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ABSTRACT

Arguing that television has a very important role to play in distance education courses, this paper outlines some of the unique roles that television can play and gives examples of how television can provide learning material not otherwise available to distance learners and help in the development of thinking and learning. Examples of how television can be used for students working primarily at home are cited, including demonstrations of experiments or experimental situations; demonstrations of principles involving movement over space and/or time; provision of case-study materials; use of archival audiovisual materials; and the demonstration of processes. It is further argued that television can enhance the learning process by providing powerful audiovisual images through illustrations, modeling, and supplantation. It is pointed out that one problem with using television is that it is a weak medium for providing diagnosis and feedback of student learning. Other conditions that must be satisfied include: the need to match the program structure and style to the needs of different audiences; the importance of suitable transmission times for broadcast television; and the need for students to appreciate the relevance of the television material to the rest of their studies. The changing nature and value of videodisks and videocassettes for distance learners as a result of such technological developments as satellite and cable television are noted. It is concluded that the information technology revolution is having profound effects on television as well, and that computers and television can play complementary teaching roles and are best used in combination. (Author/DJR)

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TELEVISION AND LEARNING SYSTEMS (DISTANCE EDUCATION)

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ABSTRACT

It is argued that television has a very important role to play in distance education courses. Some of the unique roles that television can play are outlined, with examples of how television can provide learning material not otherwise available to distance learners, and also examples of how television can help the development of thinking and learning. At the same time, the paper also briefly describes some of the problems in effectively using television for teaching at a distance.

The second part of the paper examines how developments in delivery technology - video-cassettes, video-discs, satellite and cable TV - can increase the potential value of television for distance learners, and some of the requirements for these developments to be used successfully.

The paper ends with a short discussion of the relative pedagogic advantages and disadvantages of computers and television.

The paper is written to stand alone, but it draws on examples from a 60 minute video-cassette specially produced by the Open University/BBC called "Using Television in Distance Education". The paper is therefore best used in conjunction with the video-cassette (and vice versa).

WHY USE TELEVISION?

I have been somewhat dismayed to find that on occasion my own work has been used to justify not using television in distance education (for instance, in a study done for the Planning Committee for the Dutch Open University - see Samson, 1983).

It is true that I have frequently identified shortcomings in students learning from television (see, for instance, Bates and Gallagher, 1977). After analysing the use of broadcast television in 16 distance education institutions in 1980/81,I also stated that:

> "the use of broadcasting in open universities is either marginal or non-existent, with a few notable exceptions...there are formidable difficulties in using broadcasting effectively...given these difficulties, it is surprising that broadcasting is used at all in distance higher education".
>
> Bates, 1984.

Quite independently, there is a growing school of thought in the U.S.A. that pedagogical differences between media are insignificant. If there are no pedagogic differences between media, there is no justification for using an expensive medium like television over a cheaper medium like print.

Clark (1983) aggregated and analysed a large number of laboratory controlled experiments which compared the educational effectiveness of different media. He found:

> "consistent evidence for the generalisation that there are no learning benefits to be gained from employing any specific medium to deliver instruction".

In Clark's view,

> "media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition."

What matters to Clark is not the medium, but the instructional method, which within any single medium can vary enormously. Clark is arguing that if you get the instructional approach right, in terms of clear objectives, the right level for the target group, clear structuring and segmenting of information, etc., then the choice of medium for delivering this approach becomes irrelevant in terms of instructional effectiveness.

It is true that differences between media can be easily obscured by other factors independent of media (such as the quality of instructional method). Researchers have frequently found greater differences in comprehension between for instance two television programmes than between a television programme and print (e.g. Trenaman, 1967). This would support Clark's view that factors such as instructional method are more important than media differences.

I have considerable sympathy for this point of view; nevertheless, after spending more than 10 years researching this area, I am more convinced than ever that television has tremendous value for distance education. In this paper, I shall try to show that television has unique teaching functions of

immense significance to distance education, particularly at University level, and that new developments in technology enable many of the difficulties and weaknesses previously associated with broadcast television to be overcome.

