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New technology and educational television

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This paper discusses several factors related to the development and use of educational television. Areas covered are: the impact of technological development on Educational Television, and the opportunities created for more widespread production and use; the frequent failure of the educational system to exploit fully new technologies; and the need to reconcile the tensions between the traditional educational technology approach and the drives behind much new technology.

The age of broadcasting: The origins of educational television

The television service in the United Kingdom began 50 years ago in 1936, but with the Second World War in the intervening years, it was not until the early and mid 1950s that it became widely established. By 1957 (1958 in Scotland), both the BBC and the newly formed Independent Television Companies were transmitting television broadcasts for schools. Educational television within the UK, as in so many other countries, finds its roots within the broadcasting system.

The phenomenon of educational television might have been new, but the notion of educational broadcasting certainly was not. The first school broadcast took place in Glasgow in 1924, when a group of enthusiastic gentlemen, including musicians and University professors, gathered in a Glasgow studio and broadcast a radio program to a receiver installed in one of the city's secondary schools. The fare for the assembled children was a 15 minute literary talk on "The Ballad", a reading from a French Classical novel and a solo from a violinist. After the program, the participants walked across the city from the studio to the school to be "greeted with applause" by the children who had listened to the broadcast.

From such initiatives and experiments, an educational broadcasting sector emerged. In 1927, the BBC produced over 40 series designed specifically for schools. In 1929, the Central Council for School Broadcasting was created in recognition of the need for consultation with the teaching profession. In 1947, this body became the Schools Broadcasting Council for the United Kingdom, and so with the advent of educational television broadcasts in the late 1950s a mechanism for educational consultancy and validation was already in place.

The new Independent Television companies, supervised by the Independent Broadcasting Authority, were required by statute to provide an educational service, and similar procedures for consultation with educational bodies were adopted.

At the outset, then, educational television was synonymous with Schools broadcasts, which were steeped in the tradition of public service broadcasting. It was seen by some as a rich, diverse and centrally important resource. Others viewed it as a peripheral supplement which was acceptable as long as it did not interfere with the "real" educational process. In 1961, for instance, out of 58 television sets in Glasgow's secondary schools, 47 were installed in "Junior secondary schools" (for the average and less able) and 11 in the Senior secondary schools (for the academically bright children). In Edinburgh, the figures for total of 12 sets were respectively 9 and 3. Whatever the initial reactions to the new service, educational television in the late fifties and early sixties meant television broadcasts for schools.

The age of video: Development of educational television

The influences

The technological and political environment shaped the particular broadcasting system that developed within the UK, and this in turn influenced the nature of educational television. It has grown and developed in many ways over the last 30 years, however, not only in the sense that its program styles and content have changed (mercifully), but also in the sense that it is no longer so simple a concept as it was. Its boundaries are much more fluid, confusingly so at times, and this is because it has had to adapt to a set of changing social and technological circumstances. The factors affecting its development have been many, but the following have probably had the most significant and far reaching effects:

1. The expansion of the broadcasting channels of communication.
2. The availability of low cost, high quality production equipment to a wider range of bodies than the broadcasting companies.
3. The increased availability of reception, recording and playback equipment produced for the domestic market.

The particular combination of these factors led educational television into the "video" age. The move towards a more decentralised system was marked by the breakup of the monopoly on broadcasting enjoyed by the BBC. Running in parallel to this was the development of opportunities for the educational community to develop its own television production expertise, as a result of television production equipment falling to price levels within its range. Just as important, however, was the development of the video recorder, and its increased availability to the public at large, creating a greater range of opportunities for the users of educational television material.

Expansion of communication channels

For the first half of the twentieth century, the broadcasting system within the UK was in the hands of one independent body, which, in spite of its largely successful record in remaining free from political influence, was nevertheless financially dependent on government for its support and continuation. Technological constraints were partly responsible. It was natural enough that

scarce communication resources should be centrally controlled. It was natural too that within such a system of public service, a menu of programming designed to satisfy public taste should conform to what was perceived to be shared or consensus standards.

Different needs were addressed by a variety of programming on both national and regional stations, but there is little doubt that the BBC adopted a paternal (maternal?) attitude towards its public, and little doubt that in general its public attributed to it an authoritative neutrality that was appropriate to a period when there was far more consensus in politics, morality and social behaviour. Contemporary citizens of the UK might have greater difficulty with such a concept.

The advent of television led to the breaking of the monopoly. The creation of the Independent Television Authority (now the IBA) in 1954 reflected the general post-war movements in society away from a central control political model to one which extended more resources, and therefore power, to a greater diversity of groups in society. Independent commercial companies were offered franchises, and new voices and new programming reached the airwaves.

The "pirate" radio stations of the sixties, broadcasting illegally from secret locations within the UK or from ships lying off the coast, were another aspect of this desire for new communication channels within the population, and the pressure brought about by them led to the reorganisation of the BBC radio stations and the emergence of independent local commercial radio stations. Development in technology made possible the creation of a second National BBC television channel (BBC2) and the creation of a second commercial television channel (Channel 4), in response to this desire for more communication channels.

When new independent television channels came along, the BBC had to adapt its programming to compete. When independent local radio stations were formed BBC radio stations were reorganised, and community stations developed to serve local regional needs. Both the BBC and ITV television channels have changed their menu and style in response to different programming emerging from new arrivals such as Channel 4, and sometimes as a result of programming emerging from radio, particularly in the area of community action. Existing institutions have had to adapt to new situations brought about by new forms and styles of broadcasting.

It is significant that every successive piece of broadcast related legislation in the UK has had the effect of decentralising and democratising the broadcasting system a little further. The creation of Channel 4, for example, represented a new departure. The company is a commissioning company only, and a significant proportion of its commissions derive from non-broadcast sources. In addition, the channel supports community and independent programming by funding video workshops and other initiatives. Thus the legislation behind the creation of new channels has given added impetus to decentralisation and has encouraged participation by an ever increasing diversity of groups. Their ability to participate has been influenced by the development of low cost production tools putting educational television production within their reach.

