One decision after another

Professor Eddie Norman, Loughborough University, UK

There are of course many models of designing, and like all models, each embodies some elements of revelation, as well as some traps for the unwary. A model is a representation of the reality. This was discussed by Phil Roberts in a paper published in 1992.

> In any event, to pursue this latter point more generally, the test of adequacy or of usefulness of a modelling mediated in natural language in the field of design-educational practice does not necessarily consist in its 'imitation' of 'the facts'. To subscribe wholeheartedly to 'imitation' might be to miss part of the metaphoric nature of language and, particularly, the functions of metaphor in modelling. Furthermore, to concentrate on 'imitation' might be to risk a distortion of the phenomena as experientially enacted. It is a modelling for: to be persuasive or useful, a model must differ from the subject phenomena. Models lose life, and as a consequence much of their value, as they gain in identity. Were this not so, the structure of design phenomena would be as obvious as that of the model (making the model redundant). This seems banal once stated, but the widespread failure to recognise it, and hence its significance, is well illustrated in the naïve following of 'the design line', or 'the design loop', or the four attainment targets of NC (National Curriculum) Design and Technology model, as though they provided recipes or descriptions of the structure and the structuring of design-educational activity.
>
> (Roberts, 1992:37)

The NC in Design and Technology was introduced in 1990 and hence these comments were being made soon after its introduction. Twenty years or so of research and development have taken place since then, and yet, once again, the place of Design and Technology in the NC is under review in England, and despite the growth of parallel initiatives as an international phenomenon. How can this be so? Perhaps one explanation could be the naïve models of design and technology through which its reality is commonly presented and perceived.

Another way of modelling designing is as 'one decision after another', and the papers and reviews presented in this issue of the journal demonstrate the complexity of this notion emphatically enough. Taking one decision after another sounds straightforward enough, but it all rather depends on the nature of the decisions that are being taken. Within a design project there are numerous decisions to be taken, and evidence to support any one of them could be drawn from across the curriculum. However, this is the point at which the unwary might be deceived into thinking that gathering such evidence reduces Design and Technology education to an 'applied' educational experience. At its core, it is not. Taking decisions in the face of incomplete information and future uncertainties, and with some factors that can be measured, and some that cannot, is an everyday task, which people carry out routinely. Factors such as colour, or a brand's influence on the projection of self-image might be ranked by purchasers, but cannot be quantified in the same manner as bandwidth or cost. And purchasers are taking decisions about things that exist. Design and Technology education is about providing children with opportunities to take such complex decisions about things that do not yet exist, and ultimately to understand how they might participate in creating their preferred futures. At least[1], twenty years of research and curriculum development has gone towards developing curriculum structures that facilitate such engagement of children with designing. It remains surprising that the achievements of the Design and Technology education community are so little appreciated.

The way such decisions are taken has perhaps even greater significance in understanding human history. At the 2004 Design and Technology Association Education and International Research Conference, Mike Doyle introduced the concept of 'technicity' (2004) as follows.

> I make no apology for borrowing a term from philosophy and bending it to my purpose. Design and technology, unlike traditional academic fields, seems to lack an intellectual core: it's all about making things. For longer than I care to think, this has concerned me. Our technical capacity has transformed our planet and ourselves, and continues to do so. On an evolutionary timescale these changes have happened instantaneously. Developed over the last two decades, the field now called 'evolutionary psychology', offers interesting insights into how we came to be. Unfortunately, neither this new field…, nor its academic precursors…, has anything to say about how we are able to make things….

[1] *This matter was well-understood by George Hicks (1983). See Richard Kimbell's Reflection piece 'Wrong…but right enough' in this Issue*

One decision after another

In this paper I hope to do two things:
1) Tease out and clarify 'language' as an evolutionary adaptation.
2) Draw out the core of modern human behaviour: our ability to create and innovate.

(ibid: 65)

Technicity might be seen as one of many expressions of a similar concept that have been published over the years e.g. 'graphicacy' (Balchin,1972), 'technik', (Fores and Rey, 1979), 'designerly ways of knowing' (Cross, 1982), 'technacy' (Seemann, 2006), or indeed Archer's concept of 'cognitive modelling' perhaps (1981). The essential point is that humans possess a remarkable capability that enables them to create their preferred futures. The roles that language might have played in our early evolution are frequently discussed, but there is much less said about the roles that designing and designerly thinking might have played. This could turn out to be a major omission. It has been my long-held belief that Bruce Archer was correct in arguing that 'design thinking' is distinct from the Sciences and the Arts. Clearly I also believe that this is a position which the research evidence supports. If children are not given the opportunity to engage in designerly thinking within Design and Technology education, then their education is correspondingly diminished. Designerly thinking does appear in other subject areas, but this is not their primary focus. Indeed it probably goes unnoticed.

So it is particular pleasing for me to see the researchers reporting in this issue revealing aspects of this complexity. Alexandros Mettas (and Eddie Norman, as I have the pleasure of supervising his research) report on a grounded theory approach to the development of a framework for researching children's decision-making skills within design and technology education. There are numerous factors that contribute towards the decision-making opportunities with which children are presented in their design and technology curriculum, and the manner in which they tackle them. This paper presents a framework developed from research in Cyprus, through which a snapshot of existing good practice can be taken. Design and technology education research is moving past the identification and analysis of individual factors that may play a role – such as the children's ages and development, the curriculum requirements or the teacher's approach to pedagogy – and seeking to review curriculum provision in a more holistic sense.

