A future vision

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One of the most poignant moments in Alexander Korda's 1935 version of H G Wells' *Things to Come* appears in the closing seconds. With a sweep of the arm embracing the whole universe a key character asks, 'Can it really be our destiny to conquer all this? Is there to be no rest from the unrelenting quest for knowledge, no peace for man until the whole universe is his?' 'No' answers his colleague, 'there can be no rest, for once man has taken the first step down the path of knowledge and understanding, he must take all those that follow, the alternative is to do nothing, to live with the insects in the dust. The choice is simple. It is the whole universe or nothing. Which shall it be?' Fade out to celestial choir taking up the theme: 'Which shall it be?'

Evans (1979) used this scene as an illustration in his popular look at the impact of the technological revolution. Eighteen years on, many of his suggestions, regarded at the time as being rather excessive, have been overtaken by reality. The advent of artificial intelligence, mass communication and miniaturisation, Evans wrote, would play an increasing role in shaping the workplace, the home, the school and community. He also predicted social consequences of these changes: mass unemployment with increased industrial automation and the collapse of the major communist states as a direct result of improved accessibility to communications technologies. Re-reading Evans' book lends weight to other equally dramatic, though more recent, prognostications, in particular Perelman (1994) and Drucker (1993) on schooling, and Reich (1992) and Bangemann (1996) on anticipated trends in employment and education. Evans saw a direct relationship between technology and social change, much of which has indeed come to pass. Had he been in a position to accurately predict all the technology, just what social upheaval might he have assumed would result? And more importantly to us as educators, what would he have made of the sheer pace of that change and society's ability to manage and accommodate it?

About the same time as Evans published his text, Botkin et al (1979) spelt out the dangers of societies whose education systems were designed to meet the anticipated needs of their industries based on short term predictions. They coined the phrase 'maintenance learning' as the means by which a society perpetuates the status quo through regulation of the content and context of education as opposed to 'innovative learning' which encourages a greater sense of enquiry. Handy (1987) extends this thinking, suggesting that the process of schooling should prepare children for a life of 'discontinuous change', change beyond prediction.

I find it sobering to consider the eventual employment of our nine to ten year olds. From the technological and employment indicators available, it is reasonable to assume that they will be working for companies yet to be formed in technologies yet to be realised with resources we would find difficult to imagine. This surely has implications for technology education. Technological activity in schools must increasingly use the content more creatively and less literally. It must enable children to explore technological contexts, and in doing so to develop and refine a personal construct system about what it is to live, work and learn within a technological society: innovative learning which assumes the only constant is people and the need to work in harmony with them. But governments have to be particularly sure of their tenure and confident of their influence over the teaching force to accept the notion of innovative learning, for its ultimate goal is to empower the learner, systematically relinquishing control.

The educative purpose of schooling, so long taken for granted, is under question, and nowhere more so than in areas related to technology. According to press reports, Lord Sieff of Marks and Spencer laid down an important challenge. In an open letter to the government recently he reportedly stated that he is not prepared to put money into education until the 'simple' question 'Education for what?' is answered. There must be some doubt as to whether he will receive a satisfactory answer. The government's objectives reflect a focus on the immediate, which does not bode particularly well for the future.

By and large the British people are fiercely proud of their education service. A nationalistic pride embracing the A-level 'gold standard' and a resultant Oxbridge education for the few, is also evident in our technology educators. Many believe that because USA, Germany and France have yet to introduce design education, their technology education is in some way inferior. It might be argued, however, that these countries now have a distinct advantage: they will not have to spend years unlearning before they can make real progress.

In the league tables of the Organisation for Economic Co-operation and Development (OECD), the UK at 17th with 24 in the class has little room for complacency. On the slow learners table with the UK are Greece, Portugal, Ireland, Turkey and New Zealand. Taiwan and Vietnam, regarded by many in the UK as 'developing nations' are 9th and 10th in the class. What is more, their education system reflects their position, primarily because it is relevant and responsive.

Peddiwell (a pseudonym) writes a delightful analogy known as the Sabre-Tooth Curriculum which tells of an ancient tribe who had designed a curriculum based on scaring away sabre-tooth tigers, clubbing woolly horses and netting the small silver fish that swam in the nearby river. So effective was their teaching and so successful the students' learning that they hunted each of their prey to extinction and had long since scared away the tigers, yet did not see fit to modify the curriculum which, although instilling its own regulation and discipline, became irrelevant. The message of the fable is all too clear. But with the knowledge base estimated as doubling every three to five years (depending on the source) what information is relevant in the knowledge age? What skills can be regarded as transferable and enduring? Further, what aspects of industrial process have sufficient shelf-life to warrant replication in the classroom? In 1989 the UNESCO Beijing Round Table offered as essential to the world's curricula: numeracy; literacy; inter- and intra-personal skills; communication, (including information technology); problem solving and caring.

Again it takes tremendous confidence to accept all but the first two of these as cornerstones of a curriculum because they are not knowledge dependent and therefore not examinable by traditional means.

As Drucker (1993) observes, technology will effect major change in our world, and particularly in our schools. Can existing schools, environments and pedagogies, particularly those for technology education, accommodate such change and be sufficiently responsive to outside needs and pressures? For a variety of reasons, one must conclude the answer is no. Technology education would have stood a better chance if there were some degree of consensus as to what it should be. There isn't: Duncan Graham, one time Director of the National Curriculum Council and Lady Parkes' Committee on technology in the National Curriculum posed the question. The more recent offerings of some of the examination boards are indicative of the fact that the issue has been ducked in favour of pragmatism and short term economy.