Production tools

Twenty years ago, very few institutions apart from the broadcasters themselves were able to afford the cameras and recording equipment associated with educational television production. There were some exceptions. In 1966, Glasgow Corporation invested in studios connected to the city's 300 primary and secondary schools by cable laid in the old tramline ducts. In this forgotten age when the city was 1300 teachers under complement, the television service supplemented provision with the transmission of some thirty programs per day, five days per week, representing 14 primary series and 20 secondary series of high professional standard. This kind of commitment, however, was the exception.

Occasionally, well funded Universities were able to venture into this area, and in the early days, a University such as Aberdeen was better equipped than the local commercial television station, Grampian Television, which hired facilities from it. The educational institutions which had access to television production facilities had no real outlet for their product apart from closed circuit television applications, which were mainly in house.

The Educational Television Association was founded originally in 1967 as NECCTA (the National Closed Circuit Television Association), reflecting the operating forum of most of its original members. It changed its name in 1973 to the Educational Television Association, reflecting the broadening of its sphere of activity, made possible largely by new technological developments.

The manufacturers of video production equipment were beginning to create new markets and applications in the industrial and educational spheres. Production equipment became more widely available. High quality colour cameras which cost far less than their previous monochrome counterparts were purchased widely. Microtechnology reduced size and cost and increased quality and versatility. Light weight portable production equipment, affordable by a much wider range of bodies, institutions and individuals, became available for the production of material to feed into the growing number of channels of communication.

The overall effect of the development in production technology has been that more groups and individuals have the tools of production at their disposal, including, quite obviously, those who wish to make educational contributions. Most educational establishments of any size have some sort of educational television production capability. Video material, including educational programming, is made specifically for the videotape market. The educational videotape being used by a pupil in the school or the adult at home might be a production supplied direct from the College or University television unit; or it might be an educational broadcast produced by a broadcasting company and recorded off air; or it might be a production by a commercial unit bought across the counter in a high street store.

Many of the new contenders in the "video" age are the educational television units established in Universities and colleges and local educational authorities, or in the training departments of industrial and commercial concerns. Material from college units finds its way onto the shelves of schools resource centres and libraries. University produced material designed to satisfy the requirements of faculty departments manages to achieve a commercially viable existence in specialised national and international markets.

In addition, a growing number of corporate bodies or national institutions (Health councils, Cultural institutions, etc.) have begun to commission independent video producers to produce videotape material, and educational publishers have begun to market packaged videotape material through commercial outlets, often corner video shops. All sorts of bodies and agencies, even adoption and fostering bodies, continue to use video to market products or to get ideas across.

The sources of educational television product have expanded enormously, and producers of educational television material have become more numerous and diverse, likely to come from a much wider section of the community than before. Advances in the production equipment available at relatively low cost have been the main enabling factor for many of them.

Domestic recording and playback equipment

The spread of television receivers to schools and colleges in the 1960s was followed by the introduction of video recording and replay equipment in the 1970s. By the 1980s, the video recorder had, in a relatively short space of time, made significant inroads into both the schools and the home, becoming an established and accepted piece of furniture. One of the new channels of communication, therefore, became the videotape itself.

As well as providing a time shift function for the viewing of transmitted product, the video recorder could play back material which by-passed the broadcasting system completely. Rights for feature films or educational material could be purchased and material could be recorded directly on video cassette for a public which no longer had to rely on the menu of broadcast viewing material chosen by someone else.

The notion that educational television encompassed only material produced and aimed at schools and other educational establishments became well out of date, although such material was, and still is, a most important component of educational television. The provision of educational television from a number of different sources, however, meant that the audiences changed and so did their expectations. There was an increasing awareness that there were certain groups which had special requirements over and above those satisfied by the formal school system, and that these groups required the support of educational television. The adult literacy and numeracy programs, catering for sections of the population that the formal educational system had failed were early examples of this kind of programming, but other groups requiring similar resources emerged - the elderly, young mothers, women in the home, the disabled, second language immigrants and so on. In particular, the economic climate created swelling ranks of young employed. Technological change and world recession spawned groups of people with special needs - the redundant workers, the prematurely retired, the young trainees. All had educational needs, whether these were for retraining in new skills or the pursuit of activities in increased leisure time. In such contexts, television, whether broadcast or on videotape, proved to be a particularly powerful and apposite medium for both raising awareness of issues, and for delivery of insights and basic concepts, and sometimes for delivering the content of the learning itself.

The attempt to address the needs of such groups was one of the factors which led to the emergence of different styles of educational television. With such

groups, there is seldom the same kind of support structure that exists within the formal schooling sector to support the educational training or learning. The nature of much educational television in such contexts, is to act as a spur to further learning, and this support beyond the broadcast requires the organisation of diverse resources - print, teaching packages, course tutors, access to equipment etc. Some of these elements can be incorporated within the educational television component, or included alongside it as part of a package, but usually, other agencies have to be involved, either to provide materials or to coordinate and make accessible other resources. Educational television material needed to be designed to suit a wide variety of contexts extending far beyond the formal classroom setting. There was therefore a requirement for flexible material different from traditional broadcast product.

A second factor was that most educational television material, even that transmitted by the Broadcast companies to schools, was used in recorded form. This was especially so within secondary schools in the UK which boast provision of video recorders that equals provision virtually anywhere in the world. Within schools, it was much easier for broadcast material to be held on tape and used at a time that suited the particular school timetable. Broadcasters reacted to this in a number of ways. The emergence of short separate resource units in place of a traditional program was a feature designed to allow the user of taped material (the teacher/tutor) to use and mediate the resource in a manner and at a time that suited both the timetable and the students. Experiments with night transmission of broadcast material and block broadcasting of series indicated an awareness on the part of the broadcasters that teachers wanted and valued "video" material, irrespective of how it was delivered. Copyright concessions were negotiated by broadcasters with rights holders to allow legitimate copying of educational programming, and this was extended to take in adult and continuing education.

