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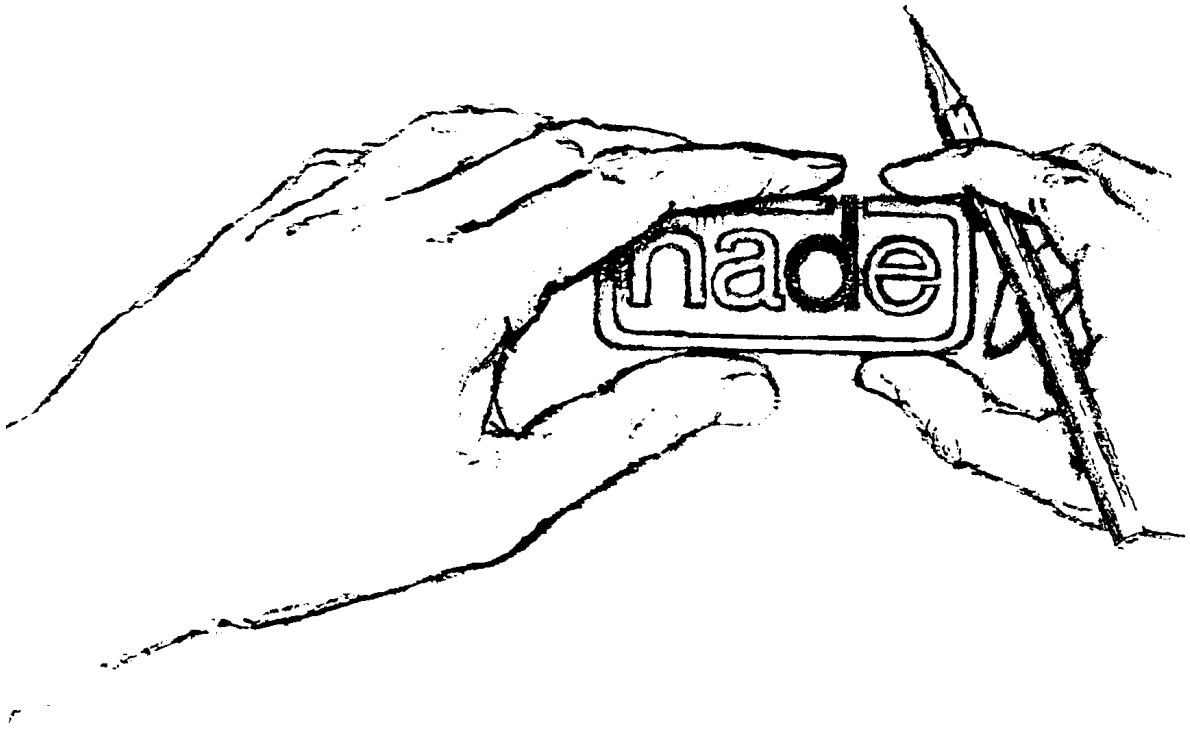

Journal.

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Contents

Officers

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Editorial

Richard Molyneux/Nigel Zanker

I'm sure many NADE members, now or in the past, would cherish the fond notion that we are (or were) an organisation that promotes change; equally one that attempts to influence opinion. However, in these days of websites running transatlantic software, one cannot be too careful; beliefs or pretensions like these may easily get you defined as 'an activist group', according to a program called WebSENSE. Others eager to join you, or merely visit you, may all too easily be denied access by this so-called 'protective software'.

Maybe, it won't happen anyway; one might perhaps be excused for being apprehensive as, courtesy of Nigel Zanker, NADE for the very first time now has its own website (www.nade.fsbusiness.co.uk). Despite the dastardly efforts of North Anglian Dealers in Escritoires (NADE Journal No.6) you can now find out what 'The Journal' didn't tell you and, maybe, excerpts from the NADE archive, which extends back to 1971. Nigel and I are now in the process of defining and listing the archive; both of us have had surprisingly good results in reclaiming 1970s typescript for the digital world. My first thoughts were what a boon it might be for researchers but, having looked back, I am also humbled by the progressive thought of NADE members (and their associates in organisations like the Design Research Association) in foretelling where Design might go (and often the manner of it). Equally, I'm cheered by the reactions of members such as Ken Baynes, who recently wrote to me, 'Let us keep in touch on the possibilities of digitising NADE material and also using 'The Journal' as a way of initiating research and debate through (the use of) draft texts'. Here, Ken has in mind the evolutionary nature of much design thinking and how this publication (and its digital alter ego) might serve that process; I hope he may give us more of his developing thoughts in the next issue, which is pencilled-in for October. At some time, by the way, we propose to dedicate one whole 'Journal' to the 'past which is still relevant' - looking, via the archive, for contributions which still have contemporary power; perhaps asking their authors for an update, an overview or even (perhaps) a reconsideration of their former thinking.

This particular 'Journal' is also a dedicated one - there is a strong focus on the nature of learning, where 'design' may be only the example. All of our authors witness this process; they are differentiated by time but all stand, Janus-like, looking forwards and backwards at an evolving discipline of thinking and doing. Phil Roberts begins by setting out some fundamental questions (page 5) and a new contributor, Carolyn England, takes us forward to the kind of designing which she, and her contemporaries may experience, one which may serve more of human need than pleasure. In his turn, David Buchan also looks beyond the 'bottom line' and, finally, Nigel Zanker looks at some key philosophical issues, set out for us within the field of information and communication technology (ICT) but having meaning for most practitioners and educationists, not solely those involved in design. This whole enquiry is fittingly prefaced by a short contemplation by Don Baines on the diffident relationship between Art, Design and Technology. Penned almost ten years ago, it serves also to remind us of the inclusive nature of NADE thinking over many years and its consistent support for dynamic forms of learning; I'm reminded, too, of what a powerful protagonist for design Don has been, hoping that he will once again become a contributor to these pages.

Looking again at the October edition, a principal feature will be a paper on the role of focus groups as tools for the designer; the authors, Deana McDonagh-Philip, Howard Denton and Anne Bruseberg, now suggest that designers themselves may undertake what characteristically has been done by market researchers and can, indeed, make a better use of such opportunity. They also note that these techniques offer benefits for sixth form students; further, perhaps, at the GCSE level. This issue also looks back on the graduate summer shows and their outcomes; we hope to include features on primary design education and on the impact of Curriculum 2000 on design and technology, as well as the debut of the Learning and Skills Council.

John Reeve

Mention of the primary field brings me to the situation that, with this issue, we shall be saying our goodbyes to John Reeve as an officer of this Association. We naturally hope that John will continue as a member and be able to contribute to The Journal.

John's was a constant presence at NADE meetings and events for many years, some of which he helped to organise; as a specialised primary teacher of design and technology and, latterly, as an Advisory Teacher for Northamptonshire, he gave much more to education. To visit John's school was to be introduced to a world in which eight and nine year olds, for instance, achieved work of a quite remarkable delight, creativity and sophistication, which compared favourably, in my experience, with that of fourteen year olds in schools less fortunate. As an advisor, he fought tirelessly for a better deal for primary design, in equipment, opportunity, timetable share and knowledge.

Latterly, John was NADE Treasurer; a rare treat was to receive a letter from him, addressed in the beautiful script of which he was a master. *His* were the only envelopes I ever thought worth saving in consequence; I shall miss their regular appearance.

All our best wishes, John, and many thanks for all you have done for NADE, your thoughts on design and your glowing example as to how we shall teach the younger pupil.

Membership and Contributing

NADE subscriptions are £15 (Ordinary Membership), £18 (Institutional Membership) and £6 (Student Membership). A NADE Membership application form, for new or rejoining members or institutions, may be enclosed with the Journal. Existing members should receive an invoice for renewal after a full year's membership. The NADE Journal is free to members, non members may obtain copies at a cost of £6 per issue, or £3 for individual articles.

Contributing to the Journal

Our aim is to publish four issues of the NADE Journal a year. This is only possible if material is submitted for consideration. Some suggestions as to the nature of contributions include:

- 'scholarly' or 'academic' articles relating to member's interests - research or otherwise;
- views on educational issues, including reform, change and polemic;
- comments, including reviews about educational resources;
- letters to the editors;
- examples of curriculum practice and innovation;
- forthcoming events that may be of interest to members (but please remember the three month gap between each issue);
- news from, and about, members (i.e. recent appointments, achievements);
- comments on articles in 'The Journal';

Formal papers are refereed and are welcome from both members and non-members of NADE. For these, please send an abstract (300 words) to Nigel Zanker for discussion before submitting the final material. Collaborative authorship is usually acceptable, especially where members feel unsure or inexperienced about writing for publication. There is help, advice and experience available in editing drafts and notes into publishable material; please contact either address below in the first instance. However, NADE reserves the right not to publish material that is felt not to be in its interests, or of those it represents.

All materials for the Journal should, preferably, be submitted in disc form, but clear typed copy can be put trough OCR process successfully. Either IBM PC/compatible or Apple Mac disc formats are acceptable provided text is saved in Word' or ASCII format (text only or RTF). Other formats: ZIP, CD, etc, please ask.