Before developing this argument, though, I would like to make some general points about using media in education:

media are generally flexible and hence interchangeable, i.e. what can be achieved educationally through one medium can usually be achieved through any other medium, given sufficient imagination, time and resources; the issue though is which medium is the most appropriate in a given circumstance; in the case of television, are there times when it is clearly the best medium to use for teaching purposes?

each medium has its own aesthetic: in other words, there are right and wrong ways to use a medium so that its unique features are appropriately exploited; this means that "quality" counts - a poorly designed television programme will fail, even if television was the most appropriate medium;

there is no "super-medium": all media have their strengths and weaknesses, and what is a strength in one medium is often a weakness in another; this implies then that a multi-media approach is usually more desirable;

however, the greater the number of media used, the more complex the design process, and the greater the chance of redundancy and wasted expenditure; the aim therefore should be to use a limited range of media in any given context, maximising learning effectiveness at minimum cost, balanced by convenience and ease of use to both learner and teacher;

lastly, while for Clark delivery may be irrelevant pedagogically, delivery for distance education is a crucial factor that must be considered when choosing media.

While then there are factors which make it very difficult to lay down hard and fast rules about the use of media in distance education, I do believe that there are important differences between television and other media. I will argue that television presents knowledge differently from other media, that these differences do have important pedagogic implications, and that delivery (and cost) factors must also be taken into account when considering the possible role of television in distance education. I shall now try to provide evidence for my argument.

SOME UNIQUE EDUCATIONAL CHARACTERISTICS OF TELEVISION

It is the presentational power of television which in my view gives it unique teaching characteristics, in two different ways:

it is a source of a wide variety of learning material of a kind that would be unavailable to most learners in any other way;

it can assist the process of learning by providing powerful audio-visual images corresponding to certain aspects of cognitive processing.

First, let us examine how television provides a unique source of learning material, and how that material can be used in teaching.

Television as a unique source of learning material

One of the major reasons for using television in distance education is that it can provide learning materials which otherwise would be impossible to provide to students working primarily at home. One way to identify such uses is to apply the criterion: "could I do this in any other way as easily and effectively in this particular distance education system?"

I have chosen just five examples from the Open University which I think would be very difficult to do without television. There are many more functions I could have chosen (see, Bates, 1984, for a full list).

1. To demonstrate experiments or experimental situations

The first example is from the Science foundation course, S101, TV22, "Falling Leaves and Beating Hearts". The presenter is Peggy Varley.

EXTRACT 1

There are several reasons why television is particularly useful for experimental work:

> many experiments just cannot be performed at home - this is obviously true of this particular example, using a live rabbit's heart;
>
> television, through enlargement, editing, and split screens, can enable students to see experimental work even more clearly than in a well-equipped university laboratory; in the example, the heart-beat could be directly related to the experimental record through the "window" in the screen;
>
> editing allows well-conducted experiments to take place, saving the student time and ensuring proper experimental results; again, this demonstration could easily go wrong. If students had no opportunity to conduct their own experiments, the presentation of "perfect" experiments would of course be misleading, so it is important to achieve a balance between home experiments, summer school work and televised experiments;
>
> in this particular instance, once the experiment has been conducted and recorded, there is no need to repeat it, thus reducing the number of rabbits sacrificed to the experiment.

2. Principles involving movement over space and/or time

Many principles or concepts in higher education reflect changes over time or space, and not just in maths, science and technology. Because television can handle both spatial and moving images, it is particularly suitable for demonstrating or explaining such principles or ideas.

The following extract is from an Open University programme about the discovery of the plastic netting used in gardening and elsewhere, Netlon.

EXTRACT 2

The idea for manufacturing Netlon is simple - once you have seen it demonstrated. Without the moving pictures and animation, though, it would be very difficult to explain, for instance, through a book.

Note also the way the process can be simplified and multiplied through the use of animation, and the use of music, together providing strong audio-visual images of the process, a point taken up later.

3. To provide students with case-study material

Television can be used to record naturally occurring events or processes, and edited to bring out the principle features of the "story" or case. This allows events occurring over a considerable time-span to be condensed into 25 minutes, while at the same time providing all students with a common case or example to work on.