A piece of educational television might therefore be simply one of a series of inter-related resources requiring mediation by a teacher or tutor or by the accompanying materials themselves. It might not have to be a "program" as such, with its own in built logic, links and continuity. All that many situations demand is the provision of a series of appropriate segments or resource units, which can be used as required by the student, or as directed by the tutor.

The results

The "Video" age has largely been an expression of the desire of people to have a greater degree of choice over their use and exposure to audiovisual product. The explosion of channels of communication consequent on this desire has been supported by, or perhaps led by the development of technology which allows the user greater access to product and greater control over its deployment. The broadcasting organisations within the United Kingdom have had to come to terms with the forces and pressures that have led to the "Video" age. They have had to come to terms with the video recorder.

The technology and the current social and educational imperatives have come together to provide the end user with a much greater degree of CHOICE and CONTROL, not only over what he or she chooses to learn, but how and when and at what pace. Learning in many settings, even traditional formal ones, is becoming much more open. The Open learning ethic is largely a reflection of the fact that technology has given us a variety of carriers and delivery systems

which afford the end user greater choice and control. We have gradually become aware that social and educational problems can be assaulted with a range of new weapons that go beyond and are independent of the formal school structures. Educational television is an important part of this armoury.

The impact of all of these factors on educational television has been significant. The explosion of channels of communication and the high penetration of playback and other devices has ensured that educational television is not merely the province of broadcasters and University departments with closed circuit systems. The audience for educational television is much larger and the interest group is much wider. Users have a wide variety of routes by which they can gain access to educational television. The development of low cost, user friendly equipment puts the creation of educational television within the reach of many more sections of the community. The potential producers of educational television material are therefore many in number.

There are, therefore, many more channels through which many more people can communicate. There are many more opportunities for the production of educational television material to feed into such channels, and many more potential users of such material, sometimes highly specific groups, at the receiving end. Educational Television encompasses much more than broadcast television for schools.

If the first age of educational television was the "Broadcasting" age, and the present one the "Video" age, then the third age, which we are just about to enter, can probably be best described as the "Interactive" age. Such terminology is meant to be broadly descriptive of the major concerns operating at various historical junctures. It does not imply that the age of broadcasting is past, or that the widespread use of video will diminish. What it does imply, however, is that the institutions that grow and develop to support technologies associated with one age are influenced by and must adapt to the next, otherwise their most likely fate is decay and oblivion.

Both broadcasters and the new producers seem to have risen to the challenge of the "old" video technology. What we need to look at is the scope for development in the context of the "new". If the "old" video technology gave users greater access to a wider variety of educational material, and greater control over its use, then the "new" technology extends this in two ways; first of all, many of the new developments enable even more material to be delivered over greater distances. Secondly, the user often has the facility to interact with the material in a way that allows fine selection and shaping, or that allows two way communication to take place. It is this second aspect that separates it from what has gone before.

The interactive age: The future

There are many developments in train at present that may have far reaching implications for educational television. They include improvements or developments in existing video technology; new communication systems afforded by satellites and cable technology; complementary information technology systems for the transmission and mass storage of data and other material; and the convergence of video and computing technologies leading to interactive applications.

Developments in video technology

The process of development in this area has continued with the introduction of microtechnology to aid and assist with complex production and post production operations. Cameras used regularly in industrial and educational contexts carry onboard computers to assist with registration and colour balance operations, or employ new chip technology to replace camera tubes and avoid lag, flare and tube burn problems. Domestic portable equipment, with automatic focussing and exposure control, shoots adequate pictures in low light levels that previously would have required batteries of high powered lights. The technology is developing so rapidly that broadcasters are using pieces of equipment developed for the domestic market for their own purposes. For example, freelance news stringers attached to Anglia Television, one of the UK's ITV channels, are currently experimenting with domestic Video X cameras for news coverage.

The appearance of light, portable, high quality camcorders has already brought original basic production possibilities to the classroom. Pupils within schools are producing video tape material to document projects, or to explore the medium in media education contexts. The gradual emergence of low cost editing and post production equipment will further extend the scope for inhouse production. The broadcast companies themselves are aware of such developments, and in fact are beginning to produce videotapes, programs and other materials to assist students and others in the techniques of video production.

As prices drop even further, more and more groups are beginning to avail themselves of production opportunities of high technical standard. Community video workshops, some producing standards of work that are of broadcast quality, are buoyant. Possibilities for educational production would seem to be growing, and along with the growth in production potential, there seems to be an ever increasing demand for new video material to suit an ever increasing range of needs and contexts. Commercial producers are finding profitable areas in the mass market, particularly if they aggravate and build on easily roused parental mistrust of the quality of school education. Trainee machine operators on factory floors are learning health and safety procedures, or machine maintenance through video. Video is helping adult learners study money management at home.

The sophistication of video tape and disc playback devices with their onboard microprocessors controlling timers, freeze frame, fast and slow scan operations etc make it possible for effective preview, selection and versatile use of appropriate educational material. Domestic equipment with features such as edit facilities and two sound channels make it possible for a teacher/tutor to compile material from a variety of sources and overlay it with a commentary or sound track appropriate to his/her own particular audience. The technology is making it easier to incorporate video material in the educational and instructional process.

The High Definition Television set will erode the differential quality between present video display and the projected image. Will there still be a need for 35 mm slides in education as a result? 3D television using video discs has already been developed by JVC. Further refinements in video equipment are not far away.

The overall effect of the development in production technology is that more groups and individuals have the tools of production at their disposal, including, quite obviously, those who wish to make educational contributions. The pupil writing a video essay in the classroom with a domestic portable colour camcorder has access to a technology that existed only in the realms of fantasy not so very many years ago.