All correspondence relating to 'The Journal' should be sent to either:

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or

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The Relationship between Art, Design and Technology

Don Baines

Some thoughts for discussion

1 The anonymous designers of the National Curriculum' chose to ignore the available rationales for designing to be considered an important activity within any general educational programme. These rationales argue for design education in various ways - epistemological, psychological, sociological, cultural, practical, to name but a few.

2 The National Curriculum's promotion of 'Design and Technology' (under the umbrella of Technology', alongside 'Information Technology') as a separate subject from 'Art and Design', reveals the anonymous designers' lack of understanding of the underlying principles of designing as a human activity and designing as an educational activity.

3 Any attempt to relate 'Art and Design' to 'Design and Technology' will break down if the arguments for 'designing' as an educational activity are ignored, or dismissed, or not engaged in. (Some practitioners of 'Art and Design' - spoken as if it were one word - refuse to engage in the argument, claiming that verbalising diminishes their art. This is to make a category mistake- the reflection on an activity is not to be confused with the practice of an activity. It might be claimed that teachers who are not 'reflective practitioners' are poorly equipped to plan effective activities for the pupils or students in their care.)

4 Part of the epistemological argument for design education insists that 'designing' (the gerundial form) is stronger than 'design' (the noun form). The argument overlaps with the psychological/neurological argument that learning is dynamic, and results from activity. The corollary of this argument is that 'knowledge', too, is dynamic and that 'knowing' is a more accurate description of those processes that make up human cognition.

5 In educational activities 'learning' (participle verb) may take the form of different actions on the part of the learner. 'Designing' is one such action, and may occur in any subject area. The capacity of the human mind to model 'in the mind's eye' in two and three dimensions means that 'modelling' - the language of designing - occurs frequently in such traditionally defined areas as art, craft, and home economics. These subjects have been referred to as 'design-based subjects' for this reason.

6 The shorthand use of nouns to describe areas of educational activity (Science, History, Mathematics, English, etc) is defensible and practical. In all areas the actual learning undertaken by children is described in terms of verbs or gerunds: investigating, exploring, observing, describing, calculating, measuring, contrasting, hypothesising, creating, composing, elaborating, analysing, synthesising, criticising, resolving etc. In art lessons children engage in all the above activities (when properly taught), as they do in craft, technology and home economics (again, when properly taught).

7 There are historical reasons for the subject once known as 'Art' in schools to now be called 'Art and Design'. In part the dual label stems from the tradition in art schools and colleges of dividing art activity into 'Fine Art[1] and 'Applied Art' (rather like 'Pure Mathematics' and 'Applied Mathematics') - what Tom Hudson once called 'the academic hoop and the practical stile for two very different forms of jumper'. Peter Green has observed that 'Art' in many schools is thought of as being, at one end of the continuum, for the 'gifted', while at the other as for the 'practical' or 'non-academic' pupil.

8 The tradition lives on in the practice of many art teachers, who regard 'Fine Art' - drawing, painting and sculpture - as somehow special in comparison with the applied arts of pottery, printmaking and textiles. Such teachers may regard the National Curriculum division of 'Art and Design' into an 'aesthetics' grouping (with performance arts such as Music and Drama) as desirable. But this division ignores the significant epistemological differences between much that counts as art activity and the very specific intentions of music and drama teachers.

9 'Art' became 'Art and Design' when proponents wished to indicate that the subject area embraced other than the 'Fine Art' tradition. (Possibly some felt that the 'and Design' gave a certain academic respectability, or perhaps deflected criticism from those of a utilitarian bent.) Many art teachers were happy to accommodate 'traditional' applied art 'design' activities - ceramics, textiles, graphics, photography etc. - but were loath to engage in other designerly activities more usually associated with the fields of industrial design, engineering and architecture.

10 Apart from a reticence to deal with hitherto unknown areas (which is understandable, though not defensible), many art teachers suffer from a lack of reflection on their practices, particularly within the context of educational activity. Many regard their task as the 'transmission' of knowledge, skills and cultural insight, and are wary of any activity that their initial training has not prepared them for. With such a view of their contribution to children's learning it is not surprising that they fail to understand the relationship of art activity (not 'Art') to similar activities in the craft or technology field. Instead of recognising the educational power of the activities listed in (6), above, they list their pupils' experience in terms of materials - paint, clay, fabric, plaster - and in terms of abstract qualities - line, tone, form, colour. It would be analogous to an English teacher defining his or her practice as 'paper, print, pencil, biro, felt-tip, rollerball... or words, sentences, phrases and paragraphs.'

11 Many people, both inside and outside art education, tend to follow unthinkingly the utilitarian misconception that painting pictures, drawing and sculpting are not, strictly, design activities. They accept the Tine' and 'Applied' art distinction. While the distinction may have proved useful in the training of professional artists and designers, in schools the division weakens much that is good in design educational practice. For a pupil who is exploring his or her thoughts and feelings through the activity of painting from imagination, or drawing from a life model, is designing, and the painting or drawing is as much a 'trace' of the learning that is going on as is a Technical Lego buggy or a model of a cantilever bridge. When that pupil's teachers recognise the significance, educationally, of the painting and drawing activity, then they are in a position to:

- evaluate the activity, and plan further worthwhile experiences;
- work co-operatively to enrich that and other pupils' learning;
- draw the pupil's attention to related activities in other curriculum areas;
- advise, influence and persuade parents, politicians and policy makers of the strength of the design education arguments.

12 NADE's task, in this area, would seem to be that of developing the sort of critique I have roughly attempted here, and to set our long-term goal the eventual unification of Art and Design with Technology in the National Curriculum. The short-term goal is to support those teachers in both areas who recognise the weakness of the present NC model, and who breach the unnecessary gap in their own teaching.

The Field of Design, The Act of Designing, and The Curriculum Subject of Design and Technology

Phil Roberts
Department of Design and Technology, Loughborough University

Abstract

Some fundamental questions are raised as starting points for reflecting on the nature of the field of Design, the act of designing, and the school curriculum subject of Design & Technology (D&T). Brief reference is made to D&T in the National Curriculum (England); and to the changing emphases in its associated pedagogy. Finally, attention is drawn to some topics that would merit reflection and inquiry on the part of practising D&T teachers.

Keywords: Design, designing, D&T, pedagogy

What is Design? (Or: How is 'Design' (and its constituent activities of designing) distinguishable from other-than-Design?)

The term 'Design' is used here to refer to a dimension of human experience and activity. In relation to professional practice (and to educational practice) it represents a broad field. Thus, when thinking of tertiary education, the *field* of Design encompasses specific, well-established, and distinguishable *areas* of design-based activity together with associated subject phenomena such as graphic design, textile design, industrial/product design, architectural design, engineering design. When thinking of general education, Design and 'design education' typically refer to curriculum subjects such as Art & Design, Design & Technology (D&T), Textiles, elements of Home Economics, as well as to craft-based areas; (in this context, D&T is the name of a school subject).

Can Design be distinguished from those two broad pillars of education, the Humanities and the Sciences? We could make a start by considering a cartoon of differing kinds of knowledge and differing ways of knowing. Science deals essentially with describing and explaining the world; the Humanities deal essentially with being a human being. Neither deals with action: that is, with acting in and on the world. Consider Figure 1, which describes Design as a 'third area' – distinct from Science and the Humanities.

The repository of knowledge in Science is not only the literature of science but also the analytical skills and the intellectual integrity of which the scientist is the guardian. The repository of knowledge in the Humanities is not simply the literature of the Humanities but also the discursive skills and the spiritual values of which the scholar is the guardian. In Design, the repository of knowledge is not only the material culture and the contents of the museums but also the executive skills of the doer and maker.

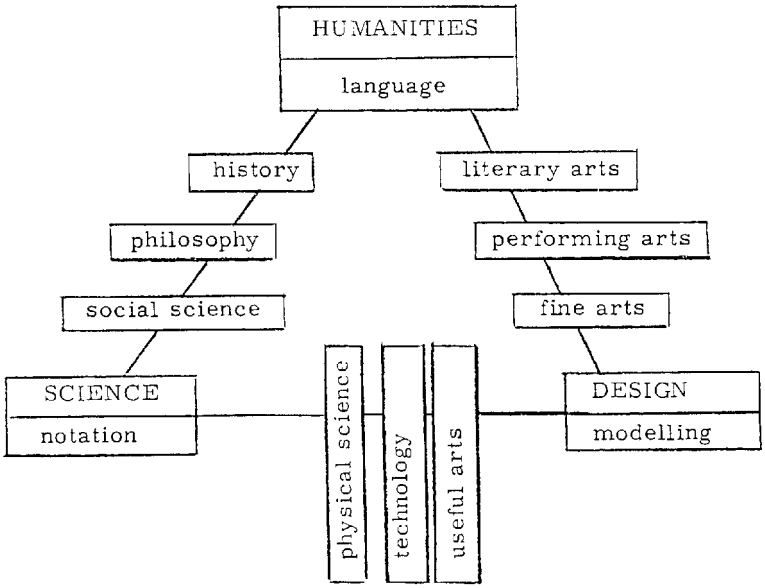

Figure 1: Design as a 'third area', analogous to Science and the Humanities
(Source: Royal College of Art Report, *Design in General Education* (1976: 16))

The repository of knowledge in Science is not only the literature of science but also the analytical skills and the intellectual integrity of which the scientist is the guardian. The repository of knowledge in the Humanities is not simply the literature of the Humanities but also the discursive skills and the spiritual values of which the scholar is the guardian. In Design, the repository of knowledge is not only the material culture and the contents of the museums but also the executive skills of the doer and maker.

