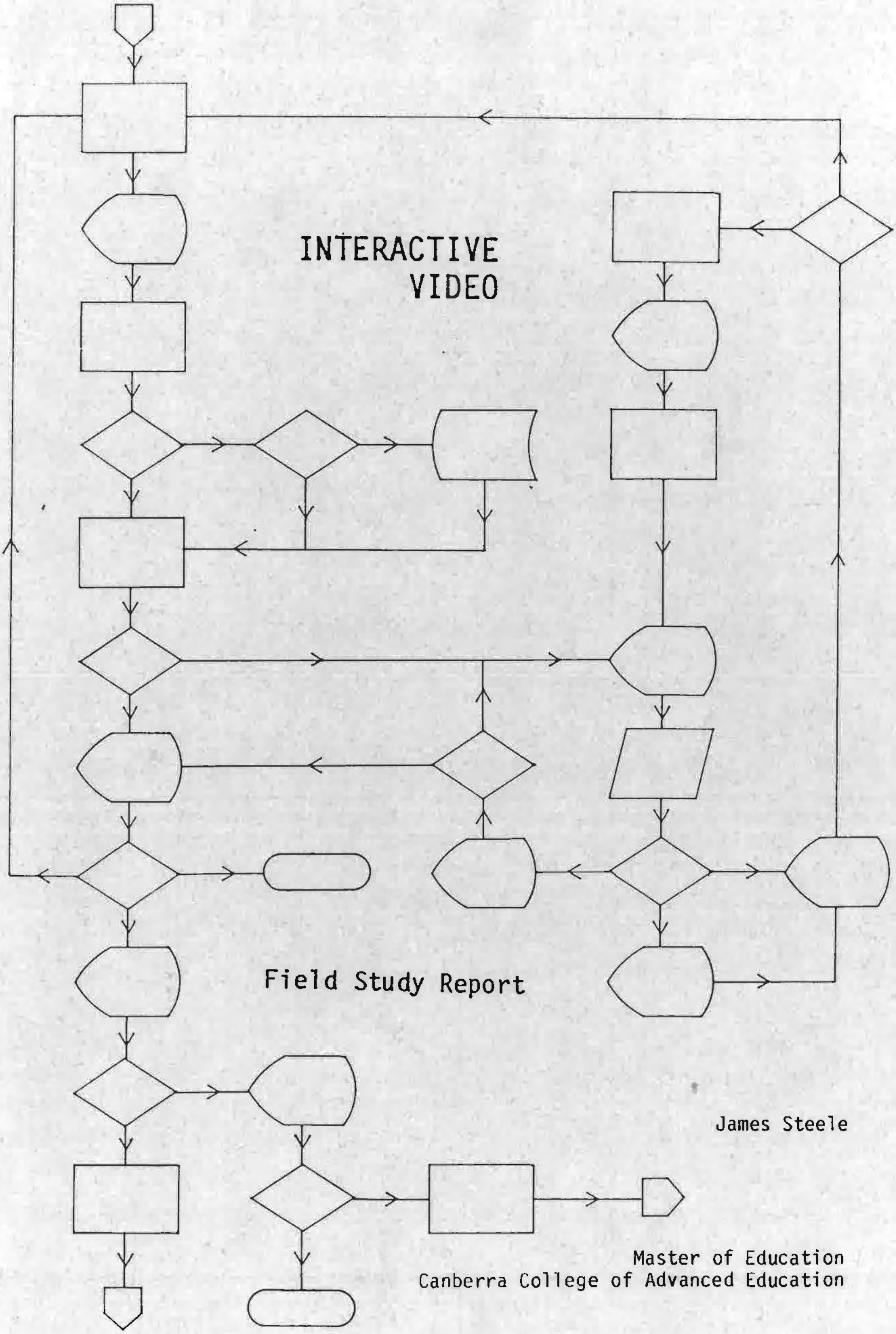
INTERACTIVE VIDEO



Field Study Report

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Master of Education
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INTERACTIVE VIDEO

by

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ABSTRACT

Interactive video is a new method of instruction which has great potential. Already, the techniques developed are being used effectively by companies with training and information dissemination needs covering large and diverse organisations.