Satellite and cable technologies

Developments in communications technology, particularly in the field of fibre optics and communications satellites, have led to an even greater plurality of outlets. Wideband Cable television systems extend choice even further, since, with 30 or more television channels at their disposal, as well as numerous audio and data channels, they can deliver a wide variety of large scale packages of product beamed in from distant satellites, or provide opportunities for the production and consumption of highly localised program material. The holders of Cable television franchises within the UK have an obligation to provide community access to one or more of their channels thus further extending access to channels of communication.

The educational possibilities are great. Distribution of educational resources with reception restricted to specified users only (eg. those who have paid) if necessary; Staff development meetings which allow Adviser/Visiting speaker/director in studio to speak to staff in schools, who can interact with full video conferencing or simple audio feedback to studio; Interschool debates, with eavesdrop audience; Home/school/Community local targeted programming; development and delivery of educational product geared for specifically local needs; interactive text telesoftware and data transmission; interactive video libraries accessible from home terminals etc. There are already a number of dedicated multichannel cable applications in which interactive teaching takes place, in contexts such as teaching hospitals where split sites often present problems.

In March of 1986, work began on the laying of three pairs of small optical fibres for a distance of 75 miles on the ocean bed between England and Belgium. They can carry 12,000 phone channels and deal with 280 million bits of information every second. They can handle the processing of video signals making two way teleconferencing operations a possibility. By 1990, there should be a global communications network of underwater fibre optic cables, linking Europe, North America and the far east. Cables should be laid in the Pacific before that date. Work has already started on the Sydney-Melbourne optical fibre link that should be capable of coping with some 60,000 simultaneous telephone conversations. The Perth-Adelaide link is due to be completed in 1989, and all mainland capital cities should be connected into an integrated services digital network by 1992. This should ultimately be able to transmit voice, text, data and images over a single carrier.

Satellites can handle the same sort of traffic and bounce their signals across the world for mass reception. Between them, therefore, the two technologies, sometimes operating in cohort with one another, can deliver unthinkable quantities of data, voices and pictures. It is thus possible to send audiovisual messages, perhaps educational resource material, halfway across the world for widescale reception, or for limited reception if the signals are encrypted. American Universities intend to beam educational program material over Europe in 1987/88. It is possible for a class of school children in Germany to

have a two way video conference with a class of school children in Scotland by satellite, during which pupil created video material of local environmental interest can be transmitted and discussed. The cultural, linguistic and general educational possibilities of such a linkup are enormous. It is hoped that something of this nature can be achieved between Australian and British schools to mark the bicentennial celebrations in 1988.

The educational television possibilities employing these technologies are legion.

Information technology systems and equipment

Information Technology devices and systems might seem to have little to do with educational television, and in fact might be looked upon as systems competing for time on the television screen. The television set in the corner of the home or classroom was once a single purpose piece of equipment, but its function has become increasingly multipurpose, with educational television/video programs being just one of many concerns competing for its use.

Viewdata, teletext and electronic mail systems need a display screen. So does online access to a distant data base, or even the search of a database stored locally on a microcomputer. The television set often doubles as a visual display unit in the home or school. The demand on the television set from this multiplicity of sources has been so great that over 54% of British homes now possess more than one television set.

Many information technology (IT) systems and applications, however, intersect with educational television and often play complementary and supportive roles. Teletext pages, for example, are used to transmit teacher's notes and other materials that accompany educational broadcasts. These, along with accompanying computer programs in telesoftware format, can be downloaded onto a micro computer in the school and printed off as required. The Department of Trade and Industry issued free modems to over 12,000 British schools last year, so that schools, using their micro computers as terminals, can link into viewdata services through the telephone system. Again, information on school broadcasts can be found in such databases.

Virtually every new piece of equipment or development has some kind of implication for educational television. The development of Compact discs, for instance, seemed to have implications for the digital storage of high fidelity sound, but no real significance for educational television. The massive text and data storage capabilities of CD-ROM seemed to have other kinds of information applications. The UK Post Office, for example, has just put all of the UK's 23.5 million private and business addresses onto a single compact disc, which is used for customer enquiries, but which is also sold to customers who have a use for it for £2,500 a copy. It, and databases like it, can be linked to personal computers which can be used to manage, search and organise the database Thus it might have been seen as a useful peripheral device in video applications.

The relevance of this technology to educational television was limited until the development of the CD-I format. This heralds a compact disc that can combine audio, video, binary data, text and applications programs. It can include 10

minutes or so of moving picture material. Those concerned with education television cannot afford to ignore it.

The convergence of technologies

The convergence of video and computing technologies has had two broad effects. First of all, it has brought automation and efficiency to many complex video production and post-production operations at a cost that is within the reach of many. It is now possible, for example, to purchase a small computer that will allow the programming of a 50 event three machine edit, with sound and video separation, for under £5,000.00. Computer graphics and special effects can be purchased for a fraction of what it would have cost several years ago. Even the small microcomputer can be used to generate titles and animated graphics for insertion into video programs.

Secondly, the two technologies have combined to produce, not a hybrid of the two, but a separate interactive technology in its own right. This has been largely made possible by the high profile introduction of microcomputers and personal computers into the schools and industrial communities of many countries.

Recent statistics indicate that between 1981 and 1985, per capita expenditure on books in English primary schools remained reasonable stable in real terms (£6.81 in 1981 and £7.29 in 1985.) In secondary schools, the figure dropped slightly (from £10.34 in 1981 to £10.15 in 1985). Expenditure on equipment, however, rose significantly during this period (£13.74 - £16.26 for primary and £27.11 - £32.38 for secondary). Some of this increase in expenditure on equipment was occasioned by the supply of IT or audiovisual equipment, but most was related to expenditure in connection with the microcomputer. Within England and Wales, some £20 million of government money has been spent on introducing hardware into schools over a 5 year period, along with £23 million on a supportive educational development program. On average, there are ten microcomputers in each English secondary school.