Although the design-educational debate has become more refined by now, the Report from the Royal College of Art enquiry, *Design in General Education* (1976), offers two definitions that still have value:

> The term 'Design' can be used in an academic or very general sense to describe one of the broad divisions of man's concern, competence and
> Knowledge, thus: Design is the field of human experience, skill, understanding and imagination that is concerned with the conception and realization of new things and events and particularly with man's appreciation and adaptation of his surroundings in the light of his material and spiritual needs. In particular, though not exclusively, it relates with configuration, composition, meaning, value and purpose in man-made phenomena.

And

> The term 'Design' can be used to categorise a range of activities and disciplines which are characterized by being anthropocentric, aspirational and operational; that is,

> that are man-related, that have a value-seeking, feeling or judging aspect, and that have a planning and making aspect. (1976: 43-44)

Figure 1 draws attention to the essential 'language' of Science as being notation (and especially mathematical notation); to the essential language of the Humanities as being natural language; and to the essential 'language' of Design as being modelling. We shall return, later, to modelling: meanwhile, let's just make a mental note of it.

What Subject Matters do Designers (and Children, when Acting in the Role of Designer) Attend to? (Or: How can design phenomena be characterized?)

Designers deal with real-world situations (or states of affairs). Such states of affairs are not – cannot be – easily contained within the boundaries of professional disciplines; nor within the boundaries of school curriculum subjects. In the professional disciplines, the boundaries of those disciplines may, albeit in a simple way, be identified by the particular discipline's outcomes: that is, by things (or artifacts), or messages (or communications), or by places (or environments). People's lived experiences do not fit readily into such categories. The states of affairs – or at any rate the full-blown states of affairs – on which designers focus their attention and skills are typically referred to as 'ill-defined' or as 'ill-structured'. They are not puzzles, which, by definition, have solutions (that are a function of the rules). Nor are they solved: ill-defined states of affairs are never finally and definitively solved – they are re-solved over and over again; and each resolution of the originating state of affairs brings into existence new, and different again, states of affairs.

(Designing – and D&T too for that matter - are frequently referred to as problem-solving. It is more useful, however, to think, not in terms of problem-solving, but of problem-centred activity. And it is crucial to remember that design problems are not to be confused with, say, science problems: the field of Design is not a down-market derivative of Science; nor is it, simply, applied Science. Design problems belong in a class of their own.)

What is Designing

Figure 2 shows a simple model to illustrate the nature of designing and its associated phenomena: designing is represented as a continuing series of overlapping 'episodes', which represent the designer's focus of attention on a specific state of affairs. And, notice, by the way, that the question, "When is a problem?" is a much more powerful question than, "What is a problem?" . The two questions also reflect significantly differing conceptions of the nature of designing, one being based essentially on artifacts and their production, the other being based in states of affairs in people's lived experience. These two conceptions result too in radically different approaches towards pedagogy.

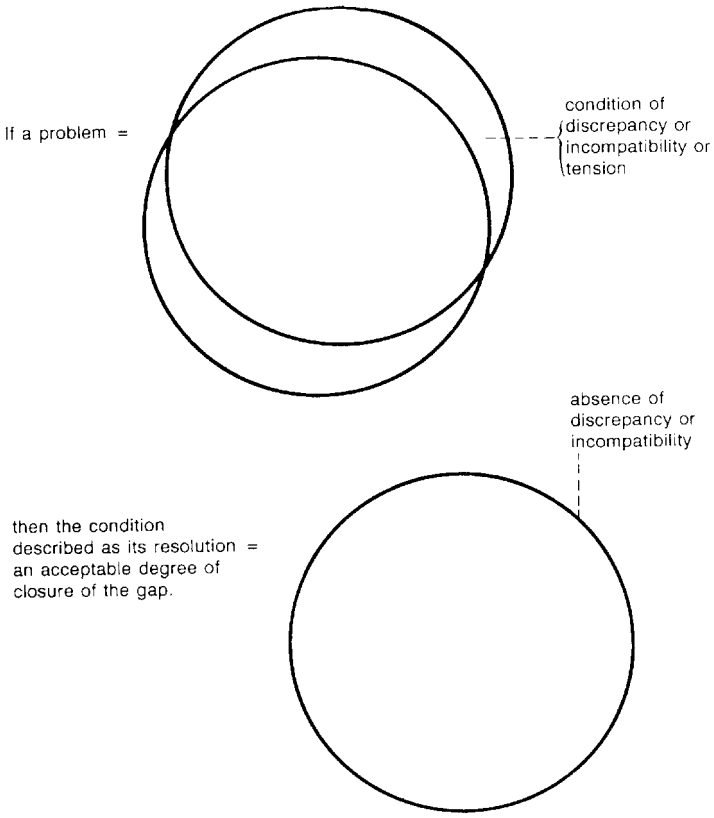

Figure 2: "When is a problem?"

Designing, on this view, consists in taking action in and on the world: in a deliberate and intentional movement from one state of affairs to some other (preferred) state. It is operational, concerned with bringing about some required change. It usually, though not necessarily, involves the design and making of things (and perhaps systems) as *means* towards achieving these desired ends. In D&T education, pupils engage in activities that are also intended to bring about change: change in them – their competence in dealing with real-world states of affairs, their knowledge, sensibility, and awareness. In D&T, the designing and making of artifacts are the *means* towards educative *ends*, and not ends in themselves. It is change – or, better, changing – that is the essence of designing and of D&T activity.

Can design problems, or real-world problematic states of affairs, be characterized? Table 1 suggests the principal characteristics of ill-defined (design) problems.

An uncertainty in the propriety of the grounds upon which decision-making might be made: that is, the grounds are unclear and cannot be generalized from no matter how many particular instances;

A uniqueness: that is, the problems are situation-contingent, and unique in particulars that cannot be exhaustively and generally nominated and specified;

An involvement with compromise: that is, their articulation and their 'resolution' require judging between, possibly (and probably), competing criteria; or, put differently, valuing is central;

Unpredictability of outcome: that is, we cannot predict, precisely, the outcome of our taking action. (The required ethic is for accepting the possible or the actual consequences of our action insofar as those consequences might be imagined or calculated.)

Table 1: Principal properties of ill-defined problems

So far, so reasonable. Now let's return to the matter of the *language* of Design and of designing. Here, we are not referring *to the meta-language* of discourse *about* design phenomena which employs natural language. We are referring to the *cognitive language* of designing: that is, to cognitive modelling as being the capacity of mind which is essentially engaged when engaged in the act of designing. This is not natural language, nor is it the notation of mathematics. By cognitive modelling, we refer to the ability to form images "in the mind's eye" – and notice, in passing, the necessity of the metaphorical expression – of things and systems as they are are, or as they might be; and to the ability to evaluate them and transform them so as to gain insights into their structure and into the likely quality of fit between alternative conceivable requirements. We cannot only model states of affairs (and things) as they are, we can also imagine and model states of affairs (and things) we have never seen, and which do not yet exist.

Cognitive modelling is independent of language or symbol systems but when appropriate the concepts modelled can be translated into or supplemented by language or notational terms. The image is usually externalized through models and simulations, such as drawings, mock-ups, prototypes and, of course, where appropriate, language and notation, or it can be embodied into the construction or enactment of the emerging responses. Without this externalization, the concepts modelled would remain private and inaccessible to others.

That is sufficient of design theory, at least for the present.

Back now to D&T in the curriculum of general education. Let's immediately make some distinctions. We can talk about design activity as something we all engage in, and having no necessary connection with the activities of the school subject of D&T: that is, Everyone is a designer. We can refer to design activity when we are talking of a school subject *and* the areas of tertiary education; and we can refer to professional design activities such as are

practised by, say, industrial designers, by architects, or by graphic designers. Some of the diversity of activities may appear to have similarities and, indeed, some curricular and some professional activities are. But they are not the same; some of the curricular activities are, rather, designer-like. The frequent but innocent conflation of such 'similar' activities hides the fact that they are not inter-changeable at all: their functions and their agents' purposes are different. It is not at all logically obvious, for instance, that the professional practice of the product designer should, or does, provide a model for emulation in general education. That is not, however, to say that one cannot learn from the other.

