Teaching and the new technologies*

Brian Allison
Emeritus Professor of Education, Leicester Polytechnic, England

Education, in all its manifest forms, is an inextricable element in the mainstream of social concerns and development. Not only are education systems the major form of preparation of individuals to take part in society and, therefore, need to be a reflection of social concerns and developments, but the kinds of preparation the individuals receive are also major contributors to the future development and well-being of those societies. To a large extent, the content of education in any given society is an expression of the values which the society cherishes and is a conceptualisation of the kind of society which is hoped will be achieved. In this sense, the content of education and the forms in which it provided is both *reactive*, in terms of its enablement of those being educated to take their places in contemporary society, and *proactive*, in terms of preparing individuals to help shape the future of that society. Education, in both its content and its form, is essentially laden with a wide variety of social values.

The history of education can be characterised as being the history of social values. This has been clearly evident in the educational provision made during all major social developments throughout history such as that of the agrarian society, the mercantile society, the urbanised society and the industrial society. At the present time, major changes are being made in education systems, particularly in those of western, industrialised countries, in order to address the needs, and reflect the values, of a number of important contemporary social concerns. Two main strands of these social concerns can be encapsulated under the headings of the *multicultural society* and the *technological society*. These changes are being initiated and effected interactively at national, regional and local levels and affect the

teaching in classrooms, lecture rooms, studios and workshops at all levels of education. In anticipation of the European Community coming into being in 1992, these changes are already beginning to cross national boundaries.

The effect of multiculturalism on education are of the most profound significance at the present time in the majority of countries and, indeed, cultural issues permeate any educational discussion. However, the main focus in this paper relates to the effects on art and design education arising from the impact of developments in what has been termed 'the new technologies'.

The term 'technology' can be defined as being 'the science of' or 'the application of science in'. There are two kinds of technology which I want to address in this paper. The first is the technology of education or, as it is termed in England, *Educational Technology* and this refers to a scientific approach to understanding how education occurs, its organisation and structure, its pedagogical strategies and methods and its conceptualisation in terms of learners' needs and potentials. The second kind of technology impressing on education is that of the 'new technologies', or, more precisely, *electronic technologies*, which includes information technology and can be described in relation to both the hardware, in terms of computers, video, television, lasers and related equipment, and the software, in terms of computer programs, interactive video discs, image generators and so on. In educational terms, both these technologies are inter-related and interactive as, on the one hand, it is through educational technology that the electronic technology can be located in terms of its potential as an educational endeavour and, on the other, it is through the electronic technology that education will have a relevance to contemporary and future society and also provide a basis on which new perspectives on teaching and learning can be generated. It is of more than a little significance that art and design education has a crucial role in educational developments with regards to both these forms of technology, not only because of

the challenges provided by the particular complexities of learning in, and the behaviourial processes of, art and design but also because of the primacy of visual imagery in the interface between humans and almost all forms of electronic technology.

Educational technology and emerging curricula in art and design

The effects of developments in educational technology on the theories and practices of art and design education cannot be over-estimated. The development of educational technology over the last twenty years corresponded with, and, indeed, has been influential on the revaluation of purposes and the content of art and design education. The general term "educational technology" is being used here mainly with reference to the generation of strategies for conceptualising curriculum content as well as ways of understanding the nature of teaching and learning practices. Of course, the term is also commonly used to describe certain kinds of educational hardware, such as teaching machines, audio-visual equipment and so on but the emphasis is this paper is on its curriculum aspects, including the organisation of learning.