Home ownership of computers within the UK varies a great deal regionally, but over 25% of all homes in Britain have a home computer. In the South east of England, the figure is as high as 40%. The prognosis is that it will level out nationally at about 45%, the same sort of penetration reached by video recorders to date.

The presence of the microcomputer at home, in the school and at work means that the strengths and advantages of the microcomputer are becoming apparent to many people and the possibilities of utilising these strengths in connection with the established video technology are gradually being explored. The emergence of interface boxes which allow the linking up of computers with video tape recorders opens up interactive possibilities. The computer can control the forward and backward movement of the video tape, and therefore can start and stop selected sequences. These instructions can be built into a program so that at certain junctures, or in response to pre ordained cues, appropriate sections of the video tape are played. Pages of text, generated by the computer, can be interposed between moving picture sequences, or mixed with the sequences if the requisite overlay circuitry is available. Access time quite obviously is slow, but careful use of text or graphics pages can constructively fill the gaps caused by search time.

The video disc brings this interactivity into its own because of the speed of access time and the volume of still, text, graphic and moving picture sequences that can be stored, and because of superior freeze frame and other control and search facilities. Tape/computer links should not be dismissed too readily, however, since they are appropriate to many relatively straightforward applications, and can be produced with little cost in house. Disc systems are being developed largely in the industrial and commercial sector, where banks and other large organisations with multiple outlets and outstations have realised the benefits of employing the technology for on the job training. Shop floor industrial training applications figure prominently also, and many of these tend to be very specific, so that there is little application of the programs elsewhere. Recently, however, generic training material has begun to emerge, and so off the shelf packages addressing areas such as writing skills and telephone answering techniques are beginning to become available. As such material widens in scope and grows in volume, then off the shelf educational and training applications will be much more of a possibility.

The strength of interactive technology is first that it combines the interrogatory and manipulative power of the computer with the impact of an audiovisual experience, and material is delivered to the learner in response to need. Secondly, the capability of the technology to hold massive stores of material means that there is sufficient material gathered together in the one place to provide the range of choice apposite to the complexity of learning programs. The educational applications of such technology, stretching from simple language overlay programs on existing material, to fully interactive real time simulations, and projects of encyclopaedic proportions such as Domesday, need no enumeration.

The technology represents a further major step in putting learning under the control of the learner. Each step taken moves us a little further in this direction. The development of expert systems is an attempt to gather together knowledge and experience that can be interrogated according to the need of the learner. Even within CD-ROM technology, developments such as CD-WORM (Write Once, Read Mainly) are attempts to allow the user to supplement the encoded material with material generated by himself, so that his own experience and information becomes accessible in response to future interrogation.

The technology can supply the data in a variety of forms (text, moving picture etc.), can deliver it from afar or store it locally in sufficient quantity to make the interrogation process worthwhile. The significant challenge for educational television is its ability to find a place that is relevant and worthwhile across the variety of carriers that are generated by technology.

The convergence of technologies has opened up other horizons for educational television. It has also blurred the concept further. Educational television, will not fit neatly into its own little box any more. It is difficult to decide whether Interactive Video is essentially a computing technology incorporating educational television, or whether it is simply the sharp end of educational television. Perhaps a body like the Educational Television Association will have to change its name again in the future, to embrace whatever composite concept emerges from the various links and allegiances it has formed with other technologies. One thing is certain: we cannot afford to turn away from

the new directions opened up by new technology: but neither can we afford to dispense with an interest in quality and standards of television production, or ignore issues of educational use and relevance. Technology has changed the medium and no doubt will continue to do so, but without the focus on educational use and relevance, then developments will always run the risk of being still born.

The integration of new technology: The experience of the past

There is little doubt that the opportunities for development are great and the educational potential is vast. Potential needs to be realised, however, and the educational system has a history of becoming a burial ground for new technologies Whatever happened to all of the programmed learning packages and teaching machines based on Skinnerian principles, that were supposed to revolutionise the classroom and change once and for all the role of the teacher? Will the computer, which manages such processes hundreds of times more efficiently leave any more than a dent in the educational system? What real educational gains are likely to emerge from the new video related technologies?

Perhaps such questions can be partially answered by looking at how previous technologies have fared. Within the field of educational television, we can find no phenomenon that should be more established and enshrined within the educational system than the educational television broadcast. It has been with us for the better part of 30 years. It appeared on an educational scene which had had a previous 30 years to get used to the notion of educational broadcasting in general, and to iron out any problems arising. There were problems, but the machinery established to effect proper liaison and communication with the teaching profession was developed and successfully established for a long time before the first educational television broadcast for schools was beamed over the airwaves in 1957. The ground was fertile and well prepared, and provision was firmly based on pilot experiments carried out as early as 1954.

As far as can be determined from viewing patterns and statistics, it is clear that educational broadcasts in schools made a very great impact. The live broadcast became part of the fabric of school life. In 1961, there were 289 monochrome sets in Scottish schools, a figure representing about 10% of Scottish schools. By 1975, over 97% of Scottish schools were equipped with television receivers, well over half of them colour. Over 80 schools television series were produced annually. Broadcast support publications accounted for more than 10% of the educational publications purchased by schools. It was not possible, for example, for a pupil to listen to or view all the educational programs produced within a given year, even if he spent the whole of his time at school throughout the year engaged in no other activity. These simple indicators provide an idea of the inroads the educational television broadcast had made in approximately 15 years.