In the UK, Government has recently issued an updated version of D&T in the National Curriculum. We can get a flavour of it through a couple of extracts. Referring to 'the importance of design and technology', we read:

"Design and technology prepares pupils to participate in tomorrow's rapidly changing technologies. They learn to think and intervene creatively to improve the quality of life. The subject calls for pupils to become autonomous and creative problem solvers, as individuals and members of a team. They must look for needs, wants and opportunities and respond to them by developing a range of ideas and making products and systems. They combine practical skills with an understanding of aesthetics, social and environmental issues, function and industrial practices. As they do so, they reflect on and evaluate present and past design and technology, its uses and effects. Through design and technology, all pupils can become discriminating and informed users of products, and become innovators." (DfEE/QCA, 1999: 148)

Later, an introduction to Key Stage 3 (ages 11-14) Programmes of Study tells us that,

> "During key stage 3 pupils use a wide range of materials to design and make products. They work out their ideas with some precision, taking into account how products will be used, who will use them, how much they cost and their appearance. They develop their understanding of designing and making by investigating products and finding out about the work of professional designers and manufacturing industry. They use computers, including computer-aided design and manufacture (CAD/CAM) and control software, as an integral part of designing and making. They draw on knowledge and understanding from other areas of the curriculum." (*ibid*: 153)

And an introduction to Key Stage 4 (ages 14-16) Programmes of Study tells us that,

> "During key stage 4 pupils take part in design and make projects that are linked to their own interests, industrial practice and the community. Projects may involve an enterprise activity, where pupils identify an opportunity, design to meet a need, manufacture products and evaluate the whole design and make process. Pupils use ICT to help with their work, including computer-aided design and manufacture (CAD/CAM) software, control programs and ICT-based sources for research. They consider how technology affects society and their own lives, and learn that new technologies have both advantages and disadvantages." (*ibid*: 155)

Ignore for the moment the rhetoric and the hugely ambitious scope of these Programmes: they provide, at least, an indication of the general policy thrust that underlies the introduction of the D&T curriculum in the UK. Implementation is, of course, another matter and indeed another story altogether. (And, in any event, curricula are never finished: they continue

evolving; they are not a finished artefact.) Nevertheless, the huge changes that have been coming about in the school subject of D&T over the past several years are beginning to show themselves more clearly. For the sake of convenience, we can focus on three aspects and represent them through questions, thus: What are the changes for pupils, and for the way we teach? What are the 'big questions" that we need to address? and, What do we need to know more about in the principles, practice, and theory of D&T education?

What are the Changes for Pupils, and for the Way we Teach

The principal changes can be represented in a Table:

The role of the teacher: manager of resources; facilitator of learning

More technological knowledge and competence required

Continuous review (and renewal) of the D&T curriculum and its courses: the curriculum is never a finished artefact

The need to address, more explicitly, the development of pupils' modelling ability (through drawing, the use of CAD, transformations between 3-d and 2-d representations of design proposals, plus mathematical notation and ability in the use of language)

TEACHING AND LEARNING:

An emphasis on LEARNING (rather than on TEACHING)

An emphasis on ACTIVE (rather than passive) LEARNING

An emphasis on REAL PROBLEMS

Attention to: How do we want to live? What kind of society do we want to live in?

PUPIL-CENTRED

NEW DEMANDS:

Skills of thinking; identifying real problem (that require a technologically-informed response); planning, making, and evaluating the results and consequences of having taken action; finding information and data (and thinking of the questions to ask); dealing with competing sets of values and criteria; understanding the importance, the benefits, the limitations, the limits, and the effects of technologies; relating and understanding human purposes and technologies

Table 2: Changes in D&T and its pedagogy

What are the 'Big Questions' that we need to Address?

What is *the nature of the design capacity and its functioning?* (that is, the capacity that is necessarily engaged when treating with design phenomena). Or: *How is it possible to design at all?*

What are *the distinctive natures of design phenomena* with which professional designing, designer-like, and D&T educational activities deal?

What (and whose) *developmental 'stages', needs, attributes, aspirations, hopes, and values* are to be attended to when engaged in learning-through-D&T?

How is the *design capacity* developed (that is, towards *design ability*) through *deliberately organized activity*? (that is, what do we need to know and understand better about the nature of the curriculum and its associated teaching and learning?)

What *knowledge, competence, intellectual and personal qualities, attitudes, and values* would be appropriate to being at ease with the conditions of the 21st century, and can be developed through D&T educational activities?

What *cultural, societal, economic, ideological, political, technological (and other) contexts, dimensions, and factors* require consideration of their present and future effects and influences?

What effects do *the diversity and, essentially, the constraining factors of educational (and other) institutions have on the above questions?*

Table 3: The 'big questions'

What do we Need to Know More About in the Principle, Practice, and Theory of D&T Education?

Many practitioners, and not least in the D&T education community, are not sympathetic to (what they see as) theory. There is a strong strain of the anti-theoretic, not to say the anti-intellectual position amongst practitioners. Some of this absence of sympathy is well-founded. But, in general, it is damaging: all practitioners practise in accord with some theoretic position, implicit or explicit. And we cannot say whether our taken-for-granted practice is as good as it could be, or could be better than it is, unless and until it is tested by critical reflection. We might find, but it seems unlikely, that, indeed, inarticulate knowledge is the better. In any event, when innovations are required, or are thrust upon fields of practice, it becomes *a necessity* to construct new models of practice: it is new models that enable us to be at ease and competent with new curriculum content and practice. Innovators necessarily construct models and theory; and the implementation of new policies and new content requires the construction of new models within teaching and learning. As we change as people - as our understandings change - so our teaching and learning change too. Teachers

are able to maintain their own professional responsibility and change themselves – that is, by their own efforts – more than they sometimes appear to believe.

When it comes to what do we need to know more about or understand better to the benefit of D&T education, everyone will be able to produce their own listing. But there are some topics that, particularly, practising teachers can reflect on and, in so doing, bring about changes in their own models of curriculum and educational practice. The following, then, are no more than suggestions of starting points for individual or collective attention.

.1 design phenomena; the nature and purposes of designing in specific areas of activity; the development of designing and curricular activities, with particular attention to the philosophical and operational significance of ICT

.2 the Design (and, more specifically within that, the D&T) curriculum; teaching and learning in the curriculum subject area of D&T (as distinct from the tertiary-level curriculum and syllabus in the area of Product Design

.3 the nature and structure of design and technological activity in professional areas of practice and in the general educational curriculum, with particular attention to differing functions, purposes, and contexts, and to communication, product, and environmental design

.4 the nature and functions of models and modelling in design and technological activity; the act of cognitive modelling; modelling as the language of designing; drawing as a sub-set of modelling; design as a fundamental capacity of mind disclosed through modelling; the relations between modelling and its technologies (including ICT)

(It's worth dwelling, briefly, on this one. It may sound esoteric to the hard-working teacher but, in fact, the models we use – and we cannot practise without using them - have a direct bearing on the nature and quality of our would-be educative practices.

For instance, in the UK's National Curriculum version of D&T, the Programmes of Study (that is, the required content) appear, at first glance to describe a process model of practice. That seems reasonable and, indeed, potentially very helpful. The model purports to describe how designing happens. But its weaknesses are serious. First, it is not a good model of how designing, in all its messiness and complexity, happens, in all its messiness. Second, it is a particular model that is offered, innocently or naively, as though it were a general model. And third, it is of course offered via language. But the logic of language – linear and sequential – is not the logic of designing (nor of learning-through-designing). Finally, in practice the most damaging, the model is used as an assessment model, leading to a mechanistic and reductionist check-list approach rather than to a more appropriate holistic judgement. In spite of the best of intentions, then, teaching – contrary to the nature of learning – becomes (unless we are very careful indeed) dominated by a not very well-founded assessment model. Such models can become the new orthodoxy and very difficult to move away from.

But the fundamental issue here is that there has been a failure to recognize the nature and status of models, and to distinguish between the model and the phenomena to which it refers. The effects on the quality of pedagogy are damaging, the more so to the extent that the distinction is not recognized. Models are not the real thing: they merely refer to their subject phenomena. They are more or less useful; but they are not necessarily for believing in.

What may first be pejoratively dismissed as 'all talk, all theory' becomes central to the nature of teaching and learning.)

.5 the relations between modelling, natural language, and notational systems; the nature and functions of metaphor and representations

.6 design epistemology, with special regard to designing as a model of developmental epistemology; designing, modelling and cognition; the relations between designing – both generally and in given areas of design – and learning

Table 4: Particular areas and topics for the teacher-as-researcher within D&T education

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Finally, education does not exist in isolation.

It is not just research into, about, and for design activity and design phenomena that is bringing new insights and new objects into designers' and educators' attention. In industry as well, over the past 20 or so years there is ample evidence of increasing attention being given to the significance of 'design': as 'something' that adds value. In the UK, such bodies as The Design Council have long promoted the value of design to industry, to education, and to the cultural-economic well-being of society.

The trend is illustrated in the comments of a Vice-President of Philips Electronics NV, Dr Frank Carruba, when speaking (in 1993) of a shift from creating products and profits to a focus on *creating customer benefits* through the design and production of *people-pleasing products*. He spoke of 'products that use technology to encourage the individual's cultural growth, promote the enhancement of the senses, and extend the individual's knowledge. (…) it is necessary to cease thinking of the product as an end in itself. It must be a creator and carrier of knowledge, services and emotions'. And still speaking of the shift of focus towards 'people-pleasing products', and in a passage that could, almost, as well be referring to D&T education, '… focusing on the growth of people, addressing the quality of life, ease and pleasure of owning and of use, exceeding user and customer expectations, promoting the fusion of available technologies, and meeting manufacturing and environmental requirements'. (Carruba, 1993)

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The Future of Design

Carolyn England

What will happen to design in future years? What will be the aims of the product designer or teacher of Design and Technology? What will design mean and how will it be evaluated?"