Very briefly, in the technological approach to education, attention is given to a number of dimensions or aspects of the educational endeavour, which is seen in terms of the organisation or provision of learning experiences leading to purposeful outcomes. Firstly, consideration is given in this approach to the purposes of the curriculum and this includes describing the nature of the learners at any one particular educational stage as well as their subsequent needs as future citizens. Secondly, strategies are available which help in defining the nature of the 'subject' and describing its content, its roles and practices in relation to the lives of individuals and societies as wholes and its meanings and significances in different periods and cultures. Thirdly, there are procedures for the generation of educational aims and goals for learning within subjects along with the further specification of teaching objectives through which aims or goals

may be achieved. An important aspect of this point is that, although any classroom activity can be a meaningful educational experience in its own right, a technological approach characterises any individual activity as being 'a means to an end' and not simply as 'an end in itself''. In other words, it anticipates that, as a result of any educational activity, some learning needs to take place which can be 'organised into the learner's experience' and which transcends the actual activity through which it is being learned. In other words, *how* something is taught or learned will be dependent on a number of factors such as the teacher's imagination and experience, the resources available, the background and motivation of the learners and so on and these will differ from classroom to classroom. Furthermore, the distinction between 'means' and 'ends' anticipates that there can be a variety of teaching and learning activities and strategies which can be designed to achieve any one 'end' or objective. Fourthly, the technological approach emphasises the importance of evaluating or assessing the outcomes of educational activities to determine the extent to which intended learning has taken place and the objectives have been fulfilled. An increasingly wide variety of strategies and methods are now available to evaluate learning outcomes although there is still a lot of research and development to be done on evaluation in art and design.

The effects of approaches drawn from educational technology as well as the continuing revaluation of the roles and purposes of art and design education on the teaching of art and design have been dramatic. This has been notable in the ways in which there has been an increasing level of general agreement or consensus about what art and design education should be setting out to achieve and what it might mean to be 'educated in art and design' at this point in time.

Many national, regional and local school systems, in collaboration with art and design educators and teachers, have devised curricula or curriculum guidelines to assist teachers in preparing learning experiences in art and design on the basis of models drawn from the extensive volume of work in educational technology. Not surprisingly, there are some differences between these curricula but an important characteristic of most of them has been, on the one hand, the breadth of conceptualisation of the subject of art and design and, on the other, the range of relationships with art and design which, it is argued, education

should necessarily seek to promote. It is within this particular curricular conception that the 'new technologies' or, indeed, any technologies, can be identified as having an educational role and purpose.

The 'subject' of art and design

In terms of the 'subject field' for curriculum purposes, art and design is taken to be multidimensional and refers to the various forms and practices of art and design as they exist in contemporary cultures.

Grouped together, art and design includes Fine Art, which embraces painting, sculpture, printmaking and so on; Graphic Design, which embraces all forms of commercially related printmaking, illustration, product and package design, tv and video graphics and so on; Industrial Design, which embraces all forms of industrial product and environmental design; Fashion and Textiles which embraces all forms of clothing and footwear design as well as fabric and other related material design and production; Art and Design History; Art and Design Criticism; and Aesthetics. A further dimension of art and design is its nature, role, function and practices in different cultures, including, but not exclusive to, the variety of cultures constituting any one society although, clearly, a society which is emphatically multicultural, such as England, must give strong recognition and support to the arts of its majority and minority constituent cultures. Although the production of art and design remains an important educational activity, this conception of the curriculum necessarily reflects the variety of relationships which people can have with art and design and this includes making, knowing about, looking at, talking about, thinking about and responding to art and design.

Aims and objectives in art and design education

In curriculum terms, the identification of different ways people are able to relate to art and design means that not only is knowing about and responding to art and design as important an educational responsibility as an involvement in the making and production of art and design but it can be strongly argued that the two aspects are essentially interactive and inter-dependent. Although there are a number of curriculum models which arise from this conception, they generally subscribe to coherent sets of aims, of which the following is an example.

1. The development of a broad understanding of the meaning of art, craft and design in contemporary cultures.

2. The development of perceptual skills leading to a heightening of sensitivity to visual and tactile qualities, together with an enhancement of experiences in art, craft and design.