Over the last 10 years or so, the effects of the "video" age have made themselves felt, and the videotape recorder was the prime piece of technology which held out potential. There were enormous problems of resource access in secondary schools which were developing increasingly complex timetables. The time shift function of the video tape recorder offered a solution. Such

equipment also offered major benefits in connection with preview, selection and control during use. Preview could establish relevance and curricular links. The pause facility and even the most rudimentary editing capability made possible selection of appropriate material and pacing during use. By 1976, regional authorities within Scotland had been both generous and far sighted in their provision. Over 71% of Scottish secondary schools were equipped with one or more videotape recorders, and the potential for development was great.

Between 1978 and 1981, however, a number of major surveys, reports and activities relating to this general area were carried out within Scotland. It became obvious that the potential of the video recorder, and therefore the potential of the educational television broadcast and other video material that was just beginning to emerge, was not being fully realised within the schools. Research was carried out into the operational factors governing the deployment of television equipment and the general resource management of the technology within schools. SCET, in concert with the broadcasting agencies, ran a major series of in service courses and exercises for Scottish Colleges of Education addressing the problem of the introduction of efficient and relevant pre-service and in-service training of teachers in the use of broadcast material within specific subject areas. A most important piece of research was that carried out cooperatively by all of Scotland's Colleges of education (teacher training colleges) and other relevant bodies, which looked at the whole area of provision, curricular relevance and use of educational broadcast material in over 200 schools within Scotland, with the intention of providing models of good practice. The findings were perhaps predictable.

There was quite extensive use of television material, but the examples of "good practice", in the sense of effective educational integration and exploitation of broadcast resources, were few and far between. Where good practice did exist, some excellent work and inventive and imaginative use of the technology was in evidence. The general pattern, however, was one in which such resources were used competently, but in a manner that was by and large uninspired and did little to exploit the technology available. The video tape recorder was used simply and solely as a time shift device in the vast majority of occasions, whether the material warranted it or not. The programs deliberately constructed to form short separate resource units, for example, were often watched straight through by classes as though the material was one continuous broadcast. The pause button was rarely used and material rarely previewed.

The reasons for many of these and other factors are complex and complicated. Some relate to the equipment itself, its location, its management, its ease of access, its shortage of supply, its reliability and so on. Others relate to teacher attitude, fear of the equipment, the curricular relevance of the material, lack of information, teacher training and a host of other interwoven factors.

The broadcasters themselves did not escape criticism. The curricular relevance of their material was called into question on occasion, and their methods of providing information were not always the most effective. Much of the programming was still based on the "live broadcast" model, and did not lend itself to segmented use or mediation by the teacher, thus making the pause button difficult to use.

One of the factors that can greatly influence the level of penetration of new technologies or pieces of technological equipment is the degree to which they become commonplace within society at large. The audio cassette is one such example. It was only when pupils educated teachers in the use of such equipment that teacher technophobia finally withered and the equipment began to be used imaginatively. In the late seventies, the videotape recorder was just beginning to penetrate the domestic market, and teacher fear and unfamiliarity might have been expected. Over the past five or six years, however, the video recorder has become a familiar. piece of domestic furniture, and one might expect the effect of such familiarity to be seen in the classroom.

As the provision of video players has grown and barriers have been broken down, the quality of use by teachers has improved. But by how much? In March of this year, the Chairman of the school broadcasting council felt obliged to state that an astonishing number of teachers were still unaware of the wide range of science and technology programs screened by the BBC and ITV. The BBC in its evidence to a Commons Select Committee earlier this year, stated that primary school teachers are insufficiently trained to use schools programs effectively. Many schools have still not come to terms with the videotape recorder.

This brief account illustrates the fact that even in situations where the climate seems propitious, it is often difficult for the technology to take root at more than a surface level. One might be forgiven for concluding that there is still a great deal of mediocre and uninspired use of broadcast and other video material, no matter how many fast and slow visual scan facilities, automatic stop and search functions and other user friendly devices have been added to the equipment in the interim period.

The videotape recorder is a basic piece of educational television technology. Its penetration of the educational system may be impressive, but its real educational strengths lie, in many cases, untapped. How, then, will other technologies fare in environments that are often far less favourable?

Prognosis for the future

Market and political forces

One very basic problem common to the introduction of many new technologies is that the claims made about them are often exaggerated and overstated. There are many reasons for this, not the least being the fact that new technology rarely springs from the educational system. Ideas may develop within it, but in most free market economies, the momentum required to turn them into tools or equipment or technology lie within industry and commerce, where the rhythms and pace and often the motive forces are very different.

Notions such as marketing and creation of demand are relatively new to the educational system. The implication often underlying this commercial terminology is that people are persuaded to see needs whether they exist or not. The industrial entrepreneur is often forced to place a great deal of faith in the ability of his sales force to create the demand which his product will satisfy. The traditional educational technology approach, however, is to derive

needs from an identification of aims and from an evaluation of performance. Working this way round, there is some chance of working out what resources are really appropriate to needs. Tailor made resources are usually extremely expensive items, however, and so in practice, one will usually be involved in searching for a "best fit" from what is available. Very often, what is available is inappropriate.

Although it is currently fashionable to apply market forces to educational systems and operations, there is no guarantee that economic success equates with educational success. In the field of IT, a "logical" keyboard was patented in America a year or so ago as an ergonomic alternative to the established "qwerty" keyboard on most typewriters and computer terminals. Eight year olds reach speeds of 90 words to the minute within six months. Logically, it might be used within educational contexts so that maximum efficiency is derived. It is unlikely, however, that large corporations will take the commercial risk of introducing such a keyboard in an area where an established tradition has taken root, whatever the educational justification.

The commercial world of video equipment is strewn with different and incompatible technologies. The video recorder has existed in almost as many formats as it has parts. The formats that failed were not necessarily the ones that were technically inferior. The present domestic market leader, VHS, is not necessarily the most technically advanced. Many engineers maintain that Sony Betamax is a superior format, and yet it has never made the inroads that VHS has.

