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Introduction

Though our time has been labelled a 'technological age', the days when technology unquestionably reigned supreme are numbered. Contoversies, such as the opposition to British Rail's proposed high speed rail links, have shown that technology must be *integrated* into society, and that technical considerations must take their place alongside socio-cultural elements. Indeed, public understanding has extended to seeing technological activity as just one type of social activity; it is necessary, but not superior to others.(1)

The Working Group have been surprisingly quick to realise the necessity of social elements within the Design and Technology National Curriculum. It is mentioned expressly that the activity of technological design includes value judgements at each stage, and that the outcome of such activity need not be the designing of 'things', but can be artefacts, systems or environments, depending on the nature of the task.

The significance of this approach must not be understated; as values are based on socially defined criteria, such judgements throughout technology development will be linked to, and confined by, social groups.(2) It is the trade-off of social factors, cultural factors and technical factors that is the main skill within technological design, and it is a skill which makes the activity distinctive. In reality, the best designs are the ones that get this trade-off right.

The branch of study within technology that is concerned with establishing a social/technical balance is that of Appropriate Technology. Since the 1970s, Appropriate Technology has been arguing for technology to be considered as fitting into a 'system' which contains people and an environment.(3) Though the theoretical background is quite complex, in a simplistic form Appropriate Technology is trying to develop technologies along similar lines to the National Curriculum, that build technical factors into a framework of social and cultural factors.

This paper describes the unique contribution that Appropriate Technology can have when applied to teaching Design and Technology. It demonstrates how Appropriate Technology fulfils the requirements of the National Curriculum whilst providing a framework for interesting projects based on real problems. The paper also shows how Appropriate Technology can be developed to emphasise the underrated skills of technological assessment, as well as to

reinforce already established areas such as problem identification, and selecting appraisal criteria. Some examples of this approach are provided, which also suggest the investigation of the cross-curricula development envisaged in the National Curriculum.

'Social' Design vs 'Visionary' Design

In an idealised concept of design, the designer is subservient to the needs of the users; for example, Chris Jones in his classic analysis *Design Methods* places the users, via the 'community', at the head of a hierarchical design structure. The role of the designer becomes one of transforming the needs of the user into design form, and the design must accommodate these needs.**(4)**

The ability to analyse a situation and understand the needs of different user groups, manufacturers, and other interested parties, and then to mix these needs with environmental considerations is a tough task. But it is also one that is vital. For no matter how good a design is technically, it must be integrated with people, in a way that is acceptable to those involved. Therefore, good design is 'social' in nature, and as much as possible *involves* people's views within the realm of design decisions.

This is in contrast to the view that the designer is a 'visionary', who is the only one to fully understand the situation, and the only one with enough forsight to look ahead. This type of design approach necessitates making decisions on behalf of people, without their direct involvement. This gives the designer *power*, and with it, massive responsibility.**(5)**

Both approaches can be seen in architecture and urban planning, where the decisions of designers will become a part of people's lives, for better or worse. An example of the 'visionary' approach is the big commercial developments like the Docklands in London. The 'social' approach is best seen in community architecture, where, for example, the architect spends time finding out how residents on a housing estate do their washing.

Immediately it is obvious that different types of design serve different interests; technological design is not neutral.**(6)** Though the philosophy behind this can be examined in greater depth, the main point to note here is that a 'social' approach to design is more likely to 'succeed' than relying on the vision of the designer/s. Involving people in design is good practice.

Where the GCSE fails and the National Curriculum succeeds is in fitting this social analysis into the students' design experience. GCSE largely relegates the 'technology and society' section of its syllabus to the knowledge domain, and as a small part at that. If full technological capability is to be achieved, then social analysis must be taught as a *skill* to be fully integrated into a design process.

Appropriate Technology: Providing the Context

In many design problems used in schools, the task is well defined. Yet *real* problems are rarely so clear cut. People are not neat, simple packages but complex and messy. To find out their perceptions, their needs and how they interact with other social groups is an involved process. In some respects it is the most important, as if this stage is wrong, then the design will fail no matter how technically brilliant it is.**(7)**

Appropriate Technology places a large emphasis on understanding the situation, and getting the design problem right. It very much follows the path of 'social' design, as it examines people's *needs*, and uses people as an information resource. Sometimes the results of this approach can be surprising. A rural village in a Lesser Developed Country decided after a meeting that their main priority was a football pitch, even though there were more immediate health and housing problems. Yet the pitch gave them self-confidence, a communications structure, and a sense of self achievement. They then tackled other problems, and stared to liase with other villages, who also developed football teams. Villages also managed to reduce the serious problem of teenage drinking.**(8)**

The 'context' stage in an Appropriate Technology design project is an excellent way of fulfilling the requirements of Attainment Target 1. Students are forced to *explore* the context before they can move on to Attainment Target 2. The very nature of Appropriate Technology necessitates the gathering of different types of information from different sources, as well as the *interrogation* of that information; not all 'facts' gathered will be equally valid.