3. The development of bases for informed aesthetic judgment; both personal and community.

4. The ability to value and meaningful experience the cultural heritage of this and other societies, past and present.

5. The ability to be able to hold, articulate and communicate ideas, feelings and opinions about art, craft and design.

6. The development of particular individual aptitudes and interests, but not exclusively in production and expression.

The classroom practices which are based on these aims are generally conceived in terms of the various behaviourial, psychological and experiential elements which can be argued as being fundamental to art and design experience. Again, there are various ways in which these elements have been identified and related but they can adequately be demonstrated by what has been termed the *Four Domains* model. This model identifies the domains of expression and production, perception, analysis and criticism and history and culture which can be described in the form of teaching objectives.

Expressive and Productive Domain

The development of skills and abilities which contribute to the understanding of the nature, purposes and processes of art, craft and design and the means to communicate and form.

Perceptual Domain

The development of skills which expand the capacities to see, feel and comprehend form, colour and texture as part of the encounter with the visual/tactile environment and as being fundamental to aesthetic experience.

Analytical and Critical Domain

The development of skills in describing, analysing, interpreting and evaluating aesthetic qualities as a basis for both experiencing and being able to communicate meaningfully about the content of art, craft and design.

Historical and Cultural Domain

The development of understanding and appreciation of the changes and effects brought about by the influence of historical/cultural contexts, and the roles played by artists, craftsmen and designers in this and other societies in relation to their contributions to the development of forms, ideas and values.

It is argued that all these four domains contribute interactively and interdependently to the development of the various skills and abilities fundamental to behaviours, knowledge and understanding in art and design.

As all learning is both accumulative and developmental, it is seen as essential that curricula which address the concerns implied by these domains are pursued throughout the whole of formal education — that is, from kindergarten through to adolescence. In a curriculum based on this view, the range of art and design activities and objects and the kinds of encounters which learners have with art and design are essentially the same at each stage level but the nature of the encounters changes in relation to, on the one hand, the level of the children's or students' intellectual and other forms of development and, on the other, their accumulating knowledge and experience. In other words, art and design is constant and the different kinds of relationship people can have with it are constant, but maturity, knowledge and experience affects how it is understood by the learners. As alluded to earlier, in pursuing a curriculum which is planned as being continuous and sequential throughout the whole of an individual child's or student's formal education, the teachers' role at any one stage of the learner's development can be seen mainly as being that of an individual, but not the only, contributor to the whole educational endeavour. One of the consequences of this curriculum centred view has been a shift in the perception of the role of the art and design teacher to being one of initiating learning in art and design and away from the traditional role which encouraged an essentially individualistic, idiosyncratic and, often, egocentric approach by individual teachers and assumed that the teacher's principal role was to act as an encourager and provider of materials for children and students to pursue what was considered to be their own 'creative expression' or to act as a kind of 'psychic midwife' to the children's or students' expression of their 'inner selves'.

In this broad view of the nature and purposes of the art and design curriculum, it is becoming an educational imperative that attention is given at all age levels to the meaning and significance of the 'new technologies'. This is not only because there is hardly any aspect of contemporary life which is not affected in some way by technological developments, nor is it because children and young people are growing up with an unprecedented experience and understanding of an electronically fashioned world but it is because the 'new technologies' are an intrinsic part of art and design, both in terms of making and responding to images.

Technology and the practices art and design

To a large degree, technology and art and design can be considered to be isomorphic as some form of technology would seem to be essential for any kind of art and design production. In educational terms, the technology of art and design is not only a major part of the subject but is also a primary vehicle for learning in art and design. This applies at the simple level of, for example, crayon drawing, in which the particular characteristics of crayon as a material are inseparable from its use as a medium, as well as in more sophisticated processes such as the use of power wheels and kilns for making and firing ceramics.