This Field Study is an attempt to explore the possibilities interactive video has for education. Since the techniques are new and still developing quickly, it was necessary to spend a significant amount of time learning about the possibilities for the medium and developing new techniques for the particular application described in this Report.

There are a number of facets to the development of a learning package which uses new technology and new techniques. All these facets must be explored to make sure the techniques incorporated in the package being developed fit together properly, to make the learner's experience an effective one.

Video production, computer programming, computer assisted instruction and subject matter expertise are the major facets of interactive video, and all have had to be explored to some degree in this Study. For the writer, a media producer with mainly film and video production experience, video production on its own was not a great problem, but computer programming and computer assisted instruction techniques, and the integration of all the various elements of the package, was new ground. Subject matter expertise beyond the writer's skills was available from other sources.

This Report covers the development of the Study from the investigation of interactive video as a new technology, through an exploration of the techniques required to produce materials for it, finally to the development of an experimental package designed to give the writer some practical skills in the use of interactive video, and insight into its usefulness as a medium of instruction in a practical setting.

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PREFACE

This Field Study Report had its origins more than two years ago, in the Lakeside Hotel in Canberra where AAV-Australia (a private audiovisual production company) demonstrated interactive video with the Pioneer LaserVision System, using General Motors programs. My thanks go first to Ruth Holzman, a Project Officer with whom I was working at the time in the Department of Communications, whose suggestion it was to investigate interactive video for my Field Study.

The subject was not one with which many people were terribly familiar, and my supervisor Barbara Chambers has been cheerful and helpful throughout her two-year stint during which we have both learned about this new method of instruction. Her greatest contribution to this Report has been in keeping it in a form that will be useful in explaining the subject to others coming along later.

The staff at the Instructional Media Centre (IMC) at Canberra College of Advanced Education have been always helpful in the development of the package produced for the Field Study. Most particularly my thanks go to Ron Jubb for the graphics, David Reid for the photographs, and Barry Lambert and Don James for their help in the production of the video material. Thanks also to Helene Walsh for the stills used in this Report.

On the computing side, Dave Roarty, Peter Harding and Laurie Spencer were great assets to one who was so ignorant of the skills necessary to utilise the capabilities of computers. My thanks to them all. In a time when information about the actual capabilities of particular pieces of computer equipment is often hard to come by, I am especially thankful to Dr Diana Laurillard for her correspondence detailing her use of the BCD board.

The whole Study was also made much easier by the support of Ian Hart, the Director of the IMC: he certainly understands the possibilities for the use of interactive video. His experiences with the new technology in Europe during his study leave earlier this year, and his work on the subject since his return, have been of great assistance to me.

Recognition is given here also to those computer programs used in the production of the package which were developed by Beagle Bros Micro Software Inc. (HI-WRITER) and by BCD Associates (OPSUBS 3.0 and related programs).

James Steele
November 1983

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PHOTOGRAPHS - Helene Walsh

ILLUSTRATIONS - Ron Jubb and Carl Ruediger

The illustrations throughout the Report are from the package itself.

INTRODUCTION

Interactive video is a new teaching technology available now for instructors to use: if they have the time, the patience and the resources to develop the skills necessary to produce material and the understanding of how to use it effectively.

Interactive video brings together the microcomputer and the video replayer, combining the capabilities of both and enhancing their individual usefulness in teaching.

This report is in three parts. Part one describes how interactive video works. Part two details the production process, and part three presents the experience of the author in the production of an interactive video program using a microcomputer linked to an industrial video player.

The objectives of the study have been to develop an understanding of the potential use of interactive video, and gain the practical experience necessary to produce interactive packages using resources already available. These objectives have been fulfilled, and this report details the experience.

DEFINITIONS

> "Interactivity ... now it has come to mean an interaction between a person and some sort of technology" (Reisman, 1981, p29)

> "Unlike conventional video, interactive video is non-linear in nature. Its images are presented in an order determined by, and appropriate to, the learner's responses and needs" (L'Allier, 1981, p3Ø)

PART ONE - WHAT IS INTERACTIVE VIDEO?

NEW TECHNOLOGY IN THE CLASSROOM

With the development of new technologies such as teletext and videotex, and the increasingly sophisticated application of microprocessor-based information processing equipment, a variety of potentially powerful education systems have recently become available.

