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Tasks in Technology

An Analysis of Their Purposes and Effects

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ABSTRACT: Technology has long been recognised as a 'task-centred' activity, but far too little work has been done to understand the nature of tasks and how they operate as teaching and learning tools. The problems surrounding Attainment Target 1 (AT1) in the national curriculum in England and Wales provide ample evidence of this. This paper explores – both in principle and through empirical research data – two central features of tasks ie pupil autonomy/teacher control and the role of the 'client' or user of the end product. Very contrasting views about tasks emerge from the four key stages.

Keywords: Pupil autonomy, continuity, technological task.

Introduction

This paper is concerned with the nature of the tasks that initiate and drive technological activity. It is set in the context of two research projects; the *Assessment of Performance Unit* (APU) project in Design & Technology (1985 to 1991) and the Economic and Social Research Council (ESRC) project *Understanding Technological Approaches* (1992–1994). The former was a large scale national survey of pupil performance in schools – involving tests on 10,000 pupils in 700 schools, and the latter is a small scale study (80 pupils in 20 schools) examining in detail the processes that pupils engage in as they tackle technological tasks. The projects were/are based in the Technology Education Research Unit at Goldsmiths University of London.

In the APU project, it was necessary to develop a clear rationale for technological tasks, since we were ourselves setting them for the large number of pupils that were to be tested (see Kimbell *et al.*, 1991, and Kimbell & Wheeler, 1991). However, in that project, the bulk of our work did not concern on-going curriculum activities. The ESRC project has exactly this focus, following in detail the tasks that teachers set or negotiate with pupils and examining the consequences of these tasks on pupils' subsequent actions. Given the current setting in schools, it is inevitable that this latter project has taken us into the thorny territory of the National Curriculum. The emergence of National Curriculum technology – with all its revisions – has been akin to the swinging of a ponderous pendulum, but it has provided some very interesting evidence about the nature of technological tasks and their consequences for teachers and pupils.

In this paper, I shall focus on two aspects of tasks that are central to understanding how pupils respond to them and what they learn in the process. The first of these concerns the end-user; to what extent and in what ways does the concept of a client impact on the tasks that pupils pursue in schools? Whilst this client issue has recently been brought to prominence by the strictures of AT1 in the National Curriculum, the second issue is much more deep rooted in the traditions of design & technology teaching. It concerns the extent to which the *teacher* controls what goes on – setting the task and controlling events – as against the *pupil* taking responsibility for these matters. How much autonomy do pupils have in setting and running projects, and what are the consequences of these levels of autonomy?

Technology and 'clients'

Technology is a task-centred, goal-directed activity. It is a multi-faceted and somewhat amorphous activity rather than a distinct discipline;[1] quite different for example from science or philosophy which have distinctive boundaries. Technology makes use of a wide range of bodies of knowledge and skill, but is not defined by them, for the raison d'etre of technology is *to create purposeful change* in the made world. Something did not exist before, but now – as a result of human design & development – it does exist. We have wheelbarrows, wallpaper, waistcoats and warships because someone (or group) decided (for one reason or another) that they would be good things to have. This is technology. But technology is not just about new things. I constantly try to make my latest model of wheelbarrow (or warship) better than yours. This too is technology. It is a highly focussed activity and it is intensely value laden as should be clear from the use of the word 'better'. I might mean cheaper, or stronger, or longer lasting, or shorter lasting, or less damaging to the environment, or more damaging. All these are perfectly proper objectives that might make my . . . whatever . . . better than yours for the purposes I have in mind.

So technology is a very human activity and is arguably one of the major distinguishing features of humankind. As Bronowski put it . . .