The extract is from D208, "Decision-Making in Britain", TV8, "Operational Decisions", and follows the decision-making process regarding whether or not the police should provide a "bobby-on-the-beat" for a village in the North of England. The story was actually developing while filming was in progress.

The aim of this part of the course was to look at decision-making within a police organisation, and the relationship between the police and community.

Television case-study material in distance education courses can play a vital role in teaching at a higher educational level. It provides a rare opportunity for students to make their own interpretations, and to develop skills of analysis, application of knowledge to real events.

Case-study material though needs great care in its use. There is abundant research evidence that OU students have considerable difficulty in making good use of such material (see, for instance, Bates and Gallagher, 1977); it is easy for such programme material to seem unintegrated with the rest of the course, and hence appear irrelevant to students; course teams and producers themselves often have difficulty in suggesting how students are supposed to use such material.

With this kind of material, then, it is essential that the course team is very clear as to <u>why</u> this material is being provided for students.

Typical reasons might be:

> to illustrate some of the general principles or ideas introduced elsewhere in the course (usually the correspondence text);
>
> to provide students with opportunities to <u>apply</u> what they have learned elsewhere in the course, by analysing, explaining or identifying the phenomena contained in the case-study;
>
> to allow students to draw on their own experience to suggest solutions to problems posed in the case-studies.

Any one programme of course may contain a mixture of all these goals.

It is also important that students can see how the material fits into the course. In this example, not only was the subject matter of the programme directly related to the content of the block (on Public Order), but the

course team also used audio-cassettes to analyse and relate the TV programmes to the rest of the course. Indeed, for this particular programme, the course team went to the trouble on the audio-cassette to analyse the decisions they themselves had made in constructing the programme, to ensure a more systematic understanding of the reliability or otherwise of sources used in the course.

Although this is not always necessary, it does emphasise that all case-study and documentary programmes are selections of reality, a particular perspective on an issue; there is a danger of students failing to interrogate such programme material, and of just accepting it at its face value.

Most of the difficulties with case-study material can be avoided with careful planning and co-operation between academic and producer, and clear communication to students about the intended role of case-study material. If students though are expected to analyse case-study material, they will need some help and guidance, preferably in the programme itself.

4. Archive audio-visual material

There may well be a store of audio-visual material available to distance education course teams. Some broadcasting organisations have extensive archives of film and video material which can be used, at a price. A number of educational production centres, particularly in Universities, often have excellent pre-recorded material, especially in medicine, science and education, which they may be willing to make available for secondary use, at minimal cost. Many museums and art galleries also have audio-visual archives.

In addition, the Open University/BBC partnership has generated over 3,000 television programmes. Most of the OU's material has been shot-listed and catalogued by the OU Library, so in most cases is easily located, and may be available for purchase through Open University Educational Enterprises or their foreign agents (although rights for secondary use may still need to be cleared).

It is not only film and video archives that can be used on television. Print copies of still pictures can be combined with audio-cassettes to provide very cost-effective audio-vision packages, rather than using television, but if many pictures are to be used, and detailed analysis of many individual pictures or diagrams are required, it may be more convenient for students if the material is integrated and structured into a single television programme. More probably, programmes are likely to consist of a mix of moving and still pictures.

Archive material of course is appropriate not only for history programmes. It can be useful for many subject areas, such as social sciences, education and technology, where developments or changes over an extensive period of time need to be demonstrated and compared.

Like case-study material, though, archive film rarely speaks unambiguously for itself. It has to be selected and interpreted. In the following video example, taken from an Open University course: "War and Society", the archive film is played twice: once as originally presented, then with the academic's own analysis and interpretation added.

EXTRACT 4

Also, because of the very large quantity of existing material, and the costs and effort required to find it and clear rights, it is important that course teams know precisely why they want to use archive material, and how they would expect students to use it in their studies. It is an iterative process, of course: only when certain material is seen does its potential become apparent. Indeed, the material itself may not be suitable, but viewing archive material may generate other ideas of how television could best be used - or not used!