Bronowski's (1981) phrase 'the hand is the cutting edge of the mind' used to have particular resonance for me during the fourteen years that I taught design and technology. Now it sounds historical, even anachronistic. I would be proud to champion working with hand tools in wood and metal as spiritual and creative activities but I fear that the arts and aesthetics are already under pressure in the curriculum.

Relevant and honest work with food should certainly be in the curriculum, perhaps as biotechnology and food product manufacturing, but much of what passes for food technology in the National Curriculum has a very short shelf life. What I want to see is pedagogic honesty. I know headteachers who ensure that home economics as we know it remains in their schools because it teaches their students so much about resources management and attention to detail. If they are convinced that their children need experience in working with food at school and are prepared to devote the necessary resources while defending the timetable space, I applaud them.

UK technology education is based on a tired, overstretched paradigm designed to service an older industrial technology while accommodating organisational palliatives. It cannot serve manufacturing in a knowledge age, driven by effective communication with increasingly sophisticated computer peripherals: robots, computer-integrated-manufacturing cells and control systems of such sophistication that, once on-line, human intervention is minimal. In the factory, the hospital and financial sectors, communication will be at the heart, the essential skills of communication being not only numeracy and literacy (increasingly requiring skills in modern foreign languages) but also modelling, sharing solutions to problems and above all knowing what means of communication to select to convey concepts, data, etc. in the most effective way. Technology educators have a major role to play in mediating opportunities for children to develop and test their organisational and procedural capabilities and sharpen their communication skills.

But there are further, much bigger challenges ahead for technology education as it fights for its share of curriculum time, and communications technology is, I believe, at the very heart of these challenges. Cable television and Integrated Services Digital Network (ISDN) lines are capable of supporting open and distance learning, 'learn on demand', 'pay as you learn' and telematics. The massive advances in object database technology makes these rather Huxlean sounding ideas not only a technological reality but a social inevitability. A huge percentage of the ECUs available through the European Commission has been assigned to open and distance learning, to using the Internet, to broadband development. There will be major projects announced in this area in the UK this year, multi-million pound programmes which emphasise the role of the home and community in providing education, programmes designed to encourage an increase in TAFs: Technologically Advantaged Families.

Drawing on recent experience in schools for the future projects in this country, the United States and Germany, it is evident that the multipurpose teaching studios still being specified for schools and technology colleges are already fifteen years or more out of date. In a school of the future, it is probable that there will be a return to discrete satellite making areas given over to machining and modelling, to small plastics shops to which learners of all ages could go to complete a particular element of the making activities necessary to their studies.

These areas need not necessarily be staffed by teachers of course, and there is much to be said for bringing in the industrialists, retired at fifty, to offer their skills and interests pertinent to these areas: the community providing education. The African proverb 'It takes a whole village to raise a child' is appearing on more notice boards and for that matter, in the States, on coffee mugs too. Such schools would act as hubs to facilitate home learning, industrial training and, indeed, recreation.

We have taken the first steps down the road to knowledge and, like it or not, we will surely take all those that follow. As more optical fibre backbones are installed by our cable companies, signalled by the green pipes being buried under our pavements, as the price of computers decreases in real terms by as much as 26% per year and as our industrial society continues to require a more responsive and flexible education service, we have no alternative but to respond. Whether that response is to passively accept the changes or to reach out and grasp the opportunities they present, will, as always, remain a matter for the individual. But the larger the opportunity, very often, the bigger is the challenge to embrace it. Progress within the information and communications technologies is awesome. The mid-1980s difficulties with hardware and software developments being out of phase are no longer present. Industries are recognising that working 'smarter' beats working harder and working smarter means changing the way in the work has been accomplished in the past to use the technologies to the full.

Whole societies, even whole countries, are radically overhauling existing organisational structures perceived as being redundant in the face of these new opportunities. A case in point is the American InterAgency Technology Task Force in Washington and

its 'Challenge Grants for Technology in Education'. It is a bold $26m venture calling on communities, communications providers and industries to submit their 'most ambitious visions of education reform ... creating ... virtual learning communities linking schools, colleges, libraries .. across the country or around the world'. This initiative does not try, as we in the UK have so often tried, to stretch existing paradigms to accommodate new thinking, new opportunities. As Abbott (1995) wryly observes in quoting the native American saying: 'You can't leap a canyon in two small jumps'. Curricula must change with the times and the most rapid response needs to be from those charged with the delivery of technology education. It acknowledges a downward trend in the population of sabre-tooth tigers long before it ceases teaching their entrapment.

Postscript

Since writing this paper in Spring 1995, a number of initiatives have been launched which address the changing nature of manufacturing and how that might be reflected in technological activity in schools. The desire to develop an open standard for video-conferencing and communication in schools' manufacturing activities is particularly welcome. It is hoped that this work will inform the thinking of any agency charged with considering changes to the current Order for Technology in the National Curriculum.

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This paper is one of a set of papers from the Royal College of Art Schools Technology Project which holds the copyright. It was written in 1995 for teachers writing for the Project to inform their underlying philosophy. The brief for this paper was to challenge present thinking with a view of technology education unfettered by current institutional or organisational constraints. This paper was written by David Dickinson in an independent capacity and has been slightly revised for this publication. The full set of papers is available at nominal cost from the Project on 0171 590 4246.