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ABSTRACT

Television has unique teaching functions that are significant for university education, and new developments in technology enable television to overcome some of its previous difficulties and weaknesses. Television's presentational power gives it two unique teaching characteristics: its ability to provide learning materials otherwise unavailable to students, and its ability to enhance the learning process by providing powerful audiovisual images corresponding to certain aspects of cognitive processing. Learning materials available through television include demonstrations of experiments; explanations of concepts, principles or ideas involving movement over space and/or time; opportunities for students to make interpretations; development of skills analysis and application of knowledge to case-study material; opportunity for use of archival audiovisual materials; and demonstration of the whole context in which processes take place. Television can help students to learn new skills and use knowledge that has been acquired through courses, life experiences, or new situations. Enhancing the learning process can be done through illustration (audiovisual images symbolizing concepts or ideas that can imprint themselves in learners' memory); modeling (concrete or physical models of abstract ideas); and supplantation (explicit images as substitutes for images students cannot generate on their own). New technological developments that enhance methods of delivery include broadcasting, videocassettes, videodiscs, cable, and satellite. (DJR)

USING VIDEO IN HIGHER EDUCATION

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In this paper, I shall try to show that television has unique teaching functions of immense significance to University education, and that new developments in technology enable many of the difficulties and weaknesses previously associated with broadcast television to be overcome.

In support of my argument, 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 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.

ther 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 some **delivery** may be irrelevant pedagogically, it is a crucial factor that **must** be considered when choosing media for off-campus teaching.

I believe that there are important differences between television and other media in the way it presents knowledge, that these differences do have important pedagogic implications, and that delivery (and cost) factors must be taken into account when considering the possible role of television in higher 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 higher education is that it can provide learning materials which otherwise would be impossible to provide to students. One way to identify such cases is to apply the criterion: "Could I do this in any other way as easily and effectively in this particular educational institution?"

I have chosen just five examples 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**

I would like to take an example from a British Open University (OU) Science Foundation courses, S101, TV22, "Falling Leaves and Beating Hearts". This involved using a live rabbit's heart and showed the effect of adrenalin and acetyl choline on the heart beat rate.

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

many experiments just cannot be performed off-campus - or even conveniently for groups of students on campus - 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 laboratory; in the example, the heart-beat could be directly related to the experimental record through a "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 "live" 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.

For instance, one Open University programme was about the discovery of the plastic netting used in gardening and elsewhere, Netlon. It used animation and models to demonstrate the principle behind the manufacture of Netlon. The idea for manufacturing Netlon is simple - once you have seen it demonstrated. Wiithout the moving pictures and animation, though, it is very difficult to explain, for instance, through a book.

Television enabled the process to be simplified and multiplied through the use of animation, and with the use of music, TV provided 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.

A television programme from an OU course, D208, "Decision-Making in Britain", TV8, "Operational Decisions" 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 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, and application of knowledge to real events.

Case-study material though needs great care in its use. There is abundant research evidence (e.g. Bates and Gallagher, 1977) that OU students have considerable difficulty in making good use of such material; it is easy for such programme material to seem unintegrated with the rest of the course, and hence seem 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 designers are 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 in the set reading);
>
> 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 TV programme of course may be a mixture of all three 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 print, (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 designers 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 it is not necessary to go to this trouble for all programmes, 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 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**

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 is not exclusively appropriate for history programmes. It can also be used in 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.

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 designers 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 it 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 of stages of a process can often be described in print, but the actual process cannot be fully understood without seeing the whole context in which the process takes place, and the nature and quality of each individual operation required.

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?

Television: content or skills?

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.

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 or material which lends itself to a variety of interpretations. 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 is to help students 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 programme 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 television 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 each design team to take responsibility itself for identifying the skills, if any, it wishes to develop through television, 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 helps 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.

Salomon also adds an important warning about the dangers of illustration. 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 an OU Maths programme.

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."

An example of supplantation would be where the brackets are "exploded" via animation to demonstrate the mental process of opening up the formula (a + b) .

Television can provide unique and powerful ways in which the learning process can be assisted. For higher education students the ability to provide alternative ways of approaching subject matter through the use of television is crucially important.

There is not space here to elaborate on all the **conditions** that must be satisfied - for instance, the need to match the programme structure and style to the needs of different audiences; the opportunity to use television to provide links between abstract ideas and concrete images; 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. (For a discussion of these issues, see Bates, 1984).

Nevertheless, there are difficulties in using **any** medium for higher education. To me, there are clearly circumstances where television has clear benefits for higher education students.

DELIVERY

The unique characteristics of television described so far apply irrespective of the method of delivery. However, recent technological developments affect delivery more than any other aspect of television, so it is important to look in more detail at different methods of delivery.