5. To demonstrate processes

This is a deliberately broad category, covering a use in many different contexts. Television is ideal though for showing a sequence of activities that need to be carried out in a certain order, within a certain context. The order or stages of a process can often be described in print, but the actual process cannot be fully understood without seeing the context in which the process takes place, the nature of each individual operation required, and the relationship between all the variables in the process.

The example I have chosen is from an Open University Humanities course, but could equally well have come from Social Sciences (e.g. management selection procedures), Technology (e.g. machine assembly by robots) or Science (e.g. the procedures to be adopted when analysing amino acids).

EXTRACT 5

Television: content or skills?

These then are just five examples of the way that television can bring unique learning material to students. But why is it so important to bring such material to students: what are the pedagogical advantages?

Teaching is an iterative process, with several stages, and many different approaches. Instruction often consists of providing students with already organised and analysed learning materials, in the hope that they will learn not only the content, but the analytic process itself, from the example set by the teacher's analysis.

We shall see that television can be very helpful at this stage of presenting an analysis; often, though, as teachers we want students to develop their own skills of analysis and application of principles by providing learning situations where the analysis has not been completed, or where a variety of individual interpretations are possible.

Television is a very rich medium, in terms of its density of information and symbol systems (movement, colour, speech, sound). This richness permits television to present complex situations which can be analysed or interpreted in a variety of ways. Thus television is an ideal medium for helping students to develop skills of analysis and for helping them apply abstract principles and generalisations to specific instances.

A most important role then for television with distance education students is to help them to use knowledge they have acquired elsewhere in their course or studies, or from their life experiences, in new situations. It is therefore not so much a question in a multi-media teaching situation of using television to introduce new content, but to allow students to develop learning skills (although of course skills have to be related to

appropriate content).

These skills will not develop automatically, by merely providing situations and hoping that students will somehow know how to apply what they have learned in the texts to the programme material. As in most kinds of learning, there is a progression to be made, and guidance and feedback is necessary. Unfortunately, television is a weak medium for providing diagnosis and feedback of student learning, nor are tutors themselves generally skilled at guiding students in using television effectively. There is therefore a heavy responsibility on course designers to think through how they can help students make best use of television for developing skills.

There are several ways in which this can be done:

extensive broadcast notes can be provided, but this merely increases the reading load;

as already mentioned, audio-cassettes can be useful in helping students make the bridge between programmes and text, but students cannot watch the TV and listen to the audio-cassette at the same time, which is sometimes necessary for purposes of analysis;

the Open University has developed a package for tutors and students, called "Learning from Television", but many students do not get the chance to work through the package, and in any case it is not usually specific enough for a particular course;

The Open University Social Sciences Foundation Course, D102, has attempted to provide a progression from didactic to open-ended programmes, with help at analysis within programmes interspersed throughout the course, and this has proved most successful. Other faculties though require different analytic skills to be developed from those covered in D102.

In the end, it is best for the designers of a course to take responsibility themselves for identifying the skills, if any, they wishes to develop through television, and to think through how students can be helped. It is also a matter of fine judgement as to when students require help, and when they should be left to their own initiative. In general, though, students get too little rather than too much help in interpreting television material.

Helping the learning process

The second unique characteristic of television is its ability to enhance the learning process by providing powerful audio-visual images corresponding to certain aspects of cognitive processing. The main proponent of this argument is Salomon (1979), who suggests at least three ways in which television can help cognitive processing:

1. **Illustration:** television can provide powerful audio-visual images symbolising important concepts or ideas which can imprint themselves in learners' memory; Salomon (1983) states:

"the unique attribute of illustration is that it is a private case, hopefully a typical one, of a relatively abstract class or category...it is a representation of a single case representing a

general class".

This definition of course is not specific to television. Television's power though is that it can create easily recognisable images which are striking because of their richness of symbolism; a good example of this can be found in the OU's Technology Foundation course programme on cars, where the high status given to cars in today's society is associated with images of worship and religion, as can be seen from extract 6.

