are to be congratulated for showing clearly the integrated nature of good practice in CDT. All in all this series is clearly of value in that its comprehensive coverage of designing and making is aimed at supporting the pupil without being obviously prescriptive. Whilst I suspect that most teachers will be selective in their purchases, I would urge them to buy one complete set. I am sure it will be well used.

David Jones

Design & Plastics

By Mike Hall

Hodder & Stoughton, £4.95

Most schools find work in wood, metal and clay to be a manageable proposition because of the historical roots of working in these materials. This begins with a sophisticated range of low technology processes; only in modern times does it reach sophisticated technological production. For this reason it is possible for schools to replicate parts of the development process and reach technology in a rational and readily teachable way. With plastics the process is different. Here we have a material which originates with high technology and which is only adapted to low technological facilities with difficulty and often with results that are markedly inferior to those of the high technology producers. Hall tackles this problem and makes a brave attempt to adapt high technology plastic processing to the resources and capabilities of schools, their teachers and their students. It is a sound attempt and one that is likely to give pupils a real insight into modern production techniques and their immense capability to produce a range of artefacts and yet at the same time to give the opportunity to achieve satisfying personal products that compete effectively with products manufactured by industry. It is not that the topics covered are new. We proceed, like most other books on plastics through heat forming, vacuum forming, injection moulding, extrusion, resin

casting, moulding and machining. But the attention to detail, the clarity of text and illustration and the skilful introduction of theoretical issues makes this a book that is somewhat ahead of the competition and likely to be very welcome in schools that are trying to make significant developments in the use of plastic materials.

John Eggleston

The Way Things Work

By David Macaulay

Dorling Kindersley, £15

This extensive book of some 383 pages serves as a very useful reference to a considerable range of technological principles, associated with 'The Way Things Work'.

It presents quite an extraordinary approach to breaking down the 'technology barrier'. The author(s) took three years to complete this task — which is no surprise. The book is graphically based — the bold, highly illuminative drawings are central to the presentation of 'principles in action'. The graphical representations are supported by clear explanations with extensive use of analogies.

The approach, based on principles rather than discreet bodies of knowledge, is a welcome alternative for schools in the present climate of the National Curriculum. 'Machines' are grouped together by their principles rather than by their uses — e.g. the Plough and 'ipper as well as the Hydroelectric Power Station with the Dentist's Drill! 'They may look very different, but when seen in terms of principles, they work in the same way.'

The book is split into four sections.

The first section — 'The Mechanics of Movement' — deals with Machinery in Motion, Movement and Force, Holding Matter Together, and The Conservation of Energy. These concepts are exemplified by dealing with 'things' involving: The Inclined Plane, Levers, The Wheel and Axle, Gears and Belts, Cams and Cranks, Pulleys, Screws, Rotating Wheels, Springs, and Friction.

The second section — 'Harnessing the Elements' — deals with More About Molecules, Strength in Numbers,

Speeding Things Up, and Breaking the Bonds. These concepts are exemplified by dealing with 'things' involving: Floating, Flying, Pressure Power, Exploiting Heat and Nuclear Power.

The third section — 'Working With Waves' — deals with Stretching Our Senses, Energy On The Move, Waves Through Matter, Waves Through Space and Communicating With Waves. These concepts are exemplified by dealing with 'things' involving: Light and Images, Photography, Printing, Sound and Music, and Telecommunications.

The fourth section — 'Electricity and Automation' — deals with Exploiting Electrons, Electricity and Movement, Electricity for Signals, and Machines that Control Themselves.

These concepts are exemplified by dealing with 'things' involving: Electricity, magnetism, Sensors and Detectors, and Computers.

There is an additional section at the end of the book, entitled 'Eureka!', dealing with the historical context of the various discoveries featured. This is followed by a useful dictionary of 'Technical Terms'.

Overall, this book is a welcome alternative to dreary technical manuals. It provides a comprehensive description of the workings of hundreds of machines and devices, backed up with explanations of the scientific principles behind each machine. The book has been conceived for readers of all ages and for those who find technology intimidating, and who wish it were less so. It succeeds in making such principles accessible to a wider audience. However, I personally hold some reservations on the authors' extensive use of 'the humorous analogy of a woolly mammoth to illustrate principles' in order to offer 'even the least mechanically-minded reader a window of understanding into the complexities of today's technology'. I feel that the over-use of the mammoth character on occasion detracts the reader from, rather than enhances, certain of the aspects being dealt with.