> Among the multitude of animals which scamper, fly, burrow, and swim around us, man is the only one who is not locked into his environment. His imagination, his reason, his emotional subtlety and toughness, make it possible for him not to accept the environment but to change it. And that series of inventions, by which man from age to age has remade his environment . . . I call . . . *The Ascent of Man.* (Bronowski J., 1973)

Technological activity is driven by human desires – for comfort, for power, for money, for convenience, for identity. Technology cannot be blamed or praised for anything, for in itself it is entirely neutral. Blame and praise can only be attached to those of us who identify the objectives and who do the designing and developing of new and ever 'better' things. The boundaries of technology are ***not*** set by our current practices and understandings in electronics or biochemistry or any other existing field. The boundaries and defined by our human desires. This is not to say that developments are always *led* by such desires, for there are many examples of manufacturers and marketing experts creating and massaging our desires. But the fact remains that any given technological outcome only exists when there is an identifiable client-based need for it. It matters not whether this need/desire is for Sidewinder missiles (very few clients but very wealthy ones – hence sufficient development and production money) or for cups and saucers (very many clients – hence a big market creating development and production money). In either case the fact remains that *technology is client-driven.*

What then of technology in schools?

There is clearly a bit of a problem here as the people doing the technology are the pupils and in the 'real' world they would be servicing the needs of their clients. But being in school means they are part of a teaching and learning programme that is controlled by the teacher. So who is in charge? Surely, either the *pupil* is in charge of the activity, responding to the needs of a client, or the *teacher* is in charge, directing the pupil into areas that she judges will be useful for the pupil to experience.

It is clearly a much more complex issue to talk in terms of a client for pupils' designing, and the notion was thrown into high relief by the publication in 1989 of the National Curriculum documents. Even from the very first of them[2] it became clear that we were being encouraged to locate pupils project work in reality; or rather 'in context'. These contexts were many and various, the list in the document including the obvious ones of 'home', 'school', and 'business & industry'.

This was not in itself particularly far-reaching, for most technology teachers most of the time would expect to locate their pupils activity into some real or contextual framework. There is not only ample evidence that pupil performance in far more effective when the tasks on which they are to engage are seen within a wider contextual framework (see eg. Kimbell *et al.*, 1991), but also that pupil performance can only really be understood in terms of that context (see eg. Light, P. and Perret-Clement, A.N., 1991). So the implied demand in National Curriculum technology for *contextualised* tasks was neither far-reaching nor particularly threatening for teachers. But far more significant – and infinitely more threatening – was the drafting of the first Attainment Target (AT1); 'Identifying Needs and Opportunities'.

> . . . pupils should be able to identify and state clearly needs and opportunities for design and technological activities. (DES/WO, 1989)

Shock!!! Horror!!! Were pupils really being expected to identify *their own* starting points for designing; identify *their own* client with an individual need that might be met? And, if so, what is the teacher supposed to do other than preside frenetically over the chaos (anarchy?) of a studio/workshop in which every pupil is doing something different for their own clients? How, in this situation, would teachers ever manage to construct a teaching programme that showed any kind of progression? Surely structured teaching requires the *teacher* to be able to control the agenda; introducing certain things at certain times. If pupils are busily setting *their own* agendas (in response to the imperative in AT1) – to what extent can teachers be said to be teaching?

The issue of whether or not a client is central to the activity has been supplanted by a different and more threatening issue. Who is in charge, the teacher or the pupil?

Pupil autonomy (learning to be self-directed)

One of the more obvious objects of schooling is to develop the ability of pupils to manage themselves; to bring them to the point where they not only understand what it means to take responsibility for their actions, but moreover they have expertise in so doing. Developing pupils personal autonomy would rightly be claimed by any teacher as a central goal for education.

Some school activities lend themselves well to supporting this goal, and other less so. But it is not unusual in England and Wales to find school prospectuses identifying extra-curricular activities as a major area in which this goal of personal responsibility is brought home to pupils and is thereby developed. The sporting ethic, the Duke of Edinburgh awards scheme, choirs and plays, neighbourhood support systems and the like all provide opportunities to underline and develop pupils' personal responsibility within a wider group framework. There is typically rather less emphasis on this in curricular activities – for there is simply less elbow room within which to do it.

But some curricular activities do lend themselves to it – and technology is one of them. In technology we do not need to feel entirely hamstrung (as are our science and mathematics colleagues) by vast lists of content to be taught, and for many years the basic mode of teaching and learning has been built around 'the project'. We operate in a studio-workshop environment on projects that typically run over an extended period, and this is an environment and a structure which lends itself nicely to developing autonomous decision making by pupils.