EXTRACT 6

Salomon also adds an important warning about the dangers of illustration as well. Here he is talking about an Open University programme, D102, TV1, on vandalism:

> "What the students see is, say, three aggressive youngsters...but do they understand that the real referent of this illustration is not the three youths, but 'vandalism'?...There is a fair likelihood they do not. It is quite possible that for a number of students such illustrations are misperceived as they are not seen as illustrating what they're supposed to but rather far more concrete (and somewhat irrelevant) referents...the relationship between the illustrator and the illustrated needs to be made specific."

2. Modelling: television can also provide concrete or physical models of abstract ideas. This is well illustrated by the use of a cube to physically represent the concept of (a+b) , in the next extract.

EXTRACT 7

3. Supplantation: to quote Salomon:

> "this is perhaps the most important, yet least self-evident function of TV's pictorial representation...when complex new ideas, constructs and processes are verbally introduced, students neither have appropriate corresponding images nor can they generate them on their own. TV can accomplish the critical function of explicitly providing the students with appropriate images as substitutes for the ones they would benefit from but could not generate on their own."

The next extract provides an example of supplantation, where the brackets are "exploded" to demonstrate the mental process of opening up the formula (a+b)

EXTRACT 8

These three examples of how television can assist the learning process are specific examples of a more general characteristic of television: its ability to link concrete examples to abstract ideas through the use of language. Learners often need a bridge between new abstract ideas and concrete examples. Television can provide not only concrete examples in the form of powerful audio-visual images, but through the sound track or graphics it can relate those images to the abstractions. It is this combination of rich symbol systems that gives television such teaching potential.

Even when the unique characteristics of television are fully exploited, this alone will not guarantee its successful use in distance education.

There are many conditions that must be satisfied. These are examined in detail elsewhere (Bates, 1984) but examples include the need to match the programme structure and style to the needs of different audiences; the importance of suitable transmission times for broadcast television; and the need for students to appreciate the relevance of the television material for the rest of their studies.

Nevertheless, there are difficulties in using any medium for distance education. There is no doubt in my mind that television can provide unique and powerful ways in which the learning process can be assisted. For students studying at a distance, often without the variety of opportunities for learning available in conventional, campus-based teaching, the presentation of subject matter through television in ways uniquely different from other media is crucially important.

DELIVERY

The unique characteristics of television described so far apply irrespective of the form in which television is presented. However, recent technological developments such as satellite and cable TV, video-discs and video-cassettes are all changing the nature and value of television for educational purposes. This is particularly true with respect to getting television material to distance learners.

Broadcasting

Using "terrestrial", "through the air" broadcasting for distance education is by far the most effective means of reaching very large numbers; for raising awareness - if not deep understanding - of issues; for recruiting to or advertising distance education courses; for providing variety and interest in a course; and for adding to the general cultural milieu, by providing an educational alternative to other kinds of television programming.

Furthermore, because of the richness of the symbol systems of television, and hence the quantity of information to be processed in a limited, transitional period of time, broadcast television lends itself to multiple interpretations and hence a greater probability of individualised, creative thinking.

On the other hand, broadcasting is a weak instructional medium: it is ephemeral, and hence cannot be "captured" for review, multiple viewing for analytic purposes, or "interrogated" in detail, all of which makes full comprehension and mastery learning difficult; its continuous, "seamless" nature discourages critical, objective analysis; since all viewers must view at the same speed, it does not allow for individual differences in previous knowledge, levels of understanding, or abilities to process the material; and students are tied to watching at set times, irrespective of their progress on the course, or the convenience of the transmission slot.

This last point is particularly important, since broadcasts for distance education students, being aimed at relatively small target groups, tend to go out at times that are very inconvenient for most students.

Video-cassettes

The ability to record programmes off-air, or to play cassettes mailed through the post at home, will overcome many of the difficulties

encountered with broadcast television. However, while most students in most countries can be reached through broadcast television, far fewer students have access to video recorders.