Throughout history, art and design has depended upon and, in some cases, initiated technological developments. The possibilities of visual expression in colour, for example, were extended by the paint technology of fresco and tempera, to be later extended by the use of oil as a medium and, more recently, by acrylics. The use of the camera obscura, as a means of rendering the three-dimensional world into two dimensions, and the invention of lenses and the camera opened up the possibilities of photographic realism and the analysis of moving form. Similarly, the invention of the lithographic process provided new possibilities for ink and chalk drawing and this process, when linked with the invention of photography, led to the now almost universal application of photo-lithography in almost all forms of commercial graphic design. The manipulation of photographic images into what became known as photo-montage not only was innovatory as an artistic medium but presaged a major technical element in more recent computer generated image making.

The development of film as an expressive medium offered opportunities to use time and seriation in image creation and the technical developments in lenses and cameras opened the way for continuous changes in image scale. The processes of editing and re-editing, including reversal sequences and the superimposition of sound-track, facilitated the construction of holistic form in the studio which went far beyond the primary source reality of the film in the same way as, earlier, the painter had constructed studio paintings from sketches. In other words, the film as a medium of expression drew upon but was not necessarily a representation of a particular reality and, in being so, allowed for the creation of new forms of reality.

In a major sense, art and design is the realisation of intentions through the materials, techniques and processes constituting media to produce a realised image or form which is, in itself, a presentation of the relationship between intention, form, processes and materials. The point being made here is not only that the technology of art and design is a major means whereby artistic intention is realised in visual form but that technological processes provide an essential way of conceiving artistic intentions.

The broadening of the curriculum has involved children in many schools in wide applications of technology in relation to designing and making activities. A prevalent approach in schools' programmes which emphasise designing and making is based on the processes involved in identifying and solving problems and focus on social and economic as well as practical and aesthetic considerations. Invariably, the problems arise from studies of what constitutes the man-made world and how some improvements may be made in practical terms. The problems vary from matters concerning product design and manufacture, including fabrics and fashion as well as industrial products, to wider issues of environmental design. The process involves problem identification and analysis and giving consideration to all relevant factors prior to proposing possible solutions. Developing skills of criticism and evaluation are considered to be essential components of the process. To place this activity in a real life context, in many local school systems in England, for example, close relationships between education and industry have been developed and schools have been able to provide children with live projects from local industry.

Although initiatives of this kind have been effective in bringing what happens

in the art and design classroom closer to the realities of art and design in everyday life, there are obvious limitations. In many cases, the children's acquisition of knowledge about materials and the development of their technical skills as well as abilities to make decisions about technological applications is limited to the particular issues or problems being addressed. Whilst there is no doubt that many children do develop high levels of designing abilities, craftsmanship and technical competence, they are invariably limited in both scope and scale. The range of problems or issues which can be addressed and the possibilities for solutions are limited by time and resources. Most importantly, however imaginative a child or student might be, it is difficult to hold all possibilities in mind with mental modelling and trial-and-error can be both expensive and time consuming at the practical stage. Problems relating to environmental issues are particularly difficult to pursue and resolve and, of course, proposals for environmental change are rarely realised in practice.

Art and design curricula and the 'new technologies'

It was argued earlier that the primary case for the inclusion of electronic technology in the art and design curriculum was that it is, on the one hand, an increasingly important part of everyday life and, on the other, that it will be increasingly evident in the work of artists and designers who shape our visual environment. Although, again, there is no doubt that a major contribution of electronic technology will be seen in relation to children's and students' production of art and design, it has important implications for the development of their perceptual and analytical and critical abilities as well as historical and cultural understandings. Whatever the value, however, it cannot be too strongly stressed that the inclusion of activities relating to electronic technology in the curriculum needs to be seen as an extension of, and not a replacement for, the range of activities alluded to earlier. Nevertheless, it can offer a new dimension of unparalleled significance.