This is an invaluable book for anyone interested in and concerned with Technology in its many forms. It is required reading for anyone interested in overcoming inhibitions about Technology as well as being a useful reference for those involved in the

teaching and understanding of Design and Technology.

Peter Taylor

Starting CDT: Projects

By Keith Good

Heinemann Educational, £12.95

Here we have yet another loose leaf volume of 'good ideas for CDT projects'. There are twenty 'ready to go' project photocopiable for students on introductory course, illustrated largely through the use of cartoons. Each project offers a clear brief and a good deal of guidance on designing, making and evaluating the projects. It is a companion volume to the author's text *Starting CDT* and its stated aim is to help students to achieve independence and originality. The projects range from display stands through to, helicopters, roller ball games, space rescue simulations and wire bending construction. All are well presented and illustrated with that special kind of classroom humour that CDT teachers have often used with particular effect.

The main merit of the volume lies in its usefulness and its convenience. The likely outcomes of many of the projects are modest; the author offers too many suggestions for ends as well as beginnings to allow for a great deal of unexpected achievement. Yet perhaps the very modesty and predictability of the projects will heighten their usefulness in schools and workshops where there is no substantial tradition of highly creative and original work. Used as a starting point pupils could still go on from this book to effective achievement greatness in Design and Technology. Perhaps the most encouraging feature is the recognition that it is only an attempt to provide a starting point from which teachers may move forward. It also has the merit of being susceptible for use by older Junior school pupils — an area in which there is still a dearth of usable material of this kind.

John Eggleston

Choosing & Mixing Colours for Painting

By Jeremy Galton

Studio Vista £12.95.

This is an excellent book!

The author has written a very good 'recipe-type' account of colour mixing that amateurs with a newly-acquired interest in doing some painting and professional artists with experience will find both fascinating and informative. In this sense, it should be a useful source of reference.

Jeremy Galton is obviously an accomplished painter with a mature competence in using brushes and colours to produce quite exciting and vibrant visual images. Of course this stems, in part, from his colour mixing ability and understanding about the interaction of colours one with another and I, for one, am delighted in his willingness to share this expertise and knowledge with us. In my view, too many artists and craftspeople tend to protect their skills, keeping them tightly hidden near to their chests, but this artist has an openness that is most welcome.

He opens his text with an informative account of how pigments are made and this is supported with well-considered photographs. I was pleased to learn as much from these pictures as from the text itself, and they certainly gave me a desire to visit a paint-making factory to enlarge my own experience. Jeremy Galton then discusses a range of media, including *oil*, *watercolour*, *gouache* and *acrylic paints* as well as *pastels* — a drawing medium which complements them well, explaining briefly how each are made and how they can be used. This is a most useful section and it sets the scene nicely for the rest of the book.

The author goes on to suggest the selection of a suitable palette, and explains about the interactive occurrences in mixing paints. The text is admirably illustrated with basic charts in full colour — which shows us at a glance exactly what the author has in mind — so that the pragmatics of colour mixing is vividly explained.

The remainder of the book is equally well written. It is informative and Jeremy Galton — understanding the problems of colour matching, balance

and harmony in the production of paintings of various subjects — provides a most helpful aid. He is to be congratulated upon a fine publication. I am sure it will be welcomed by individuals and art groups alike.

John Lancaster

Starting Craft Design and Technology Books 1 and 2

By John Shipley

Longmans, £4.95 each

John Shipley's books joins an evergrowing selection of subject specific literature available to teachers of CDT. Within both books there is a range of topics and pupils to develop. Clearly, through the books there is evidence that these topics have been developed through actual teaching experience. It is also obvious that pupils have responded to many of the topics in a positive way.

The structure of the books, with the notion of 'increasing difficulty' within each topic, will help those pupils who experience difficulty in recognising possible solutions to the problems. However, the presentation of possible solutions may impede or hinder those pupils who wish to develop the topic in other directions. Essentially the books represent a sincere attempt to present a structured CDT Foundation Course. Care should be taken in using these books in isolation, rather they should be seen as part of the variety of resource material that is essential to any well balanced CDT course.

Andrew Shears