Nevertheless, access to video replay facilities is expanding rapidly. Table 1 below lists the percentage of homes in various countries with video-cassette recorders:

Table 1: Homes with Video-cassette recorders, 1985

Kuwait	77%
Japan	64%
United Kingdom	45%
Australia	44%
United States	34%
West Germany	34%
Sweden	26%
Canada	26%

(Source: Screen Digest, November, 1985)

We estimate that already more OU students would watch if we sent them just video-cassettes than will watch on transmission, because of the poor quality times. One trade estimate is that at least 80% of U.K. homes will have a video-recorder within five years.

Furthermore, if we send students three-hour cassettes, which they return at the end of the course, this is cheaper than paying for national broadcast transmission for courses with less than 350 students. This saving is solely on delivery costs; for the OU, there is no saving on production costs, since BBC/Open University Productions produce cassette and broadcast material at roughly the same hourly cost. However, there is no doubt that in most cases, a non-broadcast production unit could produce high quality video-cassette material far more cheaply than a broadcasting organisation could.

Video-cassettes are stronger instructionally, are more convenient for students, are cheaper to produce, and are less costly to distribute for courses with relatively low numbers, compared with broadcasts. Their main limitation is their lack of penetration into students' homes, but even that is likely to change in many countries over the next few years.

Furthermore, the control that video replay gives to students means that programmes can be designed to encourage active responses and more analytic approaches to television, particularly where video can be used in group situations.

For instance, an Open University course aimed at in-service teachers, EM235, "Developing Mathematical Thinking", used the cassette to present situations which teachers in groups then discussed, drawing on their own experience. After the group discussion, they then worked individually at home on the texts, which gave the course team's ideas on how to tackle some of the problems shown. The next extract illustrates the use of video; note the production style and the techniques used to encourage interaction:

EXTRACT 9

13

Video-discs

However, while video-cassettes enable students to interact much more with television material than broadcasts do, they are still weak in providing feedback to students or diagnosing their learning weaknesses. Furthermore, searching for material is still laborious and time-consuming, and still-frame capabilities, while feasible, lead to rapid wear of tapes and recording heads. For all these, and other, reasons, many people see video-cassettes being replaced by video-discs.

Video-discs based on laser technology have a number of features which are exciting distance educators:

their huge storage capacity (57,000 still frames on one side of a disc; perhaps more significantly, the possibility of storing digital data equivalent to the whole of the Encyclopaedia Britannica on less than two-thirds of one side!);

superb still-frame quality, and ability to hold still-frame without any wear to the disc or laser;

ability to step through frames singly or in controlled slow or fast motion;

ability to access any single frame within two and a half seconds;

ability to add computer assisted control and computer assisted learning to still or fully moving pictures.

It is particularly this last feature which is seen as significant, in that it offers the chance of combining the instructional power of computers with the presentational power of television.

But just how relevant are computer-controlled video-discs to distance education? As a result of our experience at the Open University, and from a number of other video-disc projects in Britain and the U.S.A., it is now possible to identify some of the advantages and disadvantages of inter-active video.

Some of the **advantages** are:

well-designed discs permit students to work through the material in a variety of ways, allowing for individual differences;

computer control enables students to receive excellent feedback and interaction, and can be highly motivating;

interactive video is rich symbolically, incorporating still or full moving pictures, a wide variety of graphics and animation, clear text combined with pictures, and two independent sound tracks;

it provides an intensive learning experience; one interactive video-disc can involve each student in at least three hours of intensive study.

Some of the **disadvantages** are:

designing an interactive video disc from scratch involves very high production costs; an average figure (at total costs, including overheads) is around C$175,000 (£90,000);

a single study workstation for an interactive Laservision disc can cost up to C$6,000 (£3,000);

each interactive video disc requires the correct combination of hardware (disc player, brand micro, interface and monitor) to work; there is as yet no standardised system, so the probability of students already owning just the right equipment, or even part of the equipment, is very low;

producing fully interactive video-discs which exploit to the full the potential of the medium requires a very complex production procedure, involving advanced and detailed planning and team work from a number of different professions; not all institutions are capable of providing the framework which such a production process requires;

particularly from the point of view of distance education, the main disadvantage of interactive video-discs is that they are not home-based, nor will they be in the foreseeable future; conversely, they are more suitable for use in conventional teaching establishments, but only when the alternative to video-disc would be very expensive or impossible to do by other means;

to date, the range and level of interaction via a micro-computer has been rather restricted to the "show, test and help" model following the old programmed learning approach, but with better visuals; it is proving more difficult to programme in such a way that students can explore in a more creative and open-ended way (but with guidance) the large data-base that such a system can offer; there is also a lack of good indexing and "help" routines, which should be standard components of any interactive video computer programme.