Within this environment, pupils need to be introduced to the magnificent breadth of what is possible with materials, tools and a progressively more bewildering array of technologies. But at the same time, we have an ideal setting within which to develop their personal decision-making and responsibility. I have long held the view that technology teachers are almost uniquely fortunate in operating within this rich framework:

> . . . the child will move in small steps from almost total dependence on the teacher to almost total independence . . . . The function of the teacher . . . is to steer children towards the goal of independent thought and action along the tortuous path of guided or supported freedom. (Kimbell, 1982 p. 16)

From its earliest days in the late 1960s, when Design and/or Technology was first written about as a serious curriculum activity, this feature of personal decision-making has been central.

> Individuals are expected, as they mature, to solve problems on their own and to make decisions wisely on the basis of their own thinking. Further, this independent problem solving is regarded as one indication of the individual's adjustment. It is recognised that unless the individual can do his own problem solving he cannot maintain his integrity as an independent personality. (Schools Council, 1975 p. 30)

'The project' became the standard *modus operandi* for teachers, and the project would enshrine a subtle balance between the things the teacher wanted to teach and the scope for pupils to make decisions for themselves. For example, in a 'room label' project, pupils might each identify a specific room in the school and design a logo/label to describe what goes on therein. These designs might then get translated into moulds for vacuum forming and the finished plastic mouldings subsequently fixed to the various doors. The teacher would have designed the project specifically *to teach* the disciplines of vacuum forming, so if a pupil produced a design that did not lend itself to this technique, the teacher would negotiate with the pupil – manipulating it to the point at which it could be made to work as a vacuum forming.

Through this approach – allowing some freedom within a controlled framework – teachers built their whole teaching course. Introducing metal casting in this project, or electronics components in that one, dyeing fabrics here and automating a pneumatic system there. But technical content was only part of the progression in projects, for there was also an explicit and progressive pathway towards procedural autonomy. Projects would be expected gradually to place ever greater responsibility on the pupil and accordingly the teacher's framework for introducing the content would be ever looser. Early projects would be tightly constrained and would allow little deviation from the parameters set by the teacher. But gradually these constraints would become negotiable and permeable to the point where GCSE projects would be only very loosely controlled by the teacher and A level projects would be almost entirely at the discretion of the pupil, involving only tutorial dialogue with the teacher. See Figure 1.

In the hands of a good teacher, 'the project' became an infinitely flexible teaching and learning tool. It built technical expertise and procedural autonomy and inevitably therefore produced some outstanding work. But

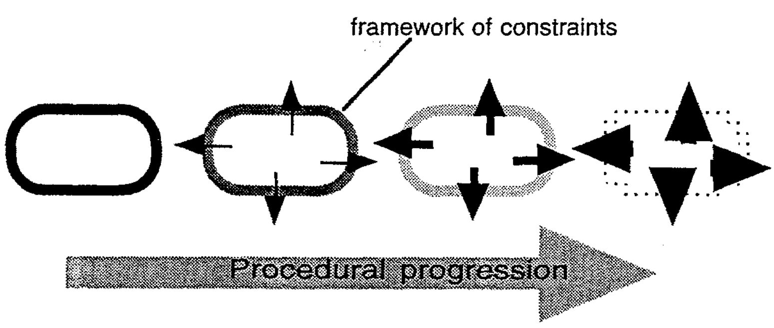

Fig. 1. The framework of the task becomes increasingly permeable.

in 1989, when AT1 in the National Curriculum ('identifying needs and opportunities') hit the classroom, this structure for project planning was thrown into confusion. The reason for this confusion lay in a deadly combination of the two issues discussed above, for the two central planks of AT1 were that projects would be seen to derive from real 'needs and opportunities' of end-users (clients) and that the pupils should be the ones to identify these needs and opportunities.

The two issues merge

The words in the technology Order appeared to weld these two sets of issues together into a formulation that placed far more responsibility on the pupil than would formerly have been expected.

- Ask questions which assist them to identify needs and opportunities for d&t activities in familiar contexts.
- Recognise in their identification of needs and opportunities for d&t activities that . . . the likes and dislikes of users are important.
- . . . pupils should develop activities which offer opportunities for open-ended research leading to the identification of their own task . . .
(DES, 1989).