Apart from educational rationales for including electronic technology into the curriculum, there are two practical considerations of more than a little importance which need to be taken into account, the first being cost and the second being accessability or, to use the computer terminology, 'user-friendliness'. With regard to the

first, developments in manufacturing processes have been so rapid that the cost is becoming an increasingly less important issue. The availability of low cost computers and related hardware makes them a feasible proposition for the majority of schools at the present time.

User-friendliness is similarly becoming less of a problem. A few years ago, I was invited to judge what was claimed to be the world's first computer art competition. At that time the programs for all the images, both still and animated, had been written by the competitors, some of whom were as young as nine years of age. It is of more than a little interest that none of the winners of the competition had learned their programming skills in schools or colleges and, indeed, none of the art and design departments in which they were studying were using computers at that time. Some of the programs were amazingly complex and the problem was to judge the image quality and not the programming ability. In contrast and in a relatively very short time, 'user-friendly' software packages are now being produced which allow easy access to image generation and manipulation and many can be used even by very young children. However, there is still a problem in establishing criteria for evaluating electronic imagery, particularly animated imagery, and it seems that much can be learned from the work which has been done in film and television criticism.

Whilst it may be accepted that computer and computer related technology needs to be an important element in the art and design curricula in schools of general education for all reasons already mentioned, it can be more than strongly argued that it needs to be seen as *essential* in the training of all art and design students following degree courses in higher education. This is not only because of the potential of the computer as an expressive medium through programmes such as the 'Paintbox' nor because of the increasing applications of computer-aided design (CAD) and computer-aided manufacture (CAM) in industry, although the latter are certainly necessary in the preparation for careers in which they play an important part, but because of the ways in which it can affect the thinking processes and contribute to the development, and facilitate the exercise, of the imagination. In order to do this, it is essential that the students' familiarity with the technology is of such a degree that the technology itself, to a large degree, becomes unimportant. This

kind of relationship to the new technology is in marked contrast to what is required in working with earlier technologies for which a thorough understanding of the technical processes is essential at all stages of designing and making. Being able to be distanced from the new technology in this way is dependent, of course, on 'user-friendliness' and ease of access and it is now the case that, except for those students who wish to pursue that kind of activity, there is little need for students to either understand the technology involved or to develop programming skills. This can be amply illustrated at the level of the kind of high-powered computers which are now being found in higher education institutions by a comparison, for example, of a machine such as the Crosfield Pro-Ed Visualiser, which takes on average about three months training to use, with that of the Spaceward Supernova, which can be used after only a few hours of instruction.

Seen in the context of other technologies which constitute the field of art and design, the new technologies provide unparalleled possibilities for both learning in and the practice of art and design. Some of these are already becoming familiar such as, for example, in exploring photomontage techniques and being able to draw upon a potentially infinite range of still and animated source images; the potential for scale and colour changes and the transformation of perspectives from a given set of parameters; the ability to capture and manipulate digitised images from animated video; and the exploration of expert systems particular to art and design. Of particular significance is the potential for providing a universe of concrete visualisations of abstract systems and for facilitating decision making on rational bases rather than solely on personal preference. In terms of students understanding art and design in the real world, it is a matter of fact that many products at the present time are so complex that they simply could not be produced without the aid of computers and the simulation of such structures as well as architectural and environmental designs offers the potential of allowing students to experience design issues in ways which would otherwise be impossible or impractical.

Nevertheless, the new technologies in art and design are only tools and only become *useful* tools in the context of the students' broader art and design abilities and understandings. The kind of knowledges, abilities and experiences

described by the aims and objectives referred to earlier provide a framework for course development through which students can become familiar with and thoroughly aware of accepted practices and the contexts in which they are working. Historical and critical understandings in art and design are essential underpinnings at any level of education. Even in this context, however, electronic technology has the potential to make an increasingly important contribution. Although still in its early stages of development, the field of information technology, particularly in its application to the creation of data banks and interactive, computer linked video laser disc systems, such as those now being produced by the Voyager Company in the USA, shows something of the possibilities for providing multidimensional experiences of art and design and may provide challenging insights into the development of critical abilities as well as historical understandings.