It is now clear that computer-controlled videodiscs have great potential where there is a major training need, or where alternatives (such as building expensive simulators) would be very costly. It is less clear that they will ever be viable for distance education, although at this stage their full potential has still to be explored.

However, it is important to make a distinction between computer-controlled and stand-alone video discs. While I have outlined a formidable list of reservations about computer-controlled videodiscs for distance education, these reservations do not necessarily apply to stand-alone videodiscs.

A good example of stand-alone videodiscs are those on cell biology being produced by the Institut fur den Wissenschaftlichen Film in Gottingen, in West Germany. They have taken film from their extensive archive and transferred it to videodisc. The disc is accompanied by a detailed printed handbook, which provides a full index of each example.

The provision of a resource disc such as this has a number of advantages. Firstly, students with the remote control handset can explore the disc as they wish. They are not locked into a routine laid down by a computer programme. A teacher or student can choose their own route through the materials. The teacher can use the disc in a group situation, selecting

exactly what is required from the disc, thus cutting down on the need for expensive work stations. On the other hand, the teacher can "tailor" the material for individual students, either by providing written information about how to use the disc, or by writing his or her own computer programme to control the disc.

The main advantage though of designing stand-alone rather than computer-controlled interactive videodiscs is that stand-alone discs are much cheaper to produce, by merely transferring or editing existing film and video material to disc, thus rapidly increasing the supply of courseware at a low cost to users.

However, as far as distance education is concerned, the value of video-disc is entirely dependent on the penetration of video-discs into the home market. Clearly, that is still many years away, although I suspect they will be used increasingly in situations where tutors and students can get together, such as at summer or day schools.

Cable and Satellite

While cable and satellite are less likely than video-disc to change the nature of teaching and learning, they are likely to be more directly relevant to distance education over the next ten years or so.

Pedagogically, cable and satellite share many of the characteristics of broadcast television. Satellite offers the possibility of linking students over far greater distances than terrestrial broadcasting; cable offers the possibility of local transmission to specifically targeted audiences; both suggest the possibility of more channels, and hence more time on television for educational purposes.

As far as distance education is concerned, cable and satellite have led to the development of live, interactive programming. For instance, Michael Catchpole, based at Port Alberni, a relatively isolated area of British Columbia in Canada, has used the cable and satellite facilities of Knowledge Network to run courses in introductory psychology for students throughout the province. Students can call in live (by telephone) with their questions, which are answered by Michael Catchpole on-air (Catchpole and MacGregor, 1984).

This of course could be done with terrestrial broadcasting, but the geography of the province requires satellite coverage, and the extra capacity provided by local cable stations, linked to the satellite system, allows for more time to deal with questions.

Until recently, most satellite transmissions were relatively low-powered, requiring large dish aerials (10 metres+), and expensive up-link equipment. Their main use for television services was to network independent cable TV stations.

However, the advent of more powerful "direct broadcast" satellites means that much smaller and hence cheaper reception equipment can be used, enabling transmissions to be picked up by individual homes. This has the potential educational benefit of reaching individual home-based learners scattered over large areas at much lower transmission costs.

An interesting development in the U.S. business sector is Ku-band satellite transmissions. These use relatively low-powered satellites, and relatively

small reception dishes (2.5 metres). This allows a large company to transmit directly to each of many local sites, and, more importantly, for the sites to communicate directly with headquarters, at costs substantially lower than using the public telephone system. One can see the potential of Ku-band transmission for a large university with many campus or extension sites spread over a whole State or province.