Much video technology development is to do with the commercial judgement, sound or unsound, of half a dozen big corporations which gather and disperse in their varying allegiances and groupings in order to try to achieve greater market penetration with their own range of products. A meeting earlier this year of the major video corporations resulted in all major companies, except for Sony, pulling out of the video 8 market, in which some had many millions of pounds already invested. The decision was a commercial one, and whether video 8 is a superior format to VHS, or a more flexible format for education, is of little importance. Very few educational forces, even when national budgets have been used, have been effective in changing the course of commercial events. Where attempts have been made to buy in tailor made technology and equipment, then the costs have been very high. The most common solution has been negotiated agreements involving the modification of already established domestic models.

There have been many attempts made to develop common standards in all sorts of technologies. CD-I formats, and High Definition Television are two technologies where moves have been made in recent months to arrive at a standard. Such attempts rarely succeed since there is always at least one manufacturer who is convinced of the superiority of his system, or convinced that he can sell more if he goes it alone and gets a critical market share at a critical time. Interactive Video is just such a field where incompatibility is a problem. It is in some respects worse in this area since the dependence on two technologies greatly increases the chances of non-standard development. The commercial imperative drives most technology. The educational clients are well towards the back of the queue, and while commerce may use the educational sector to test its prototype versions of equipment educational clients are ultimately dependent on what the commercial world offers on the

domestic market. If the equipment supplied to home users is suitable for educational use, then the chances of establishing the equipment related technology within the educational system are so much the better. The converse, however, is also true.

A further commercial fact of life will influence the degree to which the potential of educational television will be realised in the context of new technology. New systems are developed in order to generate revenue. They will therefore be used primarily for the purposes of those who can pay for them. Nowhere is this more evident than in relation to access to the new communication channels. In the United Kingdom, wideband cable developments have been private enterprise operations as opposed to publicly sponsored programs designed to create a national electronic communications grid. First expectations among the educational video producers were that new commercial outlets for their programs would be created. The outlets are there, but there is virtually no money for the purchase of educational material, since all of the effort is going primarily into the high profile commercial aspects of the operations.

Similarly, broadcast companies have been made aware of late of the potential of their land based transmitters in down time, and in the unused potential of their teletext capability. These will undoubtedly be put to commercial use, providing film downloading services and encrypted teletext messages for bookmakers and other commercial customers. The broadcasters cannot afford to turn away the trade and it is likely that this will take precedence, even though there are many educational operations that would benefit from such a service.

The educational system exists in a real world where educational ideals are only part of the motive forces that operate within society. Even in highly centralised countries which can amass the common purchasing power of many educational institutions, the dependence on product produced for the domestic market is there. Oddly enough, some positive factors emerge from this. Equipment produced for the domestic market is mass produced. Unit costs, therefore, come down, and it becomes possible for educational institutions to think in terms of quantities of equipment that makes progress a real possibility. Technology often lies dormant within the educational system because inadequate provision lends it a rarefied air. Often, what is needed is the provision of the technology related equipment in sufficient quantity to make an impact. It is much easier to manage new technology in situations where everyone has realistic access. This is especially the case with regard to the interactive technologies designed to respond to the needs of individuals. A video recorder in every classroom, or at least on every floor, might greatly affect both the quantity and quality of use of educational television. Adequate supply becomes more possible as unit prices drop, and if the apparatus surrounding a new technology becomes a common place tool about the workplace then the process of demystification is so much easier.

Another influence which cannot be overlooked is the part played by national governments in new technology arenas. Political support can breathe life into faltering technologies, particularly if financial subsidy is part of that support. Some governments have supported wideband cable developments. Many governments have voted large sums of money to the introduction of microcomputers into schools. The educational system is therefore at the mercy

of governments who may or may not make the right choices in which technology to support. Governments will invariably set up advisory bodies. They are also quick to terminate those same bodies (eg, ITAP in the UK) when their comments are adverse and critical of government policy.

The backing of government can make a considerable difference to the prospects of a particular technology in the sense that subsidy can make equipment attainable. The backing of government, however, often leads to the promotion of unrealistic claims about the educational impact of certain technologies. There is a quite natural inclination to "hype" the educational possibilities, particularly if large sums of money have just been committed to the support of a particular program. Such claims do not simply exist within commercial or government circles. They occur within the educational system also.

New technology and educational technology

New technology has had, and will always have, a bandwagon effect, which generates the heralds of new technology who have a vested interest, career or status, in proclaiming its worth. Technologies are taken on and discarded like so many paper hats. Money and funding for development programs attracts people interested primarily in the money and funding, as well as those genuinely interested in development. They are often successful, and the globe is full of inconclusive research that has merely gone through the motions, or half completed projects in which those taking part have drastically over-extended themselves in trying to fulfil rashly made promises they cannot keep.

Educational technologists are often in a very difficult situation. On many occasions, the only way to keep abreast of developments to monitor and assess the educational strengths and weaknesses of new technologies is to attract funding from government or other sources, which may very well have vested interests in success. This creates a real psychological pressure to advocate, rather than assess, and the tension is often difficult to resolve.

The training of the educational technologist ties him to a systematic, objective and analytical approach to the evaluation of media and methods. This is often both a time consuming and lengthy process. The pace of change associated with modern technology, on the other hand, is often extremely intense. The machine one purchases is always obsolete. If one stands still to evaluate one development, one cannot keep abreast of other developments that might turn out to be much more important. A real tension can therefore exist between the very legitimate desire to keep up to date, and the equally legitimate desire to be thorough in assessment. The compromise often leads to an assessment of technologies from theoretical standpoints, concentrating on what the technology in question is capable of, but ignoring crucial questions concerning real need.