For teachers who were used to the subtle exercise of control through the restrictions they built into design tasks, this was a serious body-blow. What were they being expected to do?

Some very unfortunate activities resulted from the confusions that followed the publication of the first Order for Design & Technology. Teachers inevitably drew on their only experience of pupil-initiated project work – which they had formerly reserved for much older pupils at GCSE (16+) or even Advanced level. They selected or created contexts in which pupils were encouraged to find needs and opportunities for themselves. 'The shopping centre'; 'the play group'; 'the high street' all became targets for hordes of youngsters on the look-out for 'needs and opportunities'. In some of the more extreme cases these pupils ended up designing a road crossing system, or a youth club or an advertising campaign. No-one can deny that these are genuine design tasks, with identifiable clients and valuable outcomes. But they can so easily be utterly unmanageable and inappropriate as teaching and learning experiences. Inevitably, many young pupils found it very difficult to operate in such an unfocussed way and ended up getting lost in the multiple demands of such projects. The teachers felt that they had to allow it to happen – the National Curriculum Order appeared to require it – but their instincts told them it was wrong.

It is now a matter of record that things were changed. The Order has been re-written (several times) and teachers have been exhorted to reassert their control of task setting to focus pupil activity more tightly and to worry much less about the wider contextual and client-based setting for it. Four years after the original (radical) publication of the design and technology Order, we have reverted to a document that would have been readily recognised had it been written six years ago.

Research data illuminate the issues

Over these last five years of debate (and turmoil in some schools) concerning how these two issues should be reconciled into a teaching and learning programme for technology, a good deal of heat has been generated – and far too little light. And it was with this in mind that we decided that our current ESRC project '*Understanding technological approaches*' should deliberately collect data that would enable us to describe and explain the consequences of the current position on pupil performance in the classroom.

The approach taken by the project has broadly been to observe pupils throughout entire projects – registering data of particular kinds for every five minute interval. Some of these projects are quite short; around 120 minutes, whilst some run for up to 1300 minutes. The projects span all four Key Stages (i.e. ages 5–16) and in total we observed 80 projects in 20 schools. The data we have collected informs a whole range of performance related issues, including *engagement with the task* (speed and intensity of work), *interaction* (with teachers and amongst pupils), *direction* of work (what priorities are followed), pupil *intentions* (that steer their work), and the manifestations of these intentions in terms of studio/workshop behaviour. We also have assessment data on the quality of the product outcomes, and pupil and teacher *evaluations* of the process of the project. Given this breadth and detail of data, and given that it is collected every five minutes throughout the projects, this represents an enormous database of 'real-time' pupil performance on tasks in schools. And sections of these data illuminate directly the two issues that I have outlined above:

- concerning the 'ownership' of the task in terms of who (teacher or pupil) is in control
- concerning the wider notion of clients or users and their 'needs'.

Data to inform the locus of control

Among the many observations built into the observer schedule is one that registers the points at which the teacher is *directing* the pupil to do something in particular or is *supporting* the pupil when they are trying to do something of their own choosing. This provides us with a crude but simple way of representing the axis of control in a project.

Theoretically, the teacher might be directing or supporting in 100% of the 5 minute time slots[3], but in reality this never happens. The following twelve project examples are taken directly from the data and show two things. First they demonstrate how the balance of direction and support indicates who is driving the project (project 2, for example, having 4 times as much direction as support). But also the data provide a measure of the 'lightness of touch' of the teacher. Some projects (eg. no. 3) show the pupil receiving either direction or support from the teacher in about 50% of the 5-minute slots throughout the project. Others (e.g. in project 7) show the total amounting to only 20%. In this case the teacher is allowing the pupil to get along on his/her own for much longer periods.