Clearly, satellite distribution could be of great value for distance education, where there are large distances to be covered by a single course. Cable provides a means by which conventional, campus-based institutions can spread their teaching into the local neighbourhood, and perhaps more importantly, recruit a wider variety of students.

However, there are three fundamental questions that distance teaching institutions need to ask, irrespective of the system of distribution:

> who will pay for transmission, and what will be the transmission costs?
>
> for how long can we rely on the system of distribution?
>
> who is going to pay for production, and what will be the costs of production?

How is the distribution of materials to be financed? At a rough estimate, the "real-cost" of providing a single, direct broadcast satellite television channel seems to be somewhere around C$2-4 million a year (£1-2 million). At around C$500-1,000 (£250-£500) an hour, for 100 hours a week, the cost does not seem too high; but that depends on all five channels and all 100 hours on each channel being fully used every week of the year. That requires an awful lot of programming. Most educational uses of satellite have either been short-term pilots, to test the technology (e.g. the first Indian SITE project) or have been heavily subsidised by central government (e.g. Knowledge Network). Providing a regular service via satellite or cable requires substantial funding, to cover both distribution and production costs.

Secondly, making programmes that exploit the unique pedagogic characteristics of television costs money. If cable or satellite is to be used solely for relaying lectures, there are far cheaper and more effective methods of doing this (for instance, duplicated lecture notes or audio-cassettes sent through the post, or radio). Furthermore, the greater the transmission time available, the greater the number of programmes that are needed. It is no good having a distribution system without the programmes to fill it. Production costs can quickly and substantially exceed distribution costs.

This is not to argue that satellite and cable will have no value for distance education; however, they are not the low-cost panacea that some politicians are seeking, and distance education systems need to think very carefully about the best way to exploit these opportunities. The danger is that money will come from external sources for short-term projects, but the more permanent funding required for proper and continuous educational provision through cable or satellite will be too big an egg to swallow.

TELEVISION OR COMPUTERS?

In recent years, interest in the educational potential of computers has

tended to lead to a decrease in interest in television. However, the informational technology revolution is having profound effects on television as well. The development of low-cost facilities for storing television signals means that many of the real learning disadvantages of off-air broadcasting can be avoided; the development of low-cost means of distributing television means that more and more people can now study independently at home using this medium, at reasonable cost.

Television and computers in fact should not be seen as competitors, but complementary. Television can present information in a much richer form than computers and can organise information in a much more open and ambiguous way, encouraging the development of creative and imaginative thinking and individual interpretations; computers on the other hand are much better at logically structuring information, but in more limited ways than television. Computers are also better at providing feedback and diagnosing learning difficulties. Thus these two media, like text and face-to-face teaching, can play complementary teaching roles, and are therefore best used in combination.

Television can be a most valuable asset for distance education, provided that resources are available to do the job properly, and those teaching the course know exactly why they are using television. Distance education courses can certainly manage without television, but in my view they suffer from a lack of quality. Television, used well, can provide the richness of stimulation required to develop students of high quality, able to think for themselves and to apply their knowledge to a wide range of new experiences.

REFERENCES

BATES,A.W. (1984) Broadcasting in Education: an Evaluation. London: Constables

BATES,A.W. and GALLAGHER,M. (1977) Improving the use of television documentaries and case-studies on Open University courses. Milton Keynes: Open University, IET (mimeo)

CATCHPOLE, M.J. and MacGREGOR, A. (1984) Macro and micro perspectives on the use of television in educational delivery. Vancouver: Knowledge Network.

CLARK,R.E. (1983) "Reconsidering research on learning from media", Review of Educational Research, Vol.53, No.4.

SALOMON, G. (1979) Interaction of Media, Cognition and Learning. London: Jossey-Bass.

SALOMON, G. (1983) Using television as a unique teaching resource for OU courses. Milton Keynes: Open University, IET (mimeo)

SAMSON, M. (1982) AV-media in de open universiteit. Utrecht: Stichtung Film en Wetenschap.

TRENAMAN,J. (1967) Communication and Comprehension. London: Longmans.