By and large, the successful educational applications of these and related technologies have not to date been a feature of schools, colleges and universities in Australia.

This situation can be explained by a number of factors, including:

- lack of resources,
- minimal institutional support for such high-technology systems, and
- lack of understanding of the way these systems could be used in an educational setting

VIDEODISC

For some years, laser-read optical videodisc systems have been under development. The first commercially successful release of a working system came in the late 70's, when the LaserVision system was introduced by Pioneer and Philips.

Optical videodiscs reproduce video and audio material with exceptional clarity, limited only by the quality of the original and the limits of the television systems used to record and reproduce it. As a delivery system, the cost of distributing material on videodiscs is potentially much lower than the costs for equivalent programs on much less durable 16mm film.

Videodisc players can also provide features not easily available with 16mm film projectors or conventional videotape players. These features include the potential to freeze-frame, go forwards and backwards at a range of speeds from slow motion to very high search speeds, locate any single frame from 54,000 on one side of the disc in under three seconds and be controlled externally with remote control units or computers (or internally with on-board microprocessors).

As it stands at the moment, the videodisc has several major hurdles to clear before it becomes the ideal audiovisual medium. Firstly, to compete directly with the videocassette recorder, videodiscs must be re-recordable (development of re-recordable disc systems are to the stage where several with a limited capacity to record and replay video are being marketed for data storage applications). Secondly, the price of videodisc players, especially in these times of shrinking budgets for education, needs to come down. And thirdly, program material of a range and price to compare with existing videocassette and film products has to be available.

The videodisc player's ability to be controlled by microprocessors is of particular interest, since this provides the opportunity to tailor presentations of learning material to individual users in a way which can take account of their responses to it.

LEVELS OF INTERACTIVITY

Daynes (1982, pp49-55) has developed a useful schema for distinguishing between videodisc players of differing capabilities:

Level Ø : Players with no inherent capability for still framing or locating individual frames on the disc.

Level 1 : Players in this category are simple domestic-type models which have some form of frame-addressibility, although control is limited to the machine's (possibly remote) control panel. Individual still frames can be displayed.

Level 2 : The principle difference between level 1 and level 2 players is the latter's ability to be programmed to search out individual frames or scenes, stop automatically, perhaps await input from a viewer to determine what scene should be displayed next. The memory and controlling mechanisms are on-board, and the players are faster, more rugged, and provide better control for the user than level one players.

Level 3 : In this category are level one or level two players which are controlled externally by a microcomputer, and combine the use of video images and sound from the videodisc with text and graphic information generated by the computer. The range of possibilities provided by the joining together of the videodisc player and the computer expand the capability of the stand-alone player enormously.

Level 4 : Even more advanced systems which exploit the potential of the computer-videodisc player combination to the fullest. Additional devices, providing input or output for the system may also be included.

Packages using players of the third and fourth levels are those of interest in the present study, since it is these types of interaction which provide the greatest scope for the development of effective learning systems.

INTERACTIVE VIDEO

Interactive video combines the sound and vision replay capability of the video player with the sophisticated forms of interaction possible with the computer. The video player could be a videodisc player, or a videocassette player. Both can be controlled externally by computers if the appropriate equipment is available.

In the past, visual materials of various sorts have been promoted as useful resources in teaching - drawings, diagrams, still photographs, films and television programs have been and continue to be used in the classroom, the lecture theatre and the library as invaluable aids.

'Moving image' media - film and television - are of great value in teaching. For example, processes which are not possible to demonstrate within the normal classroom environment can be shown easily with a film or videotape taken on location: the film or videotape replaces the actual demonstration. In addition, film or videotape can bring into the classroom the views and attitudes of people who would otherwise be unavailable, or can take the class to places not easily accessible to students.

One of the major shortcomings of 'moving image' visuals has been the fixed nature of their presentation - a program, film or video, has a beginning, followed by a middle and then an end. Until the advent of the videotape recorder, it was difficult to allow individual students to see film and video programs in their own time, watching them at their own pace. With videotape recorders, this is now possible, but with little guidance, and no feedback, the value of presenting moving-image programs in this way may be less than ideal.