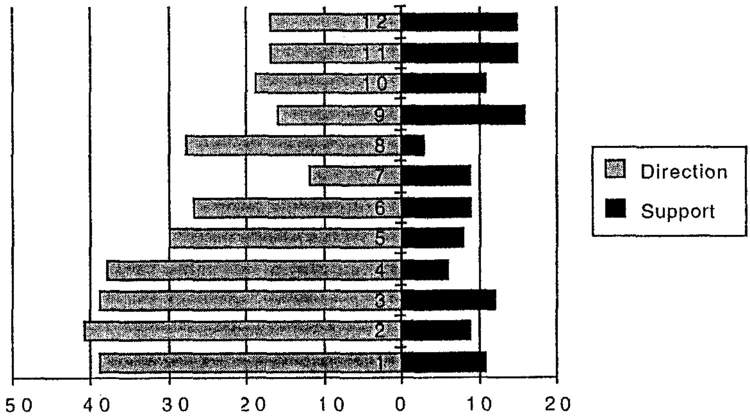

Fig. 2. The balance of teacher 'direction' and teacher 'support' in 12 projects.

Even this, however, is a serious oversimplification of the position, for in reality the balance of direction and support is not constant through a project. If the data are plotted against time we can see how this balance varies through a project. For this purpose we have divided the projects into 5 phases, each representing 20% of the time of the project. The chart below shows this balance in a single project but spread over the five phases of activity.

In the first phase of the project there was a very high level of direction – with minimal individual support, but gradually as the project gets up-and-running the teacher backs off and in phase 3 spends all her energy

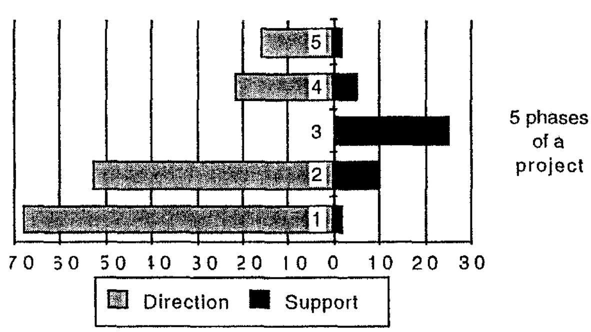

Fig. 3. The balance of 'direction' and 'support' through the life of a project.

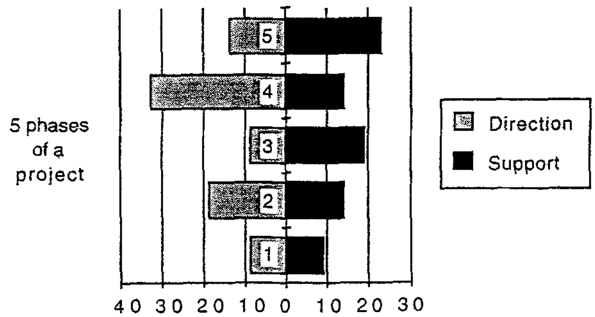

Fig. 4. A different teaching style results in a different balance of direction and support.

supporting individually. The end of the project then reveals further steering by the teacher. The average figures over the life of this project are 30% direction and 8% support (it is project No. 5 in Figure 2).

A quite different pattern emerges from another school (project 9 Figure 2). Here the teacher spends as much time supporting the individual as in directing activities – even at the outset of the project. Interestingly, the greatest amount of direction arises in the heart of the project where most of the making will be going on, suggesting a degree of technical instruction of skills/procedures.

The average figures for this project are very different; 17% direction and 16% support. This not only reflects a more even balance of direction and support, but also indicates a 'hands-off' approach by the teacher with the pupil working independently (without either direction or support) for significant chunks of time.

It is one thing to describe these effects, and quite another to interpret them and we are in the process of combining the data to see – for example – whether the differences of approach are associated with differences of outcome in the assessment and evaluation data. It is interesting to note for example that project 5 (30% direction and 8% support) is a secondary project whereas project 9 (17% direction and 16% support) is a primary

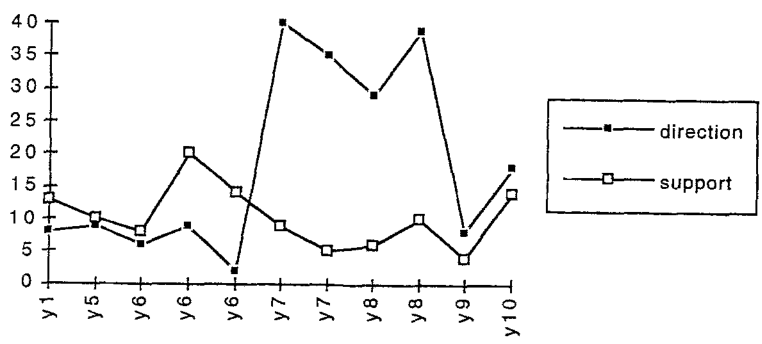

Fig. 5. The reversal of 'direction' and 'support'.