The ever-increasing rate of change currently occurring in the world will inevitably lead to substantial alterations to design in future years. In order to maintain pace with the technological advances, it will be necessary to adopt new design strategies and to alter attitudes towards design. Design will assume new meaning and will have new objectives. Consequently, design will be evaluated differently. Perhaps design will be judged on the contribution it makes to survival, through analysis of factors such as environmental consequences of the product, how successfully the product meets the requirements of the consumer, and whether the product benefits those people who are most in need. Consumers may, themselves, evaluate the merit of products in terms of ecological factors in place of aesthetic appeal. Maybe the future will see transformations in the quantity, quality and type of products produced.

Dieter Rams discusses the future of design in his article entitled "We must design a future where less is more". He raises major issues concerning the rapid rate of change due to technological advances that is presently occurring in the world. These changes will certainly continue to take place at an accelerating pace in the years to come. Similarly, Alvin Toffler considers the effects of the changing world in his book *Future Shock*, which describes how he believes people will react to the rate of change:

> "They will fall victim to tomorrow's most menacing malady: the disease of change."
> (Alvin Toffler, *Future Shock, 1974.* p 39.)

Toffler feels that people will not be able to cope with life in the future, as they may not be able to adapt themselves fast enough to maintain pace with the technology. Instead of technology being life enhancing, perhaps it will prove to be fatal if it advances so much that it is uncontrollable. Ideally, technology should act as an aid to enable global communication and travel, to maximise efficiency of work, and to provide leisure opportunities and medical benefits. However, technology should be designed to match the requirements and capabilities of the human. The human should not have to alter to fit technology, as "man is not infinitely adaptable".

As a result of technological advances, economic growth in the industrialized countries is accelerating, creating a wider gap between the developed and developing nations. Unless designers adapt a new approach of "less is more", this gap will continue to increase as the output of goods in the industrialised countries increases. Dieter Rams uses this expression to emphasize that it is not the quantity of products manufactured that is of greatest importance but, rather, the quality and versatility of the products. For example, much material wastage

could be reduced considerably through the development of multifunctional appliances. This opens up a whole new field for potential future design in which innovative interaction and increased compatibility between products would be encouraged through a systems approach to design. The "systems approach" is a way of tackling interrelated products holistically, in order to obtain a solution that satisfies the requirements of all the components, rather than solving each problem separately and then attempting to link the components.

Design has always been difficult to define precisely, as it encompasses so many skills from such a wide range of subjects, including science, mathematics, and art. Design involves creativity, decision-making, problem resolving and innovation, and it can have long-lasting social, moral and ecological consequences:

> "Decision making in the face of uncertainty, with high penalties for error."
> (Asimow, Christopher Jones, *Design Methods,* 1970.)

Design aims to continuously improve our lives in some way or other, hence it is about new ideas or new applications of ideas that have not previously existed. Therefore, designing is unpredictable, as it involves creating images of things that do not yet exist. There are no "right" or "wrong" answers in design, only (in terms of outcomes) "better" or "worse" state of affairs:

> "Solutions to "wicked problems" are not true or false, but good or bad or better."
> (Horst Rittel & Melvin Webber, *Man-Made Futures,* 1974, pp272-280)

Consequently it is difficult to evaluate the result of design, because there are no rules to tell us when we have reached a solution. Designers have to make a sensible judgement on when to reach a conclusion, based upon their own (or their client's) satisfaction with the product or service. However, the evaluation of design will become more precise in the future. This will be due to the introduction of specific guidelines for objectively assessing the success of a new product or service. Design will .be evaluated in terms of its long-term environmental and social consequences, and its appropriateness to the needs of the consumer:

> "The designer must be conscious of his social and moral responsibility."
> (Papanek, *Design for the Real World, 1997,* p 102.)

The future designer will have to take responsibility for what they bring into existence, because designing is ethically based. There will always be competing views held against a design proposal, due to the great diversity of cultures. However, it will be the task of the designer to negotiate a moral, social and ecological compromise, or otherwise they may face legal action.

The meaning of design will inevitably change in the future as a consequence of the accelerating pace of change, and with the introduction of new approaches to design. One major change will be the move towards "inclusive design", which means obtaining the best possible solutions for the largest number of possible users. This design strategy will involve broadening the expertise of a design team to include the users or consumers of the final product or service. Through "inclusive design" the view of society will be represented when major design decisions are made, hence designing will become more democratic. Their experience, knowledge and personal views will be vital to the successful resolution of a design problem, because design in the future will mean design for society. Products and

services will be judged by how successfully they meet the requirements of the people using them:

> "Companies need to become more diagnostic and less prescriptive in their approach."
> (Philip Ross, 'Unfurnished Business', *FX*, March 2000, p32)

This emphasizes the need for designers to respond to what society actually needs. It is vital that future designers provide user-friendly products that satisfy end-users, rather than being interested only in the commercial or aesthetic aspects of design. Consequently, ergonomics will play an increasingly important role in design in the forthcoming years.

In the future, design will be assessed in relation to the moral and social consequences of the product or service:

> "Would your project if carried through promise benefits to the community, and if so what are these benefits, how will they be distributed, and to whom and when will they accrue?'
>
> (Tony Benn, 1970)

Tony Benn highlights the necessity for design to be aimed at specific markets, so that everyone in the world benefits from future projects. All too often, it is only a minority of people who actually benefit from design, as the products and services are inaccessible to a large proportion of people. It is usually only the developed countries that can afford to make use of the technology available, or that have had the opportunity through education to acquire the necessary skills.

Therefore, in the future we will see a shift towards "Design for the Third World". This will require a dramatic change in the attitude and aims of the product designer:

> "It was up to the designer to knock on doors that had never opened before."
> (Papanek, *Design for the Real World, 1997,* p 37.)

Designers will be responsible for making the benefits of design accessible to people who do not usually gain from design. To achieve this, they will need to be willing to sacrifice at least a proportion of their time and salary to designing for people in need, and in doing so they will adopt a policy of:

> "Designing for many instead of designing for money."
> (Papanek, *Design for the Real World, 1997,* p 69.)

Instead of producing novelty artefacts for a minority of wealthy consumers, the designer will be creating products and services that will make dramatic long-term improvements to the lives of many people. This will encourage a move towards designing for "need" as opposed to designing for "want". Hence design in the future will be partly evaluated in terms of the advantages it will bring to the developing countries.

Similarly, design will be assessed in terms of its contribution to the lives of the elderly and disabled. "Good" design will be considered to be that which enables the disabled to become "able". Product designers will strive to design products and services that will provide more opportunities for people with disabilities. Credit will be given to those products that are

universal in function, aesthetics and ergonomics, and whose appearance is non-discriminative. Ideally, designers should aim to design products that meet the requirements of the largest number of people possible, including the young and elderly, the disabled and the less fortunate:

> "By designing for the most vulnerable, you end up designing for all."
> (Paul Snee, RNIB Product Manager)

If a product can match the requirements of such a variety of people's needs, then it can almost certainly be used by anyone.

Simplicity of the product or service will be another criterion in evaluating design. Maximum credit will be given to a design that accomplishes its designer's intention in the most economical and minimal way:

> "Is there a cheaper, simpler and less sophisticated way of achieving at least part of the objective that you have in mind....?"
> (Tony Benn, 1970)

"Good" design will be that which provides an "elegant solution". This means that future design should not only have an uncomplicated appearance, it should also be as simple as possible to use and maintain.

Minimalism will also be vital in terms of the use of materials and energy resources required for product manufacture, use and disposal. Due to the rapidly depleting supply of the earth's natural resources, the future designer will have a greater responsibility to limit the use of these resources and to turn to alternative materials wherever possible. Design will be evaluated in terms of its ecological consequences and, hence, designers will be forced to move towards "green design". This will result in inevitable changes to the design approach:

> "Many designers assume that their area of responsibility is limited to function and appearance."
> (Mackenzie, *Green Design,* 1997, p8)

The designer's role will not only be to produce items that perform well or that possess aesthetic qualities. It will also be to preserve the world's natural resources, to reduce pollution and the effects of global warming, and to limit waste. The designer will aim to meet these requirements through a growth in design for renewable, non-polluting energy resources, and design for reuse, recycling and remanufacture. These strategies all support a reduction in the quantity of goods manufactured in the future. This would alter the way that products are perceived, by changing the emphasis away from ownership and materialism towards a society that is more concerned with moral and life sustaining issues. The new design approach will also involve the work of environmental specialists throughout the design process. In this way the 'designer' will have a continuous source of knowledge and understanding of environmental issues that can be applied to future products and services, thus significantly reducing the risk of long-term ecological disasters.

Not only will future design be "environmentally friendly", it will also possess an ecological appearance, because a new "organic" style, influenced by the forms of nature, is arriving on the design scene. The use of organic aesthetics supports long-term use and the conservation of resources. This will help encourage designers and consumers to gain a more positive attitude towards "green design":

"Nature will always be a visual inspiration."
(Aidan Walker, *FX*, March 2000, p13)

This combination of natural aesthetics and ecological design will lead to the development of holistic products, that are commercially viable in addition to environmentally sound.