With the advent of the microcomputer, it became possible to break the traditional start-middle-end format of the video program by placing the video player under the control of a microcomputer.

Interactive video permits the development of learning packages with the capacity to present to learners a series of moving images and associated sound in any sequence, dictated by the student's responses to the material presented. Interactive video is non-linear, whereas traditional film and video are linear.

Dede (1981, p205) points out other advantages of the joining together of the two technologies (microcomputer and video player) thus: "Barriers of inconvenience (in schedule or distance), cost and total time commitment will be reduced; the diversity of possible offerings will be expanded."

The new technology of interactive video may not only have the effect of extending "the diversity of possible offerings" to those already receiving the benefits of formal education, but may also mean "that a larger proportion of the society will have access to instruction." (Dede, 1981, p204).

Now, individual users can be shown a short scene of moving visual material, with accompanying audio, from the video player, and then immediately quizzed by the program contained in the microcomputer. The next scene displayed from the video program would be determined by the viewer's response to the question or questions asked.

As Pipes (1981, p11) points out:

> By their [video players] simplicity, plus the ability to harness them to workhorse computers, they lend themselves to the ultimate goal of instruction: to individualize learning for everyone.

Or, as Reisman (1981) puts it:

> We are now, through display on the television set, able to use information coming from a machine that is not just text and graphics, but that is information more like the kind we prefer to see when we are talking to someone or when we are watching some sort of event .... The major breakthrough now is in the practical integration of the naturalness of the information that comes off a tape or a [video] disc with control by a computer.

BRANCHING

The sequence of instruction provided by the computer and the video player could be:

- display of visual material, with accompanying audio, from the video player under the control of the computer
- presentation of a question by the computer for the student's response
- if the student's answer is correct, continuation of the video program to the next scene, or
- if the answer is incorrect, either:
  - the previously shown scene repeated, or
  - another scene designed to explain the answer more clearly or in a different way

  then returning to the question for another attempt.

Many variations of this 'programmed learning' regime are possible - the important features of the system are that:

- the student is presented with the information needed to answer questions included in the video program,
- there is feedback to the student on the success of his or her response, and
- there is some provision made to give the student remedial treatment or practice, after which another attempt at the question is allowed.

An important feature of this interaction is that, to the student, it should feel 'natural'. Reisman (1981, p29) puts it this way: "... what we're trying to get to in this evolution is a transparency in man/machine [sic] interactions where you, as the man [sic], don't even know you are talking to a machine."

Interactive video can be considered to consist of two major elements - computer assisted learning, or CAL, and recordings of all sorts of audio and video materials.

CAL extends to many sophisticated forms of learning aided by computer, too broad to cover here in any depth. Therefore, this study will relate only to the use of CAI, or computer assisted instruction.

CAI means the interactive use of computers in the management and presentation of learning material, and the evaluation of student learning. It consists of three basic processes in a variety of combinations:

- the presentation and structuring of information,
- acceptance and evaluation of each response from a student, and
- taking the student through one of several instructional paths.

What sets CAI apart from other educational media, and its importance as an educational technology, is the immediate feedback it gives the learner.

One might ask, why combine the computer with another medium, such as video? The advantages of the computer in drill and practice exercises are to some extent accepted, and the power of the moving image to communicate relational concepts is also accepted -

combining the two may help to overcome some of their individual disadvantages and combine their advantages. As Laurillard says (1982, p173): "It is an ambitious project but the educational potential is tremendous if only we can marshal the expertise to exploit it properly."

Interactive video is a combined medium - it combines the media of computer assisted instruction and video. The branching process is the same as in CAI, with the addition of video and audio segments from the video source.

The development of CAI has been going on for some years now, and its design is the subject of much discussion in the literature. It is not intended that a full exposition of CAI design should be presented here, but suffice it to say that those elements of design for CAI packages which have been developed over the years have equal relevance to the development of interactive video packages.

Overall, the general principles of CAI and of video recordings, separately, apply to the 'combined medium' of interactive video. Interactive video packages should, for example:

- follow the branching patterns associated with programmed learning, as used with CAI,
- after each response, give the learner immediate feedback, indicating whether or not the response is correct,
- follow any incorrect response with an explanation sufficient to allow the learner to answer the question correctly on subsequent retesting,

- at any point during the presentation, allow students to end the lesson if they so wish, and
- use the production techniques developed for educational video recordings, with a little adaptation to take account of the destructured nature of interactive video.