Broadcasting

Using broadcasting is by far the most effective neans of reaching very large numbers; for raising awareness - if not deep understanding - of issues; for recruiting to or advertising higher education courses; 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 is not possible, 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 higher 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 play cassettes in libraries or at home however overcomes many of the difficulties encountered with broadcast television. While most students in most countries can be reached through broadcast television, and far fewer students have access to video recorders at home, 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, 1984

Kuwait	73%
Malaysia	54%
Japan	48%
United Kingdom	40%
Australia	33%
West Germany	25%
Sweden	23%
U.S.A.	20%
Canada	15%

(Source: Screen Digest, November, 1984)

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 sent 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. For campus-based students, replay facilities can be provided in libraries at relatively low cost.

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 cassettes to present a situation which teachers in groups then discussed, drawing on their own experience. After the group discussion, they then worked individually on printed booklets, which gave ideas on how to tackle some of the problems shown.

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 have a number of features which are exciting 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 Encyclopedia 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 higher 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 DM350,000.

a single study workstation for an interactive Laservision disc can cost up to DM12,000; certainly too much to expect students to provide, but not too expensive for institutional use

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

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 off-campus education, the main disadvantage of interactive viedo-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 of 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 video-discs 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 higher 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 video-discs for higher education, these reservations do not necessarily apply to stand-alone video-discs.

A good example of stand-alone video-discs 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 video-disc. 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 provide guidance for students, either by providing written support material, indicating ways to use the disc, or by writing his own computer programme to control the disc.

The main advantage though of designing stand-alone rather than computer-controlled interactive video-discs is that it becomes 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.

As far as off-campus teaching is concerned, this is all dependent on the penetration of video-discs into the home market. Clearly, that is still many years away, although I suspect that stand-alone video-discs will be used increasingly in situations where tutors and students can get together, such as on conventional campuses.

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 higher 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 higher education is concerned, cable and satellite can lead to the development of live, interactive programming, off-campus. 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 on-air.

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.

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

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

who will pay for transmission, and what will by 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 4-8 million DM a year. At around 1,000-2,000 DM 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 amount of 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.

This is not to argue that satellite and cable will have no value for higher education; however, they are not the low-cost panacea that some politicians are seeking. Higher 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.

THE MAIN BARRIERS TO INNOVATION

However, I will be surprised if there is extensive use of any of these new technologies in higher education, either on-campus or at a distance. This is not because the technology is inappropriate (although in some instances it is), nor even because of bloody-mindedness by teachers.

The main barrier to innovation lies in the nature of existing educational institutions. Their decision-making structures have evolved to protect the existing system, protecting not only existing academic departments, but more importantly existing administrative structures, both of which need to change radically if new video technologies are to be successfully integrated.

The introduction of new technology usually needs a fresh injection of capital, and recurrent costs to operate. Sometimes, it will lead to savings in the long-term, but in the short-term, in an increasingly common situation where resources are fixed or even diminishing, innovation can only take place by robbing Peter to pay Paul; in other words by cutting an existing budget to provide funds for the innovation. University decision-making structures though have been finely honed to prevent that kind of thing happening.

Another example is the need to change not just teaching methods but the whole process of curriculum design if television is to be used sensibly in higher education. Existing closed-circuit television is under-utilised in most universities, because they are seen as appendages to existing teaching methods. In very few places has the whole teaching system been transformed so that television could be fully exploited. In particular, television is particularly valuable for off-campus teaching, which could if organised properly allow for a much more flexible and continuous system of higher education.

It has to be faced that most new technologies require high set-up costs, both in terms of equipment and academic time, and there is little evidence yet to suggest that the returns, in terms of increased effectiveness, lower running costs, etc. are worth the investment.

Another major barrier is lack of academic staff development in teaching methods in higher education institutions. To use television properly, some form of training for academics is essential. Time and again research has shown that differences within media are greater than differences between media; in other words, it does not matter which medium one uses if the teaching is poor. A well designed television programme will teach better than a poorly designed lecture, and vice versa. But to design a good television programme, the teacher needs to know what television can do well, and what it does badly. The producer cannot do that for the academic, because only the academic fully understands his or her subject area, and how they want to teach it.

Lastly, it is important for a higher education institution to have easy access to and adequate funds to approach or support a relatively low-cost educational television production unit, with someone who understands educational as well as production issues. New technology enables such units to operate at far less cost than broadcast standard facilities.

These are all major obstacles to the introduction of new technology in higher education. However, it may be no bad thing that higher education is cautious and conservative regarding new technology. Not all that is new is good, and if the traditional obstacles require the new technologies to be fully justified, this could be a welcome counterbalance to the sometimes "gung-ho" attitude of politicians and media specialists towards the new technologies.

HORSES FOR COURSES

Those of you that follow the sport of kings will know that a good steeplechaser will rarely do well on the flat, and vice versa. Similarly, television needs to be used selectively, depending on the type of course, and above all on the target audience and the skills to be developed.

Television can be a most valuable asset for higher education, provided that resources are available to do the job properly, and those teaching the course know exactly why they are using television.

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