Another intriguing aspect of this complex picture is revealed by Adrian Twissell's paper, which derives from data gathered within current practice in England. Cognitive ability tests (CATs) have been used for many years in order to identify gifted students. This study supports their effectiveness as predictors for 'academic' subjects such as History and Languages, but the hypothesis that giftedness in Design and Technology can be identified by CATs was not supported by the statistical analysis. Perhaps this result should not be regarded as particularly surprising in that Design and Technology education is not only related to the analytical aspects of human capability that are commonly associated with the 'academic' curriculum. The paper goes on to recommend consideration of other measures to assess giftedness related to visual-spatial skills and creativity. There is further significant evidence here that Design and Technology is providing children with education relating to different, and important, areas of human capability.

Louise Milne and Chris Eames's paper concerning the development of a planning framework for junior technology classes learning outside the classroom demonstrates that this view of Design and Technology education is neither an 'English' view, nor one that only applies to 'older children'. The framework was developed in New Zealand for 5 year old students and evaluated in the context of a visit to a chocolate factory. This visit was planned to support the designing and making of chocolate gifts for Mothers' Day. The students had surveyed their mothers about their favourite flavours and fillings, thus giving them early insights into user-centred designing. This information needed to be embodied in the product, and combined with the expected product design criteria, such as visual quality and feasibility. In essence, it is demonstrating an experience of evidence-based designing, engaging with the 'real world' beyond the classroom, and one which facilitated the students in making a creative response. Such good practice, and the many other examples that have been developed over the years, demonstrate that Design and Technology is not fundamentally about 'applying knowledge' gained in other areas of the curriculum, but about intervening creatively in preferred futures.

The paper by Wendy Fox-Turnbull and Paul Snape provides another sophisticated example of the development of appropriate pedagogy for (Design and) Technology teacher education through a constructivist approach. The paper demonstrates how students successfully gain an understanding of (Design and) Technology education through a practical activity. As the authors state examples 'are presented of the higher level thinking obtained by the students as they participate in this collaborative and co-operative exercise and reflect on their learning'. In New Zealand, as in many countries around the world, this subject area is known as Technology Education, rather

than Design and Technology Education. This has been argued as being an acceptable description of the subject area by many commentators and researchers, but I am coming to the view that it is potentially damaging to its defence. In my view, it is the opportunity to engage in designerly thinking that separates Design and Technology education from other subject areas, and 'Design and...' needs to be there.

And then there is the question of tools for designing. Designing involves communication through all the senses of imaging in the mind and external models. One of the matters that changes the nature of designerly thinking is the design tools that are available to facilitate such thinking. In their paper Niall Seery and Oliver McGarr describe appropriate pedagogy for integrating parametric CAD in Irish post-primary schools. The main area through which this subject is developing in Ireland is Design and Communication Graphics, which has replaced the traditional Technical Drawing subject. Parametric CAD is a significant element of this subject. The research found that teachers welcomed its introduction, but as it was a novel teaching environment, it had a significant effect on their pedagogical approaches.

And it is not just the research papers that demonstrate the fundamental nature of Design and Technology education. Torben Steeg reviews the Nuffield KS3 STEM Project developed by Cris Edgell, which is focused in the area of sustainability. There are 'Pods' in 'Waste', 'Cars' and 'Climate change', which all lead towards a 'Futures' Pod. So, although perhaps wider than current Design and Technology practice, it is evident that there has been careful curriculum development that can enable students to engage with these complex agendas.

This Issue also features a review by Chitra Natarajan of David Guile's *The learning challenge of the knowledge economy* and a review by Eddie Norman of Mario Tokoro and Ken Mogi's *Creativity and the brain*. These are key future research areas for Design and Technology education and these publications indicate some of the insights from which development can occur.

So, all-in-all, this one Issue of the journal should have enough research evidence to convince policy-makers of the importance of Design and Technology education. If that is not sufficient then accessing the DATER hub (www.dater.org.uk) provides online access to nearly 2000 research items. There are also other important sources of research findings, such as the *CRIPT* and *PATT* conferences and journals such as the *International Journal of Technology and Design Education*, the *Journal of Technology Education and the Journal of Technology Studies*. Designing a National Curriculum is a complex matter, just like any other design task, but how much evidence is it necessary to provide before the reality that there is more to important human capabilities than analytical skills is fully recognised. Policy-makers in England are now engaged in taking 'one decision after another' and it has to be hoped the new curriculum design can be seen as a further movement forward towards enlightenment. There are many of us that are concerned that this might not prove to be the case.

References

Archer B (1981) internal memo; Royal College of Art, Design Education Unit, cited in Ken Baynes and Phil Roberts 'Design Education: the Basic Issues' (2005) in *A Framework for Design and Design Education: A reader containing key papers from the 1970s and 80s*, The Design and Technology Association, Wellesbourne, UK, 45-46

Bachin W G V 'Graphicacy', *Geography*, 57, 185-195

Cross N (1982) 'Designerly ways of knowing', *Design Studies*, No.3(4), 1982

Doyle M (2004) 'The evolution of technicity: whence creativity and innovation? In Norman E W L, Spendlove, D, Grover, P and Mitchell, A (eds), *Creativity and Innovation: DATA International Research Conference 2004*, The Design and Technology Association (DATA), Wellesbourne, 67-72

Fores M J and Rey L (1979), 'Technik: the relevance of a missing concept'. *Higher Education Review*, 11(2), 43-56

Roberts P H, Archer L B and Baynes K (1992) Modelling: the language of designing, Design: Occasional Paper No.1. Department of Design and Technology, Loughborough university
https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/1689

Seeman K (2006) 'Preparing Learners for the Innovation Economy: It's time to rethink almost everything about technology education', *Design and Technology Education: an International Journal*, 11(2), 31-40

E.W.Norman@lboro.ac.uk