Interactivity could extend to a far greater range of devices than just video players. Indeed, even now three dimensional external devices like robots and other models under the control of computers are interacting with learners. The possibilities for learning by (apparently) doing, at no risk to the learner or any patient or victim, are growing all the time.

The manner in which a package branches from one segment to another can be simple or quite complicated, depending on the complexity of the package developer's model for the control of the presentation and sequencing of material. Considering for the moment only the video component of the package, the standard, linear film or video program can be thought of as a series of scenes with no possibility of branching. In this case the learner must see one scene after the other until the film or video program has finished (Figure 1a).

Much more complex patterns of interaction are involved when there is a choice of following scene (Figure 1b). This choice may be the package developer's choice, the student's choice, or may be made by the computer based on a student's answer to a question or other criteria. Looking at the diagram, and comparing it to Figure 1a, it is obvious that this pattern of branching requires a lot more production and development work than does the simple linear video program.

CONTROL STRUCTURES

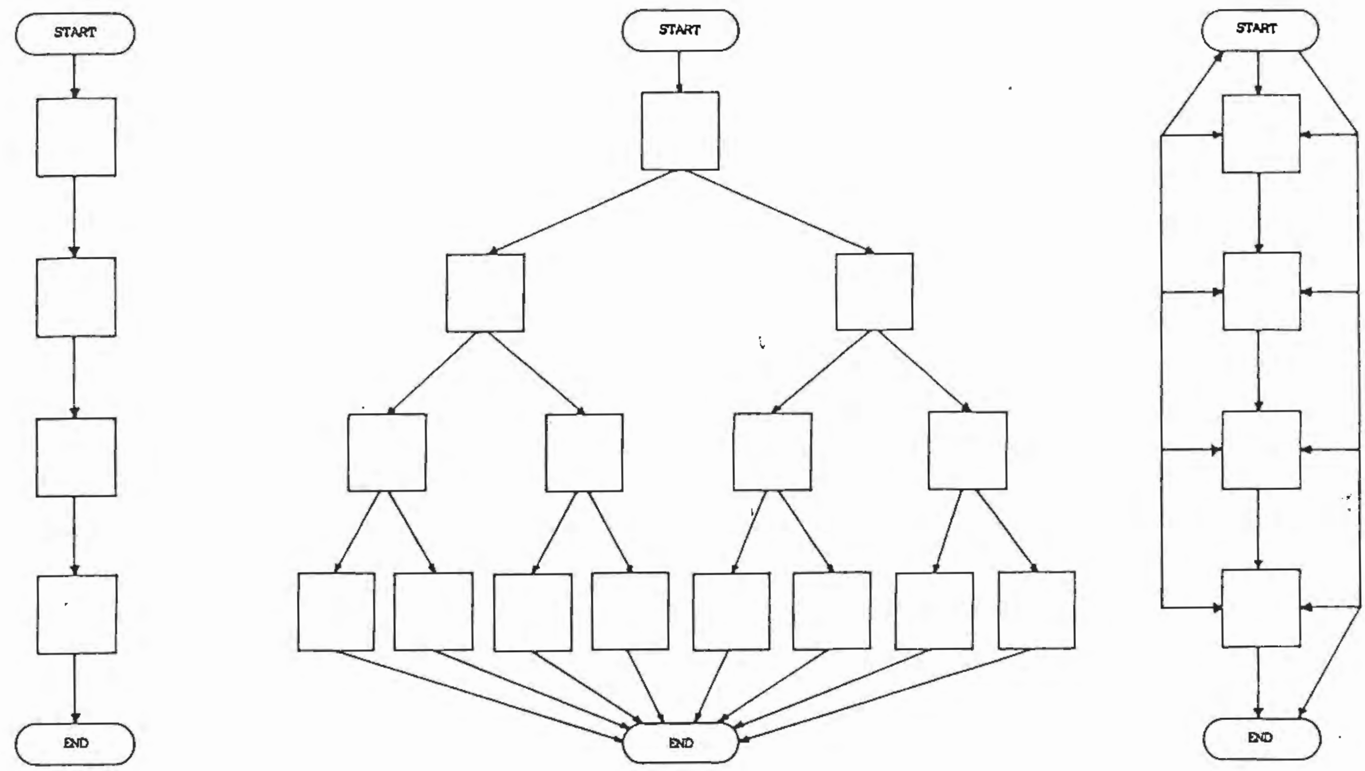


Figure 1a : Linear

Figure 1b : Branching

Figure 1c : Random Order

FIGURE 1 : PATTERNS OF BRANCHING

(adapted from a talk given by Dr Fred O'Neil, WICAT Computers)