project. Indeed we have been struck by the consistency of this trend in the data. When we plot these data from the 47 projects and 11 schools in which our data is currently complete, and organise it according to years (y1–y10) a fascinating picture emerges. We find individual 'support' outweighing 'direction' in primary schools, and the reverse in secondary schools. Moreover the transition between years 6 and 7, as pupils move from primary to secondary schools, is particularly stark.

In year 6, it appears to be the norm for teachers to spend much more of their time supporting individually than instructing or directing. In this setting pupils appear accustomed to taking significant responsibility for managing their work, using the teacher to advise and support when problems arise or advice is needed. In year 7 the contrast could hardly be greater, with between 30% & 40% of the five-minute slots registering an instruction or direction, either to the individual or to the class as a whole. This is a totally different way of working, and one that must come as something of a shock to pupils used to a very different approach to teaching and learning.

In terms of the growth towards personal autonomy, this year 6–year 7 boundary appears to represent a major step backwards. From a condition of relative independence and responsibility in year 6, the pupils have reverted to a frightening level of dependency on the teacher. They wait to be told what to do – even when they know perfectly well (and are prepared to tell you) what they might sensibly do next. They seldom do it, preferring to join a queue of other similarly timid souls waiting to ask teacher what they ought to do.

One thing that emerges very clearly from these data is the extent to which technology projects at Key Stage 3 (11–14 yrs) in our sample of secondary schools are heavily teacher directed. Her Majesty's Inspectors' (HMI) report on the first year (1990–91) of implementation of the NC (DES, 1992) criticised the work in KS3 in 'some schools' where '. . . pupils often spent much unproductive time trying to identify needs'. Our project has been observing projects since 1992 and we have seen no evidence of this. Indeed we have observed quite the reverse – and the data outlined above suggest that KS3 teachers currently see their role in very different terms to that implied by the HMI criticisms of 1990–91.

Data to inform the role of the user/client

What then of the other major issue outlined above – concerning the role of the outside world and the 'client' or 'user'. As we saw earlier, there is a good *prima facie* case for suggesting that in order for us even to call the activity 'technological', the user's role must be clear. If there is no purpose to a project beyond teaching a skill or internalising a piece of knowledge, then the activity would more appropriately be called craft or science or history (depending upon what kind of knowledge/skill is involved). If pupils are genuinely to be designing and making in technological terms, then they are designing and making *something* for *somebody*

– even if it is only for themselves or their mum. The user therefore ought presumably to make an significant contribution to the exercise.

In order to explore this dimension through our data, we are using a measure that distinguishes between when the pupil is dealing with *user/task* issues, and when s/he is dealing with *manufacturing* issues. 'User issues' would be registered when the pupil is considering eg. how big it should be or what shape it might be for people to hold it comfortably (whatever 'it' is). 'Manufacturing issues' would be logged when the pupil was working out *how* to manufacture it – or actually doing the manufacturing. We would therefore expect manufacturing issues to outweigh user issues if only because a considerable amount of time on a project is typically spent in 'making'. But in terms of the user/client issue, this approach allows us not only to quantify the extent to which pupils are dealing with it – but more interestingly it allows us to register how this concern changes through the life of a project.