Change is currently taking place so rapidly that even the lifespan of products has been reduced for transient purposes. Throwaway products, modular buildings and temporary structures are all designed for short-term use, and therefore lack durability. Consumers are encouraged to purchase replacement products more and more frequently, as a result of obsolescence. However, this will all change in the future as we experience a move towards long-lasting products:

"Optimisation of longevity and usefulness."
(Dieter Rams, *The Independent,* 5th January 2000)

Evidently, the longer a product lasts, the less often a replacement needs to be purchased, so materials are conserved, consumer costs are reduced and the amount of energy consumed through manufacture is lowered. So in the future, designers will need to aim towards increased durability. Not only will the materials and technology need to be long-lasting, but so too will the aesthetics in order to discourage people from making purchasing decisions based upon trends in fashion. Product appearance will no longer be determined by fashion. Instead products will tend to have more classic, timeless aesthetics. Thus consumers' purchasing decisions will be influenced primarily by product performance, and aesthetics will play a less important role in the years to come.

Teachers of Design and Technology will be required to change their aims and teaching methods to provide the opportunity for designers to gather the knowledge, skills and experience necessary for becoming successful designers of the future. Thus, a new curriculum will be introduced that will highlight the importance of moral, social and ecological design. Teachers will need to encourage the creation of multidisciplinary teams comprising students of varying ages and cultures. These teams will work together on real-life projects and their resolutions to the design problems can be passed on to relevant organisations, thus developing the experience and skills needed for creative problem solving. Teachers themselves will need to be involved in design practice in order to provide students with up-to-date information and personal experience. It will then be their responsibility to educate future industrial designers to encourage a wise and appropriate use of design skills to devise products that meet the requirements of the future.

It is evident that the profession of design will radically alter in the forthcoming years, due to the accelerating rate of technological change. Product designers, and teachers of Design and Technology will have new aims, and design priorities will change. Instead of an emphasis being placed on aesthetics, profit making, fashion and mass production, design for the future will mean design for need and design for the environment. In evaluating the success of a design, moral and social implications will take precedence over economical factors, and an emphasis will be placed on product performance and durability as opposed to quantity of production. Most importantly, design will be accessible to everyone. Teachers of Design and Technology will have the responsibility of educating future designers to provide them with the knowledge and skills to succeed, and the role of designers will be to apply what they have been taught to future design projects. The result should be the creation of innovative designers focused on "changing our world into something better", through ecological, ethical and ergonomical design.

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Business School: Looking beyond the bottom line

David Buchan

At the merger of certain colleges with their neighbouring university, a day was set aside to enable the several factions (two colleges and two university departments) to meet on what was intended to be neutral territory.

Amongst the organised events was a lecture given by a member of the University Business School whose task it was to impart, to those assembled, some notion about education. The lecture was delivered with great confidence and assurance whilst most of those present, already destabilised by a succession of upheavals in their working environment, listened to what amounted to a philosophy approaching heresy - a heresy which has, since then, almost become accepted practice.

The 'merger' itself had been occasioned by what was then called 'The Great Debate', in the late seventies, wherein representatives of the business and political world had together, taken it upon themselves to 'raise the standard' of education. As a teacher, then newly-appointed to a College of Education, 1 do not recall much participation having been invited from teachers. The fact is that the debate arose out of perceptions of business and commercial needs and how best these could be served by the schools, for it was to the health and well being of business and commerce, which the government looked for national improvement. It did not, of course, follow that captains of business and politics are best qualified for the task of educating the nation's children or preparing them for adulthood - including work itself. After all, national prosperity also depends on the medical care and attention its citizens receive, but no one would gainsay the important part that doctors, for instance, should play in ensuring it.

There was nothing new about the orientation of teaching in State schools towards the business, commercial and political world - indeed, were it not so, I sometimes wonder, would there be any state schools? An unworthy thought perhaps - but not long before 'The Debate', educators, psychologists and philosophers in various parts of the world had been advocating a more grass roots approach to education: one in which prime consideration was directed towards individual pupils' particular abilities, strengths and emotions rather than the 'top-down' educational prescription now prevailing. Such were the considerations at the root of principles propounded by lecturers in Colleges before and after the war and warmly embraced by teachers returning from the Armed Services where, incidentally, it had been found that, after years of formal prescriptive teaching, illiteracy was surprisingly high. The orientation of education towards the training of pupils merely in the immediate and specific requirements of trade and industry was seen as simplistic- indeed, self-defeating: it did not make for confidence or desire to further their learning throughout life, nor did it give much opportunity to develop initiative. On the contrary, it tended to be suppressive and of short-lived, limited value - not to say undemocratic.

The education of young people, it was believed, ought to prepare them to take on the responsibilities of adulthood - including a will to contribute creatively to the wealth of the nation as well as to earn a living. Detractors from education based upon the study of children and their needs seemed to interpret the expression 'child-centred' as a philosophy of self-centredness on the part of children; hence a recipe for nurturing a generation used to 'having all its own way'; never concentrating on any 'real work' and lacking social conscience. The true objective, of course, was quite the opposite. There was also that gift to the critics of that other expression: 'the play way', which represented nothing more than a recognition that learning, expertly led and directed, can be enjoyable and being enjoyable, is powerfully motivating whilst associating learning with confidence and satisfaction. It involved basing the educational approach upon the study of the whole child and his or her intellect and sensitivity, in order to direct growth to best advantage, both socially and individually. The aim of education would be the optimum development of the individual in society, as distinct from one springing from the perceived industrial and commercial requirements of the day.

There is a certain brashness - a 'short-term fix' attitude - about the notion that general education should be business- or industrially-centred. There are also dangers, not least of which are that the requirements of business and commerce are subject to constant change. Each child needs to retain and develop an ability to adapt to change: to be equipped with the tools whereby he can survive, enjoy life, and have the satisfaction of making a valuable and, if possible, *valued,* contribution to the welfare of society in general as well as to himself in particular. This must surely involve the nurture of his personal propensities and their direction into appropriate channels. It requires, in his schooling, a substantial element of freedom and selection *in relation to the whole curriculum.* He must be given opportunities to apply knowledge and information, acquired both in and out of school, to improvise and devise in pursuit of personal initiatives. In doing so he will gain experience and confidence in the kind of thinking and action needed in the real world including the habits of self development and ready adaptation to new possibilities in a constantly changing society. Sentiments such as these have been expressed in the NADE Journal before - but there are now further concerns.

The importance of education has been far from reflected in the financial support given. Those of comparable ability in other walks of life command higher salaries and in most cases, enjoy superior working environments. School buildings and equipment, in contrast, are often inadequate. Alongside these shortcomings successive governments, ever aware of the likely effect upon voters of increases in taxation, have been reluctant to meet them by those means. The possibility of more direct involvement of self-serving interests (commercial, religious and, not least disturbing, extra-national) in the school curriculum by means of the Trojan horse' of financial assistance - is ever present. This does not only apply to our education system; it applies also to other systems, notably those concerned with health and transport, which are also appropriately nationally controlled and designed.

Delegation of control to outside interests, in exchange for support, is likely to result in continuing direction of education towards short-term partial advantage in limited fields.

It may be claimed, further, that a similar effect applies where, for example, specialists in their teaching fields coin words. Literacy, numeracy, graphicacy are all essential attributes of a well educated person but the words become the banners of special subject groups who, in promoting their own particular field of interest, tend, by so doing, towards a separation of their subject. The advantages of holistic cross-discipline collaboration are over looked when the subject is not seriously extended, as an element interacting with other areas of the curriculum to a mutual advantage.

It needs to be pointed out, very clearly and forcibly, that proponents of 'design education', do not only espouse a single 'subject', as do advocates of 'literacy' 'numeracy' or 'graphicacy'.

The cause of design education differs in that its theses are rooted in practice - in the resolution and meeting of life's requirements and problems, the rectification of discrepancy and the exercise of imagination. Since it has to do with the use and gaining of knowledge, skill and experience in the real world, it allows and encourages the use of every aspect of knowledge and resource available (and usable) within the bounds of fairness, civility and consideration. Importantly, in embracing all fields - not only technology and art, areas normally associated with design - it can provide the holistic education we need, aid the digestion of knowledge and, in a well-balanced diet, bring about that synergy in which the amalgam is greater and more powerful than the sum of its separate 'subject' parts.

Effective Information and Communication Technology

Nigel Zanker

Introduction

In January 1998, I was commissioned to write a book as part of a series on effective teaching skills. The overarching aim of the series being to address those traditional skills which remain essential to today's teachers, skills which need adapting to today's schools, and new skills which need to be adopted in schools for the future. A daunting task, but, nevertheless, the book, *Effective Information and Communication Technology* (Zanker, 2000), was completed in time for the new millennium. (Hereafter referred to in this paper as 'the book'.)

The series editor's brief was that the text allows teachers, at various levels of their professional development, to address how a curriculum entitlement for ICT might be sensibly delivered. The method by which this has been achieved is to provide activities, related to the teacher's own school (or for trainees, their placement schools). Consequently, the book contains forty-four activities; starting with 'Identifying the ICT resources you already use' and progressing to 'Tying together your responses towards a whole-school policy'.