A third pattern for a branching video program is presented in Figure 1c. In this case, the number of scenes in the presentation is the same as for the linear video program (Figure 1a), but the presentation is not restricted to any particular sequence of scenes. Great care in production needs to be taken when making video programs of this sort - few could be broken up into scenes and the scenes shown in a random order, and still remain coherent.

Other, more sophisticated models of branching are possible. For example, the Open University is developing techniques of interaction which view the video presentation as a whole, not necessarily being composed of a series of discrete scenes divided up by the package producer. The student has control over how much or how little of the video material s/he sees at any time (Figure 2), and can stop the video program whenever desired.

STUDENT CHOICE

(Adapted from Open University Model)

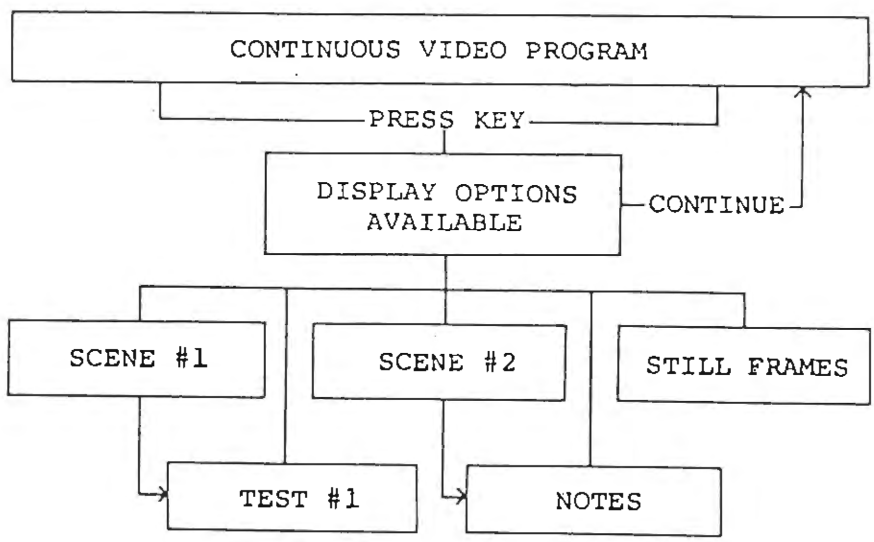


FIGURE 2 : STUDENT CHOICE

These differing levels of user control over the presentation of information may be seen as a range over a continuum from, at one extreme, complete producer control (as in a 16mm film, for example), through to a model such as the Open University's, where the user can stop and start the video program whenever and wherever s/he likes.

Interactive video packages can lie virtually anywhere along such a continuum. A package in which the producer decides what the user will see next, even if dependent on the user's answer to a question, restrict the freedom of users to follow their own interests. Towards the other end of the continuum, free access to any part of a video program presents the user with an unstructured experience which may not be appropriate to particular subjects.

As a broad generalisation, the free-choice structure would be more useful to situations where learning of a more general nature is desired - even group learning circumstances, where discussion arising from the material presented is the desired goal.

Lock-step structures are more appropriate to the learning of facts and lower order mental (or even physical) skills, where it is necessary for all students to gain a requisite body of knowledge from the experience of the package.

In a way, it is much easier to design the latter type of package. It can be decided that a clear part of the curriculum is to be learned, no more, no less; that there are certain clearly stated objectives that will have been fulfilled after the package has been completed; that all users shall follow clear paths through the package; and so on. It becomes a mechanical process to translate such a package into reality, something which computers handle very well.