The attempt to identify the educational potential of a piece of technology may be perfectly genuine, but unless this is related to such factors as the readiness of the environment, the perceived need, the ease of use and a host of other factors which often require practical trial and experiment to assess, then the claims made for the new technology stand a very good chance of being disappointed. A model often advocated is the exploration of potential in an

environment that is positive and well resourced so that examples of good practice or peaks of achievement emerge. The danger of the "Centre of Excellence" approach is that it is based on a level of resourcing that the system at large perceives to be unrealistic, and thus arguments for rejection are fuelled, rather than broken down.

A further problem exists. The educational technology approach advocates careful and systematic evaluation of media and methods in relation to clearly identified needs. Fast moving technology, however, gathers to itself a high proportion of committed acolytes often dedicated to the uncritical promotion of the technology in question. Government bodies, for example, are set up to promote, rather than assess, developments such as cable or satellite television. Such bodies may well be engaged in the direct marketing of systems and the creation of demand, often in direct competition with one another. Attention grabbing headlines are manufactured from the slimmest evidence in the body of the text.

Much as the traditional educational technologist may deplore such subjective and value laden stances, it is often necessary to "hype" technology in order to bring it to the notice of people. Without such an agenda forming operation, possibilities may never be explored because people are not made sufficiently aware of them, or because they are not sufficiently excited and stimulated to try them. Experiment may very well lead to the discovery of applications that do meet real needs, and such experiment often depends on the stimulation and excitement created by unashamedly partisan visionaries. The educational technologist very often needs his opposite number to create a suitable environment for systematic evaluation to become a possibility. In order to get new technologies on the agenda of people in education, he may have to, on occasion, become a partisan advocate himself.

The potential for educational television development is great. The prospects are less certain since many of the developments depend on the directions taken elsewhere. It is relatively easy to generate lots of ideas on how cable television might bring with it countless educational opportunities, or how interactive video can be used in school settings to stimulate language work. Ideas on their own do not lead very far, unless they reach fruition in adequately resourced development programs designed to test the acceptability and ease of integration of the technology across the board, as well as highlighting potential in one or two carefully nurtured situations. Some ideas will not reach fruition quite simply because there are not sufficient resources to fund them. Others will depend on the success or failure of particular technologies in the wider community.

It is likely, given the trends noted earlier in this paper, that technologies promoting learning that is independent of institutions will receive encouragement and support, not only because they are broadly in line with the notion of extending further choice and control to the learner together with the possibility of matching material to the individual, but also because the costs of institution based training, if not learning, are very high.

It is likely therefore that developments such as interactive video will be given support. It would be too easy to jump to the conclusion that the educational claims made on its behalf will be realised. Many applications to date are

relatively unsophisticated branching programs, some not a great deal advanced over traditional linear video programs. Within school settings, such straight forward applications may be pointless. On the other hand, they may be perfectly appropriate to particular settings. Evaluation is required. A DTI sponsored initiative within the UK represents a sensible approach. Funds have been devoted to support a small number of development programs exploring the production and application of interactive video applications within school. The intention is to evaluate the usefulness of Interactive video in a variety of school contexts, presumably with a view to establishing the need for further support and development.

The success of the scheme will depend on the objectivity of the evaluation and it will be important to examine the failures as well as the successes.

The need for effective integration

Careful evaluation of educational potential in real settings is required to complement the drives of new technology, and such evaluations need to be as free as possible of political and or commercial influence. One way of addressing this is to set up central bodies responsible for evaluating new developments. Such bodies are generally educational technology institutes or organisations, and provided they are adequately resourced, they can provide an invaluable function in both developing applications of new technology and evaluating its strengths and weaknesses with a view to disseminating conclusions so that others benefit from the experience. Many technological developments need such a central organisation in order to coordinate development and educational exploration. Without such bodies, development will be piecemeal, repetitive and unconsolidated.

Such central bodies need to have adequate staffing and resources to be able to manage comprehensive programs. An under-resourced central institution of this kind is often worse than none at all, since it very often takes the initiative away from other parts of the system without being able to deliver the goods. Ideally, it should be flexible enough to be able to recruit staff appropriate to the tasks in hand so that it can respond to change. The model of a small core of managerial staff organising the programs of fixed term staff brought in for particular requirements has something to commend it, but it is sometimes difficult to operate this model in practice.

It also needs to be able to control its own resources so that it achieves an independence of operation and so that its stance is unambiguous. Bodies funded by central government rarely achieve complete independence and objectivity. Agendas are invariably set, or at least influenced by government representatives. Nevertheless, such bodies can retain academic integrity through individual programs of work.

There is invariably a large range of activities in different fields undertaken by such central bodies. Specialist advice is not always on hand. A natural complement to such central bodies, therefore, are the professional organisations. These are important in a number of ways. First of all, their reason for existence is generally to promote the interests of the profession they represent. Secondly, they present a perspective from the practitioners' point of view. They are thus instrumental in developing perspectives that are both independent but highly focused, and that is often a very necessary

counterbalance to centrally funded organisations. A body like the Educational Television Association, therefore, through its conferences, publications, committees and regional meetings exists to promote the views of its members on matters germane to educational television. It has established procedures or collecting such views and endeavours to represent these to Government bodies, administrative and educational, in the hope of influencing decisions that will ultimately affect the profession. Sometimes, its protestations go unheard. On other occasions it has surprising success and influence. The point is that it gives people with a common interest a voice.

It also acts in the other direction in the sense that it provides an informative role to its members, drawing attention to achievements or developments that may affect them, highlighting likely areas of significant movement. It thus acts as a mechanism for the dissemination of information and good practice. The involvement of such a body in major technological developments is often essential for the effective integration of new technology into the educational system.

Both centrally funded adequately resourced bodies, and professional associations or interest groups are essential to the process of integrating new technology into the educational system. The central bodies need to be continually assaulted by the sharp edges of professional concern. The professional associations must have a focal point for the expression of that concern, otherwise their efforts are dispersed and ineffectual. Both need to intersect constructively if educationally relevant television technology is to be successfully integrated in learning experiences.

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