Teaching and the 'new technologies'
Developments in the new technologies have been so rapid that they have figured very little in the past experiences of many practising teachers and, as was illustrated by the earlier reference to the computer art competition, the children in the schools and students in colleges are often more familiar with the electronic world than their teachers. There is no doubt that a great deal needs to be done to extend teachers' understandings of the new technologies if they are to become part of the general provision for art and design in education. Although the new technologies are being increasingly adopted in degree course, many of the art and design graduates who currently enter the one-year course of specialist teacher training in my own institution immediately after the end of their degree courses, for example, have had little familiarity with computers and we make it a requirement that they all undertake workshops in both technology and computing. Again, the increasing availability of user-friendly systems makes this an easier commitment for both students and staff. Similarly, there is a great demand from practising teachers in England for courses and other kinds of familiarising experiences in the new technologies, particularly as pressure is being applied from central government to relate the curriculum of schools at all levels more closely to technology and the needs of industry and the majority of schools are now being provided with wide ranges of equipment.

The possibilities offered to art and design education by the new technologies are extremely exciting but a great deal of research and development work needs to carried out into the ways in which the new technologies can affect and contribute to the curriculum in art and design and how the practices of teaching and learning may be extended by the possibilities being offered to them. A great deal of collaboration and cooperation will be needed to explore and exploit these possibilities and there is no doubt that international cooperation will play a significant role in this endeavour.

Summary
In this paper, education systems were described as characterising the values of society and seen as being *reactive* to contemporary circumstances and needs whilst, at the same time, being *proactive* in terms of preparing the young to participate in and contribute to future social developments. Two major contemporary social and educational concerns were identified as being those of the *multicultural* society and the *technological* society.

Some considerations drawn from the field of *educational technology* were put forward as providing useful perspectives for the revaluation of art and design curricula and particular reference was made to the identification of roles and purposes, the definition of subject content, the nature of aims and objectives and the important role of educational evaluation.

The subject of art and design was described as being multidisciplinary and emphasis was given to the inter-relationship between the production of and response to art and design. An example was given of a coherent set of aims for art and design education which, it was argued, were an essential underpinning for curricula addressing the whole of formal education from kindergarten through to adolescence. The possible universe of knowledge, skills and abilities in art and design were encapsulated in a four domains model, which was described in terms of educational objectives.

Art and design practice was identified with developments in the *technology* of art and design and reference was made to both the possibilities and limitations of emphases on technology in designing and making with regard to children's and students' learning in art and design.

Some of the possibilities offered by the 'new technologies' to teaching and

learning in art and design were identified whilst, at the same time, it was stressed that the development of students' designing abilities within the context of a broadly based curriculum was an essential prerequisite for the application of the new technologies. Emphasis was given to the importance of the quality of images and products over the technology and it was stressed that the accessibility or 'user-friendliness' of the new technologies was of utmost significance. An argument was put forward for the inclusion of the new technologies as being essential in art and design education in higher education, not only because of its relevance to contemporary art and design practice but also because of its value in relation to the students' thinking processes and development of the imagination. Some reference was made to the ways the new technologies might be helpful in developing students' analytical and critical abilities as well as their historical and cultural understandings.

It was argued that the new technologies needed to be given priority in art and design teacher education and that provision needed to be made for inservice training courses to enable practising teachers to become familiar with the possibilities for teaching and learning which the new technologies offer.

However, it was noted that developments in the new technologies were still at an early stage and, although they offered exciting possibilities, a great deal of research and development work was necessary if those potentialities were to be explored and realised. It was argued that this work needed to be underpinned by collaboration and cooperation between teachers, lecturers and the specialists in the new technologies and, particularly in the light of the moves towards a unification of the European community, that this collaboration would need to cross over national boundaries.