ADDITIONAL MATERIAL

The computer not only allows the package producer to break down the previously linear video program into scenes, using whatever strategy for the selection of the scenes to be replayed, it also adds to a package producer's range of sources for material. Computer-generated images and sounds can provide additional information, questions can be posed by the computer, and answers evaluated on the spot. The computer can make the decision about which scene is presented next, based on whatever criteria the developer has included in the package design.

THE ROBOT TEACHER

The nature of machine involvement in education has always had its detractors - they say that nothing should replace the human involvement of the teacher in the classroom. Pipes (1981, p11) says of the critics of the new technology:

> Educators fear that media have the capacity to eliminate their jobs - and the more powerful a medium, the greater its threat.

The traditional place of the teacher in the classroom appears to be threatened by new technologies which will take some of his or her teaching decisions away. Wagner (1983) says that media challenge the teacher's autonomy, involving the decisions of other professionals (not necessarily teaching professionals, either) in in what will be taught to his or her students, and how it will be taught. Wagner advances the economic argument that at some point it is cheaper for a society to use more media and fewer teachers in teaching, replacing, not supplementing, teachers with television and radio.

From a systems-wide viewpoint, this is not a difficult argument to support. On the level of the individual school and classroom level, it is, however, difficult to accept that traditional teaching could be replaced by media. Certainly new technologies could be integrated into the traditional classroom to ease the teacher's load, but the now popular view is that such machines could <u>replace</u> the teacher. Pipes continues (1981, p11):

> Useless to hail the great boon of a device that repeats a lesson ad infinitum, without losing patience, until the message takes, and thus spares the instructor's nerves and sanity. Useless, too, to point out that even when individuals can operate equipment to teach themselves, someone is needed to guide them in knowing what they need to know.

Grinstein and Yarmish (1981) say that it is a myth that the teacher can be made redundant by computers. Their view is that computers can be no more than classroom supplements, providing drill and controlling the presentation of material to students. Although computers are very good at imparting knowledge, this is only one of the functions of today's teacher: computers cannot provide discipline nor supervise students, and certainly do not provide a role model for students in the same way as "real" teachers do.

The two sides of the argument appear to be that, on the one hand, it will become cheaper to teach using media: on the other, that machines will never replace the human teacher.

Teaching using media means centralising teaching, if the benefits of mediated instruction are to be fully exploited. David G. Gueulette (1981) writes that the high cost of the equipment and the expertise needed to operate it effectively require centralisation, but such a centralised organisation is highly susceptible to government or other special interest groups who may gain control. He describes the possible development of a "super school":

> ... a centralised organisation that may be governmentally controlled that produces or acquires and distributes television programming, films, audio materials or computer programs. (Gueulette, 1981, p39)

Or interactive video packages? This "monopolisation" of knowledge could lead to restrictions in the way people are taught, and to converging rather than diverging patterns of thinking in the society.

Such thinking, on one level, and the lack of knowledge and resources in most schools on the other, suggest that new technologies will find it hard to find an effective foothold in schools. Imposition of the technologies from above would only alienate teachers and school administrators even more, and seems an unlikely road to a successful incorporation of new technologies into schools on the grand scale.

The institutionalised nature of the curriculum may mean that schools are less and less the places where education will take place. Already some children in the USA and in Australia spend more time in front of the television set than they do in the classroom. Roland Meighan and William Reid (1982, pp355-56) put it this way:

> With the flexibility which is offered by the new technology the balance will be tilted more sharply to the home as the place where children acquire objective knowledge of the world. Here will be found information channels which are controllable, interactive, up-to-date and client oriented, while schools are starved of the funds necessary even to maintain their stocks of traditional textbooks.

It is not intended that this discussion be pursued any further in this report - suffice it to say that the strain which new and potential technologies will continue to place on the institution of education in society requires consideration and urgent action if society is to both benefit from the introduction of new technologies in education, while not destroying totally the present educational system.

It is unlikely that teachers will be replaced by machines, at least in the forseeable future. What is important is the question of how much autonomy the teacher in the classroom will have to give up if society overall is to benefit from new technology in teaching.

THE COSTS OF TEACHING

The reasons for promoting the use of the new interactive technology does of course include economic considerations. Although the initial capital costs associated with the introduction of the hardware would be high, the operating costs of the systems once in place would be reduced, compared with the operating costs of the present teaching systems which they would replace.