The data shown below are from 47 projects in 11 schools and two matching trends are clear when they are plotted against year groups. Concern with manufacturing issues rises to a peak in years 6, 7 and 8, and falls

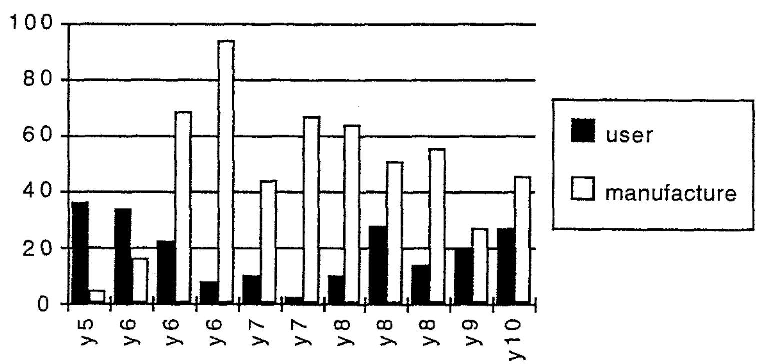

Fig. 6. The change in 'user' & 'manufacture' priorities.

Fig. 7. The change in 'User' and 'Manufacture' priorities – year group averages.

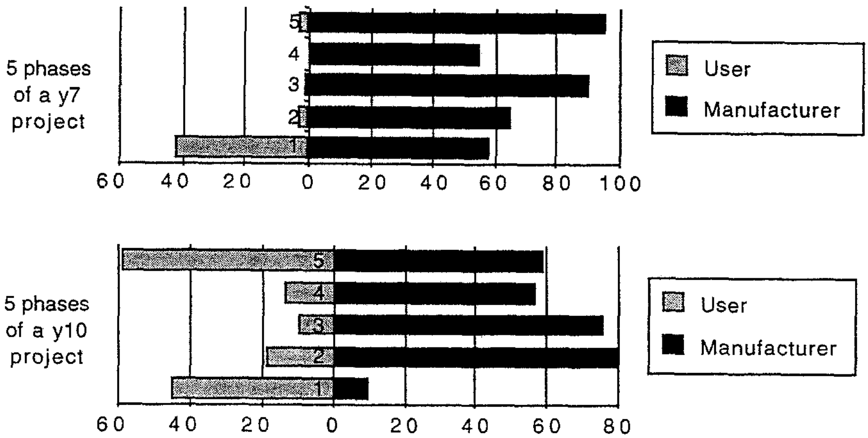

Fig. 8. The 'User' and 'Manufacture' balance in KS3 and KS4.

back towards year 10. By contrast the 'user' data starts high in year 5, drops to a low in year 7 and rises back to year 10.

A somewhat clearer picture emerges if we merge the data within year groups, and the trend in the 'user' figures is very clear whilst that for 'manufacture' is somewhat less so. In year 7 projects in particular there is scant regard to any user and in years 6, 7 and 8, there is a dominant concern with manufacturing issues. A more balanced picture then re-emerges in years 9 and 10.

These are, however, average figures for year groups and – as before – when these averages are spread across the five phases in the life of single projects we see a very interesting pattern. We can observe for instance the reconciliation of the user/manufacturer balance in KS3/4 in the two patterns taken from a project in year 7 and a project in year 10 respectively. See Figure 8.

The year 10 pattern of 'user' concern is as one might conventionally expect. It is high at the outset of the project (phase 1) when the task is being clarified and detailed, and towards the end of the project (phase 5) when the performance of the product is being evaluated. In between these peaks, manufacturing issues dominate the pupil's activity. But the year 7 project however reveals a quite different pattern. At the outset (phase 1) there is significant user concern – but this disappears almost totally thereafter, with manufacturing concerns completely swamping all else. These data suggest that whilst the year 7 pupil did not see the user as significant or relevant to their activity, the year 10 pupil was significantly influenced by this factor.

Conclusions from the data as a whole, and clues for the future

Taken as a whole, these data suggest that technology projects are seen as very different things in the four key stages. When we combine the observation data outlined above with the more discursive and interpretive data derived from conversations with teachers and pupils, the different characters of technology across the key stages begins to emerge.

Cultural technology
'Its all around you and always has been', is characteristic of KS1. Projects here tend to be topic centred across the whole curriculum (eg. the Saxons) and technological activity derives from within the topic, involving Saxon forts or transport systems.

Problem-solving technology
'Try it for yourself – can you make it work?', is more commonly associated with KS2. Projects often have a fixed starting point – eg. a wood strip vehicle chassis – and the challenge is to make it travel as far/fast as possible. It is common here for projects to amalgamate technology with investigations under the auspices of science AT1.