So an immediate cross-curricula link at this stage would be with english and/or media studies. Students will often have to deal with conflicting views, and must come to understand that 'facts' are socially derived and are changable. The differing stances taken over specific environmental/ pollution issues make this point. Much depends on how these views are presented, by whom and in what form. Even the apparently simple matter of local transport schemes, like road closures, can generate a variety of opposing viewpoints.

The world is not divided up into subjects, and this is reflected in Appropriate Technology contexts. Indeed, Appropriate Technology encourages subject cross-fertilisation, as different groups will perceive different areas as being important. For example, a project being researched by the development group Intermediate Technology is the design, manufacture and marketing of home-produced textiles in Bangladesh. This can involve art and textiles in the design, but also geography to analyse the available resources and distribution networks, chemistry/biology for the production of dyes, history to explain the history of textile and dye production (which is very much linked to colonialism)and also the types of garments that are worn, business studies to examine the effects/risks of textile production within the local economy, and even religious education,

as certain garments are linked to religion. Any of these factors can be incorporated into a design process, if wished.

But this type of exploration and research can only happen if a real situation is examined. Appropriate Technology projects are actual, not theoretical. A traditional brief like, 'design a toy for a child' is not based in reality and so has no context to explore, and no people to ask. More importantly, there is no basis for making decisions. Appropriate Technology projects can teach the skills of social analysis and interaction which characterise *all* design, even high technology.

Technology Assessment

Once a context has been explored and a need identified, students follow a design process, as specified in Attainment Target 2. The research that students have already gathered can be used to filter and prioritize the inputs to that process; judgements still need to be made. Indeed, the exploratory stage need not stop once a need is identified; the users can also play a key role in decision-making *during* the design process. This is an active method of ensuring that formative appraisal is conducted.

In fact, the whole question of appraisal - Attainment Target 4 - is far from straight forward. Most models of the design process (and there are plenty,) place an emphasis on the exploration/investigation at the start of the process. It is assumed that by the end, the appraisal is simply based on what went before.

Appropriate Technology projects recognise that just as the problem may appear different to different groups, then so will the evaluation criteria. The evaluation will involve judgements on what constitutes success.**(9)** For example, the Department of Transport view some road schemes as a success, whereas to local residents they are a failure. Neither side is right or wrong, as they are using different judgement criteria.

Technology Assessment is therefore concerned with analysing the basis for judgement of the factors influencing design development and the evolution of appraisal criteria. Appropriate Technology projects stress the point that *all* decisions are judgemental; even the purely technical.**(10)** If we just concentrate on designing the gearbox for a vehicle, we are saying that other factors, such as resource use, are less significant. Importantly, Appropriate Technology projects allow the realisation that with different groups involved, there is rarely just one evaluation. Technology Assessment permits the reality of conflict in design.

Some Examples

These examples are projects used within 4th Year GCSE classes for CDT: Design and Communication. This was determined by timetabling rather than curriculum considerations; they are equally applicable as Design and Technology projects across the curriculum. What

follows is a brief breakdown of the projects, showing how they incorporated a full design process, and how they highlighted important design and technological principles. Though presented as separate design stages, the design process was by no means linear.

a) Vet Bag for India

This was based on one of Intermediate Technology's education packs for CDT. Rural vets have to carry a variety of medicines and equipment over difficult terrain. The 'deshi' bag that they use at present is heavy, cumbersome, and does not protect or separate the contents. The need was for an improved container.

The project pack consisted of a newspaper article explaining the job of the rural vet, and giving some information on equipment and travelling. The pack also included descriptions of the current designs, as well as a list of the necessary contents to be carried. A limited amount of design analysis was provided.

Exploring the Context/Research

Though students were unfamiliar with the situation, it was stressed that much of the problem faced by any designer is that of placing her/himself into an unfamiliar context when designing for others. The only input initially given to the students was the project pack. Very quickly they realised the complexitiy of the 'real' problem, and were forced to adopt strategies such as information interrogation, functional analysis, design limitation identification and listing information required to make decisions, before the need could be identified fully.

The unfamiliar context highlighted the need for thorough research. This was varied in its scope, covering many social and cultural factors from the pattern of medicine use to an understanding of the physical conditions in which the container would be used. Much discussion centred on limitations at the production stage, and the need to use local materials. This linked with other areas of the curriculum, such as biology, chemistry and geography, and required research outside school.

Design Solutions

Solutions required a comparative knowledge of:

i) Materials - availability; suitability; properties; conflict of use for other purposes; waterproofing; strength-weight ratio

ii) Production - labour intensive means; simple fabrication; manufacturing processes; equipment availability

iii) Construction - methods of forming; fastening; frameworks

iv) Energy - sources for production; absorption

v) Ergonomics - lifting weight; arm function; carrying weight; back function

vi) Use Patterns - recognition/perception; Blue Cross symbol

vii) Communication skills - all the skills associated with designing

Realisation

As this was for a Design and Communication course, the designs were modelled in soft materials. Design modelling techniques were introduced, including the effective application of surface finishing. A link with the Textile department enabled some students to use cloth built around a rigid frame for their final model.