The purpose of this paper is not to provide a review of the book, nor is it to discuss Information and Communication Technology (ICT) solely in the context of the National Curriculum. Instead, an overview is offered of five key issues raised in the book and the sources used to inform and guide my thinking. In a later issue of the Journal an independent review will be presented.

The book is not about Design, Computer or ICT education, or, indeed, any other subject 'taught' in a school. It is about teaching and learning and how ICT resources need to be intelligently incorporated into all subjects. In the two years to complete the book I am indebted to colleagues both in NADE and at work (which includes contact with over forty schools). Unwittingly, they have helped to shape my perceptions of how children should be taught how to learn (if, indeed, they should be). For example, in a recent conversation with one particular colleague we posited that there should be only one subject in the curriculum - learning itself (and of course we agreed that Design education is well placed to do this is because of its inter-relationship with other subjects).

One of the key messages in large letters is:

I am foremost a teacher of _____,
not an ICT teacher!

(*ibid*, 112)

In today's schools, in England (and probably elsewhere), all teachers are expected to be ICT teachers. However, in order to do this it is not essential that teachers are experts in ICT. What they need to be is experts in incorporating technological advances into their teaching repertoire. This is the aim of the commentary and activities in the book.

Five Key Issues

1 Effective teachers' use of ICT in their subject

For teachers to be effective in using ICT resources to support their teaching and learning they need to:

- be skilled as proficient and discerning users, and not as technicians;
- know how to use the resources, and not how the resources work;
- know how the resources can be built into education, and not bolted onto education;
- develop teaching skills that incorporate technological advances in ICT by not discarding the old to make way for the new.

(*ibid*, 27)

Early attempts at using computers in British education (and maybe elsewhere) have not produced the levels of ICT literacy that have been desired. HMI commentaries (eg Goldstein, 1997) and HMCI Annual Reports (*eg* Woodhead, 2000) have consistently reported poor quality of ICT education and low standards being achieved. I would provocatively suggest that one of the underlying reasons is that a two-sided culture, amongst teachers, has been established concerning the use of ICT resources. On one side, teachers who have used ICT resources to their own benefit (not necessarily altruistically). On the other side, teachers who lack confidence in the use of ICT resources and so have not used them. The lack of synergy between the two sides of this culture may have left the ICT experts to their own devices, which has not been to the best educational benefit to the learners. Many good teachers have not used ICT in the repertoire of their own subject teaching. An example of this is the location of ICT as a single subject in many schools' curricula. This is often through the belief that ICT skills are best taught by an expert, and not through the contexts offered by other subjects.

It is this, which the government has recognised through the New Opportunities Fund (NoF). The aims of this funding, spread over the period 1999 to 2002, are of:

> 'making a real difference to standards of pupils' achievement',

and to provide

> 'training for school teachers will ensure that they have the confidence and competence necessary to make effective use of ICT in subject teaching'
>
> (DfEE/TTA, 1998)

These aims, if they are to be more than aspirational, need to overcome the gate-keeping behaviours of the ICT experts. Such behaviours are rooted in a power-base, which is characterised by technical knowledge of knowing how the resources work and the advocacy that the technology will change the education system in its entirety (by the experts). Any established assumptions about learning are invariably ignored.

2 The Art of Learning

The impact of ICT on teaching and learning are often associated with 'open-', 'distance-' and 'flexible' learning approaches. An example of the effectiveness of these approaches is described in the *Final Reports of the Education Departments' Superhighways Initiatives* (DfEE, DENI, NCET, Welsh Office, 1997). However there are some significant problems in articulating clear meanings of these terms. Some clarity is required of these approaches. They do not apply solely to the use of ICT to support learning. They are more concerned with time, place, and method of learning. The approaches have a commonality in that they all purport to self-supported study.

For self-supported study there is, by definition, minimal intervention by the teacher. Teaching control is not based on what, when, where and how knowledge and skills are acquired; but simply that they are acquired sometime and somehow. The role of the teacher is to set the work to be done, (*ie* through a topic or project) with an appropriate time-scale for its completion. Therefore learning is placed in the hand of the learner. For self-supported study to be effective the learner needs be taught how to learn - and, therefore, to understand the nature of what has been learnt. Furthermore, the teacher needs to establish that the anticipated learning has taken place - and been understood by the learner. Correctly managed, learners respond well - but only if the expectations are made clear with precise deadlines. Therefore, there is a paradox in that the learning is not as open, distant or flexible as it might first appear: These learning approaches need to be taught.

Papert (1980), based on his work in the early 1960s, recognised such confusions amongst proponents of the two educational psychologies of behaviourism and constructivism. Theories based on these psychologies are of the art of teaching (pedagogy) and not of learning. He suggests that there are no theories, within general educational practice, to describe the art of learning. He considers this to be the reason why teaching methods often fail to invoke their required learning. In an attempt to articulate such a theory he proposes, a term to describe the art of learning, mathetics[1], and then describes examples of mathetics in practice through children's use of the programming language 'Logo' (*ibid* and Papert, 1993).

3 Assumptions about Learning

Papert's mathetic theory focusses on learners' motivation. Good teachers are aware that learning takes place when their learners are motivated. Motivation is only one example of assumptions about learning, which teachers use subconsciously and automatically. Barth (1975), from observations of open-education in the 1960s, listed further assumptions about children, learning and knowledge. This was at a time when such ideology was viewed as trendy and politically left of centre in the UK, with the exception of experimental initiatives such as primary education in Leicestershire (French (1966) cited by Barth). However, the impact of Papert's and Barth's work had a far reaching effect on general education practice in the USA (as a consequence of President Kennedy's

[1] Mathetics - derived from the Greek word *mathematikos* (disposed to learn) from which the English word *polymath* is derived (a person of much or varied learning).

speech to Congress (25 May 1961) which started the Space Race by establishing the goal of landing a man on the moon).

Barth's original list of twenty-nine assumptions contained seventeen based on learning. They are reproduced below, edited from the third-person, 'children' to the first person plural because they apply to all learners:

1 We are innately curious and display exploratory behaviour quite independent of the intervention of others.

2 Exploratory behaviour is self-perpetuating.

3 We will display natural exploratory behaviour if we are not threatened.

4 Self confidence is highly related to capacity for learning and for making important choices affecting our learning.

5 Active exploration in a rich environment, offering a wide array of manipulative materials facilitates learning.

6 Play is not distinguished from work as the predominant mode of learning.

7 We have both the competence and the right to make significant decisions concerning our own learning.

8 We will be likely to learn if we are given considerable choice in the selection of the materials we wish to work with and in the selection of the questions we wish to pursue with respect to those materials.

9 Given the opportunity, we will choose to engage in activities which will be of high interest to us.

10 If we are fully involved in and having fun with an activity, learning is taking place.

11 When two or more of us are interested in exploring the same problem or the same materials we will often choose to collaborate in some way.

12 When we learn something which is important to us we will wish to share it with others.

13 Concept formation proceeds very slowly

14 We learn and develop intellectually not only at our own rate, but in our own style.

15 We pass through similar stages of intellectual development . . . each in our own way, and at our own rate and in our own time.

16 Intellectual growth and development takes place through a sequence of concrete experiences followed by abstractions.

17 Verbal abstraction should follow direct experience with objects and ideas, not precede them or substitute for them.

Barth's assumptions have had a resurgence in general educational practice in the late 1990s because of the impact of ICT resources on teaching methods, in particular through the use of computers as tools for learning. An example of this may be found in *The National Curriculum Handbooks* (DfEE/QCA, 1999, 22), where 'thinking skills' are cited as separate but complimentary to 'key skills'.

The intelligent use of ICT goes beyond the drill and practice of computer-based 'learning' popular in the 1980s and 90s. In these two decades some of Barth's assumptions seem to have been disapplied to ICT education. Why? Because of fear of new technology as a teacher substitute, and therefore the possibility of losing direct control of pupils' learning? Because of the 'gadget factor' being used as the prime motivator and, incidentally the prime demotivator?

Look at Barth's list (above) again and consider the links between the assumptions and the use of ICT to enable pupils to learn how to learn. This is the basis of Activity 13 in 'the book' (*op cit*, 42). It is also worthwhile, considering the assumptions in relation to pupils' designing (and also to consider if the National Curriculum D&T fosters or suppresses them).

4 Half-life of knowledge

The pace of development, in the 1990s, of information and communication technologies and their impact on knowledge accretion has had profound effects on all areas of industry and commerce. The effects, so far, have been to a lesser extent on education. Toffler (1970), in describing the transition from an industrial economy to one based on knowledge, predicted that:

> Tomorrow's schools must therefore teach not merely data, but ways to manipulate it. Students must learn how to discard old ideas, how and when to replace them. They must in short, learn how to learn.... By instructing students how to learn, unlearn and relearn, powerful new dimension can be added to education.
>
> (Future Shock, 367)

These ideas can be illustrated using the half-life of knowledge concept. The basis of this concept is that products and process tend to be replaced by new ones more rapidly than before. Also they become redundant more rapidly. The two main characteristics of this concept are that, in a finite period of time half of a body of knowledge becomes redundant and, in the same time, the volume of a body of knowledge doubles. Shapero (1989) suggested that the half-life of knowledge to be five years for the fields of engineering, science and technology. By the year 2010 this period has been predicted by Gardner (1999) to be as short as twenty-two months.