Disciplinary technology
'You need to know about this', emerges sharply at the start of KS3. Projects are contrived specifically to include a small range of skills/knowledge from the (still largely separate) disciplines on the timetable. Pendants (to teach metal fabrication & enamelling), alarms (to teach simple circuits and sensors), snack-bars (to teach ingredient mixes and processing).

Simulated technology
'This is how real designers work', gradually emerges at the interface of KS3 and 4. There is a move to individual projects – identified by the pupils themselves and therefore generally having some reality. Within these projects pupils are expected to be rigorous in the application of an abstracted designerly process and the development of a portfolio that reflects it.

Except in terms of the remarkable phenomenon described on page 9, the boundaries of the key stages blur these distinctions and the titles are only intended to suggest broadly evolving patterns in the nature of technology. These contrasted models explain why 'users' are largely seen as irrelevant to pupils in KS3. It is difficult to take a personalised user too seriously when the whole point and focus of the activity is an instructional one common to all pupils in the group. The situation is very different from KS1 where the whole experience (eg. of the Saxons) leads to some awareness of them as living in (and hence users of) castles or wagons. Similarly at KS4 where the user re-emerges as significant, it is not infrequently the genuine needs of the user (eg. best mate/grand-parent) that prompts the project. The four different models of technology also explain the contrasted pedagogy of KS2 & 3, with top juniors frequently trying to work things out and investigate things for themselves and new entrants to the secondary school learning to do (largely) as they are told.

Given these contrasted models of what technology is about, we should not be surprised that there is no universal interpretation of what a technological task is like. Tasks evolve to fit the picture that teachers have in their heads as to what technology is. We can sensibly talk about a KS1 task or a KS3 task – but there is very little common ground between them that allows us to speak about technological tasks *in general.*

That then is what we have found from the preliminary scrutiny of the data. It is, admittedly, early days in the analysis, but even now there is little doubt that the patterns outlined here will be more firmly established as the data become more complete.

The big issue of course is that having *observed and described* this progression of models of technological endeavour, it does not follow that they *ought* to exist. As the philosopher G. E. Moore[4] first observed, you cannot argue from 'what is' to 'what ought to be'. It does not follow that because these trends *do* exist – it is right that they *should* exist. They may well be completely wrong-headed.

The fact is that technology as a curriculum activity from 5–16 is so new and so undeveloped that it would be little short of astonishing if current practice were anything approaching coherent across the key stages. It is only in the last four years that it has been taken seriously throughout primary schools, and even in secondary schools it is a mere baby in the curriculum. The late 1960's would be a generous estimate of its date of origin. The ten Natural Curriculum levels sought to lay out a progressive pathway towards capability throughout the compulsory years of schooling, but the pathway was derived not from painstaking observation of what *is* going on in classrooms so much as from an abstract rationalisation of what *ought* to be going on.

There is an obvious route for the profession now to take. The abstract rationalisation was important, and so too is the detailed observation and analysis of what is currently going on. We need now to bring them together and raise the level of debate about what technology should be like as a whole. Should there be such different models of technology across the key stages? Might we not plan KS3 with rather more understanding of the qualities that have been established in KS2? And might this not all have a dramatic effect on what KS4 might be like?

Resolving this matter will of course require teachers in all key stages to come together and learn to talk – in a common language – about capability in technology. Such a dialogue would allow the profession to develop a securely rooted model of progression towards this capability. Given this wider perspective, we could then profitably debate what tasks should be like and what demands they should make on pupils.

It has taken technology a mere twenty five years to become enshrined in the curriculum. We will do well if we establish this progressive pathway to capability in the next twenty five.

NOTES

1. Peter Medway (1992) provides an illuminative analysis of the multidimensional nature of the activity.
2. The Interim Report (DES/WO, 1988) of the Design & Technology Working Group.
3. It is important to remember that we are making no judgements about the value or wisdom of this direction or support – we merely note that it is happening.
4. G. E. Moore *Principia Ethica.* Cambridge, 1903. Moore used the term 'naturalistic fallacy' to describe the mistake of defining 'good' in terms of any empirically observed phenomenon.

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