Appraisal

The unfamiliar context meant that extra care was needed to assess each decision; the need for formative appraisal was demonstrated. The project cumulated in a group evaluation session to decide appraisal criteria, leading to individual appraisals. The designs have been shown to Intermediate Technology, who are compiling their reply to the group as a whole. In the light of the group's comments, Intermediate Technology are re-working their education pack.

Areas for Project Expansion

The economics of production could easily be included, linked perhaps to the structure of animal care, and the reliance on animals within food production. A thorough analysis of the properties of materials could be instigated, including textiles. A costing exercise would add realism.

b) School Bicycle Parking Facilities

The need for parking originated from pastoral work conducted across year groups, and from the school student council. The project required the selection of suitable parking stands and if necessary their modification, as well as the choice of a suitable site. Students were expected to assess potential demand, and present cost estimates.

Exploring the Context/Research

The need was confirmed by a combination of interviews and questionnaires, as well as an analysis of local transport. Benefits of providing parking went beyond the obvious; for example, many Asian girls reported that they would participate in more after-school activities if they had their own means of transport. Information came from cycling pressure groups, as well as Friends

of the Earth manufacturers and the borough engineers. Geographical skills of map-reading and scaling enabled students to adapt maps of the school to plan the location of the facilities.

Research of existing facilities in other public places highlighted the fact that poorly designed or poorly located facilities were simply not used by cyclists, who will rarely deviate much from their intented route. Photographic studies helped in this design analysis.

Design Solutions

It soon became obvious that there were conflicting interests. Cars, commercial vehicles, pedestrians and cyclists all had different needs, at different times of day. The need for security conflicted with the need for minimal disruption to classes, and lighting (which deters theives). Space, cost and installation also had to be accounted for in the selection of the design and location. A wide consultative process included students, teachers, sports centre visitors and other staff. In some cases, further questionnaires resulted.

Realisation

As a Design and Communication project, this took the form of a scale model of the chosen parking stand, with detailed finish, along with a scale map showing possible locations, supplemented by photographs in some cases.

Appraisal

This proved difficult, as so was generally presented from the viewpoint of different groups. Use was made of predictive techniques to isolate possible outcomes of different decisions, especially in 'worse-possible' cases. The project cumulated in a group evaluation session, leading to individual appraisals.

Areas for Project Expansion

The questionnaires/interviews and the presentation of a case for implementation could be explored in media studies. Costings could be involved, especially if the area of signing is included in the project. The elements of planning regulations could also be incorporated, as could a detailed analysis of transport energy requirements, vehicle pollution or transport policy.

Conclusion

The National Curriculum for Design and Technology provides an oppportunity to teach to full technological capability. Appropriate Technology projects are a medium through which technical skills can be developed alongside skills of social/cultural analysis, all of which can be used in effective design and technological activity. Students not only learn technology, but also learn to be adaptable and to transfer their analytical skills to a variey of situations.

Appropriate Technology is unique in the way it forces students to explore the context of the users' needs from many and varied perspectives. The process of Technology Assessment enables them to find order in the chaos of alternatives; skills which are becoming vital as the complexity of technological decisions increases. Appropriate Technology projects allow for conflict as a normal occurance in design. But most importantly, by focussing on people's needs, such projects bridge the gap between the classroom and the world. This seems an admirable basis for true design and technology education.

Bibliography

1. For example: L.Winner (1986), *The Whale and the Reactor*, University of Chicago Press

2. C.Mulberg (1988), 'Putting the 'T' into CDT: Technology and Culture', *Green Teacher*, Sept 1988; C.Mulberg (1989), 'Putting the 'T' into CDT: Multicultural Technology', *Green Teacher*, May 1989

3. C.Mulberg (1988), 'Technology For People', in *Dater 88 Conference Proceedings*, Longmans, in press

4. J.C.Jones (1980), *Design Methods*, John Wiley, 2nd edition

5. Winner (1980), Chapter 2; A.King (ed) (1980), *Buildings and Society*, Routledge & Kegan Paul; J.Rakausen & H.Davidson (1982), *Out of our Hands: What Technology does to Pregnancy*, Pan; J.Rothschild (1983), *Machina ex dea: Feminist Perspectives on Technology*, Pergamon Press; J.Zimmerman (1986), *Once Upon the Future: A Women's Guide to Tomorrow's Technology*, Pandora

6. D.Nelkin (ed) (1984), *Controversy: Politics of Technical Decisions*, Sage, 2nd edition; R.Welchel (1986), 'Is Technology Neutral?', *IEEE Technology and Society Magazine*, Dec 1986

7. V.Papenek (1984), *Design for the Real World*, Thames and Hudson, 2nd edition

8. L.Taylor and P.Jenkins (1988), *Time to Listen: the human aspects in development*, I.T. Publications

9. T.Pinch and W.E.Bijker (1987), 'The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other', in W.E.Bijker, T.P.Hughes and T.Pinch (eds) (1987), *The Social Construction of Technological Systems*, MIT Press

10. D.MacKenzie and J.Wajcman (eds) (1985), *The Social Shaping of Technology*, Milton keynes, Open University Press