However the half-life period differs between fields of study. Knight (1997) proposes that there are two forms of knowledge half-life; short- and long- (SHK and LHK). Knight's comparison of their characteristics may be found in Figure 1.

	Long half-life knowledge	**Short half-life knowledge**
Knowledge type	Academic, basic, theoretical	Practical, vocational
Examples	Citizenship, language, logic, mathematics, reasoning, socialisation, theoretical parts of professional training,	Industrial processes, software use, specific technical and professional skills
Acquisition time	Long - months, years	Short - days, weeks, years
Depreciation time	Long - years, decades	Short - weeks, months
Economic return	Slow	Fast
Positive externalities*	High	Low
Source of finance	Families, state	workers, businesses

* '**positive externalities**' - a term used by economists to mean the economic or social benefits accruing to society and not just to the individual.

Figure 1: The characteristics of long- and short half-life knowledge (Knight, 1997)

The educational implications from the half-life of knowledge concept are significant, and include that:

- in the past, newly acquired knowledge served the individual from secondary schooling well into adulthood; the majority of that knowledge remaining valid and reliable;

- today, newly acquired knowledge may not serve the individual from secondary schooling well into adulthood;

- the teaching of prescribed bodies of knowledge (except, perhaps, literacy and numeracy) may no longer be the most expeditious use of teaching time;

- pedagogy may need to focus more on teaching learners how to learn for themselves. For example, open, flexible and distance-learning teaching styles.

(*op cit*, 84)

At least three key questions (and their supplementaries) emerge relating to general education:

- How do we know what knowledge is an essential core that is of value to learners for their future? Should we bother considering a core at all?).
- What is the nature of the pedagogy that may be needed to equip learners to learn, unlearn and relearn for themselves? (The NC thinking skills'? (*op cit*)).
- Are schools threatened as learning institutions? (Because of the pace of development of ICT).

It is these three question,. which form the basis of Activity 31 in 'the book' (*op cit*, 85) where teachers are asked to consider the impact of ICT on teaching and learning now and in the future.

5 Reengineering principles and teaching skills

The series of which 'the book is one, represent an attempt to follow the reengineering principles described by Hammer and Stanton (1995) in *The Reengineering Revolution: A Handbook*. The intention is to suggest how these principles may be applied to education. Hammer's and Stanton's aim is to help readers succeed in reengineering a corporation.

Their definition of reengineering is:

> The fundamental rethinking and radical design of business processes to bring about dramatic improvements in performance.
>
> (*ibid*, 3)

Starting from common mistakes they propose a set of three 'morals':

- only processes can be reengineered and they must be first identified;
- reengineering without the proper leadership is a fatal mistake and doomed to failure;
- before implementing a process in the real world; create a laboratory version in order to test whether the idea will work.

(*ibid*)

The third moral may, at a first reading, not appear relevant to education because it is not in the field of science. However, in the two most recent decades this is exactly what has happened to schools through Government funded initiatives. For example, the Technical and Vocational Education Initiatives (TVEI) of the 1980s was an experiment to test whether a technology enriched school environment raised standards. This led to the wider Technical and Vocational Education Extension (TVEE) programme. Similarly, Open Education in Leicestershire in the 1960s (*op cit*) could be described as a laboratory version to test an educational hypothesis. This was extended to other LEAs, but was short lived due to subject-driven models which were pre-cursors to the primary National

Curriculum. Many other examples exist - it is worth reflecting on their failure and demise (and of more importance to what they led to).

The underpinning philosophy to bring about dramatic improvements in performance is not simply to throw out the old to make way for the new. Instead it is to take those systems which work and to consider how they can be made to work better. Conversely, to identify systems which don't work and to either make them work better or to discard them.

There is a parallel here with the Ofsted inspection process: To identify strengths and opportunities for development by reporting on **the educational standards achieved**, the **quality of education provided**, whether **financial resources are managed effectively** and the **spiritual, moral, cultural development of pupils** (Ofsted, 1999).

Reengineering requires an organisation to be willing to sacrifice old ways of doing things in the interests of making improvements. The Ofsted Inspection process, therefore, through quality assurance (QA) and total quality management methods (TQM), reduces the willingness by enforcing reengineering.

Effective Information and Communication Technology (the book) attempts to help teachers apply reengineering principles to address the problems of integrating ICT into their lessons, their subjects and their school's curriculum provision. The resources and the effective teaching skills exist. Experimental initiatives in pilot schools have existed. What has not existed is the process, or the guidance, to integrate resources and teaching skills to the use of ICT in individual subjects in all schools. The NoF initiative (*op cit*) may be the catalyst to bring about this required reengineering- it will affect all teachers in all state schools in England.

Summary

From *Effective Information and Communication Technology* (*ibid*, 125-126):

> Trying to articulate ideas that have worked, against changing political playing fields is difficult - especially when what has worked is often ignored by the agents of change. However, there is good reason to make ICT high on the educational/political agenda - the concern about teachers' continued low ICT capability, in general. It is important not to throw out the bath and its occupant along with the bath water. It is essential to build on what has gone before, because many of the systems are in place but not working properly - hence the need for reengineering. ICT, as IT, in UK schools is less than twenty years old, and in that time there have been some positive developments in the growth of this field of study - both as a subject and as a cross-curricular dimension. But these positive developments are not widespread, especially in primary schools. This is through no fault of teachers who have been struggling with an over-prescribed curriculum entitlement.
>
> In the twenty years since the introduction of the first computers in UK schools we have seen every school attempt, to varying degrees of success, to make their use effective - as subjects grow these attempts are unprecedented. This is remarkable if

we make a comparison with science, which took sixty years to be taught in every UK school following the recommendation of the 1902 Education Act.

Unfortunately the rate of growth of ICT may have been so fast that there has not been time to develop a secure and replicable pedagogy. Consequently developments across schools are hit and miss. Research in the field is in its infancy and there is little evidence upon which to develop a pedagogy. Teachers have been too pre-occupied with reacting to change through two revisions of a National Curriculum - consequently development of pedagogy to include emergent technology has taken second place.

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The Crafts Council: In the shadow of its former self

Richard Molyneux

Looking at what was, in a sense, the Crafts Council's valedictory show*, at the London Institute Gallery, I found myself remembering the happy relationship we had formerly enjoyed, particularly when Steve Burroughs was Director of Education and NADE could count on a London meeting place. The Council's strong support, in all kinds of ways, for creative talent in the crafts touched a sympathetic chord in many members; the NADE archive has many examples of support for its enlightened policies, which nurtured and sustained three decades of young (and sometimes not so young) designers, artists and craftspeople. Most members will be aware that the Crafts Council no longer exists as an autonomous institution. I suspect they, and a wider public, would wish it had its independence again.

The Council was founded in 1972; I seem to remember it first in Hay Hill and then in rather grander premises not far from the Design Council in the Haymarket. It had a Royal Charter and immense clout among the fine crafts (and a discerning public) for its work of promoting, cultivating and sometimes celebrating the work of a wide range of disciplines; Its demise as an independent body seemed to happen very quickly; the decision to place it within the broader remit of the Arts Council was taken ahead of general consultation, I am told, and one wonders whether, given the propensity of the performing arts to gobble all they can, it might have been a more effective solution to have created a separate body for design, craft and the visual arts, an organisation that could marry, for instance, with Ken Baynes's ongoing vision of the arts (NADE Journal, No 6, 1999).

If you did see the show, or are now prepared to chase it through the dales and valleys, then you'll find the Council commissioning three visionary people, two curators and a potter; each commemorates a decade of its existence and chooses what represented the spirit of British design for the crafts within that time. In their selection, Ralph Turner, visualising the 70s, looks at the unsure, questioning and sometimes discordant spirit of the times (remember the Sex Pistols?) and the sometimes unpredictable results within the crafts, as typified by Caroline Broadhead in jewellery, Fred Baier in furniture and Steven Newell in glass. In the '80s, Emanuel Cooper saw a more orderly vision; solid, dependable and highly skilled but moving towards invention; ceramics by Walter Keeler and Alison Britton, hampers and other basketwork by Lois Walpole, chairs by Erik de Graafe. The movement across media and a search for new materials in the 1990's lead Polly Binns to feature Caroline Broadhead again, with her cloudlike light and fabric 'installation', an extraordinary 'narrative pot[1] by Grayson Perry and an armchair (in felt) by Jane Atfield.

Where will it end - where will the erstwhile Crafts Council under its Director, Janet Barnes, go next? It's clear from current brochures that education is still, thankfully, being supported and perhaps we should given central government a chance to put its money where its mouth appears to be, coming up with a positive, supportive policy for a vital, lively and profoundly satisfactory part of the creative environment.

* Three Decades - 30 Years of British Craft 1972 - 1999, now at the Cleveland Arts Centre and then the Glynn Vivian Gallery. Swansea.