Also,

> ...the prices do not weigh so heavy when balanced against the possibilities for enhancing learning. For some students, seeing makes the difference between learning and not learning; visual reinforcement improves retention for us all. (Pipes, 1981, p11)

Interactive video is, in an absolute sense, an expensive medium to produce and to use in the classroom, but its real cost must be compared to the cost of either teaching in another way the material that could be taught by the interactive video package, or the cost of not teaching the material at all.

WICAT is an American computer company which has an educational division involved in the production of interactive video packages. One of the projects that the company has produced is a National Science Program package to be used by high school science students across the USA. The reason for the project is simply that US schools do not have sufficient well qualified teachers to teach the basic science curriculum to students in all schools. The interactive video package teaches students who would otherwise miss out on science education. The cost of the project is said to be worth it in comparison to the alternatives - not to teach the students, or increase the salaries of science teachers so that sufficient skilled people are attracted to the profession, away from industry where they are also needed.

Another of WICAT's projects involved the US Army - the package replaces traditional teaching methods in the diagnosis of faults in a particular missile system. Results of a survey carried out when the package was first introduced showed, by comparing the traditional approach with both a CAI program and an interactive video-based package, that students who used the interactive video package solved test problems in a shorter time than the other two approaches. Although the interactive package cost the US Army $US 500,000 to produce, it removes the need to use missiles costing $US 14m each for instruction and assessment purposes, which is the traditional approach. The interactive video package appears certainly to be a cost-saving and more effective alternative when compared with traditional methods of instruction.

A third example of the use of interactive video in situations where it appears at first sight to represent an expensive solution, is the American Heart Association's cardiopulmonary resuscitation package (Hon, 1982: of which more later). The results of preliminary testing indicate that, although the student never sees an instructor, s/he is taught cardiopulmonary resuscitation skills more quickly and to a higher standard than can be achieved by a live instructor (should one be available).

VIDEODISC vs VIDEOTAPE

All of the abovementioned examples are packages which use videodisc, not videocassette, as the delivery system for sounds and images. Given the cost of making a videodisc once a final videotape has been produced (mastering costs are up to about $US 4,000 at the moment, but are dropping quickly), and the other relative benefits that disc has over tape, the cost of producing a videodisc can be justified easily in relation to the overall cost of the development of the whole interactive package. There are other considerations, of course, such as the availability of suitably sophisticated editing equipment for the production of the videotaped program suitable for disc mastering, and the availability of appropriate replay equipment - not every institution has videodisc replay equipment yet - but it is important to note that the cost of providing the final video program on videodisc is small compared with the overall cost of developing the whole package, if all steps in the production are costed totally.

It may be that not all steps in production are actually charged against a production budget: costs for organisations with in-house production facilities and suitable computer and video replay equipment can largely be hidden within existing budgets, and the "above the line" costs for the production of simple interactive packages using videocassette players linked to small personal computers are negligible. The cost of making a disc of the video program is prohibitive in such a case as this.

Also, discs may not be appropriate for these institutions - once made, the disc is unalterable, and a new one must be pressed if a disc is used in the interactive package. On the other hand, making alterations to a videotape program is much simpler, and may not cost anything in 'above the line' expenditure. Low volumes, and a rapidly changing subject area, suggest tape rather than disc, if interactive video programs are required.

Other institutions which are prepared to live with the shortcomings of the videocassette player as opposed to the videodisc will find the choice of delivery via videocassette costs them less in money terms, but again the cost of disc mastering is not great relative to the cost of the project as a whole.

There are a number of characteristic differences between videodisc and videotape which need to be considered when choosing which video format, tape or disc, to use in a particular situation.

Tape is more readily available, a more established format with which professional production personnel are familiar, and for which there is a wide range of existing facilities. Tape is less stringent in its requirement for high quality images compared with the videodisc, and replay facilities are readily available. It is also cheaper than disc. At the present time, videodiscs cannot be recorded over in the same way as videotape can be. Once a video program is on the disc, the only way of changing the content is to produce another disc.

On the other hand, the videodisc provides a better image, excellent still frames, access time from one frame on a disc to any other frame on that side of under three seconds (compared with up to 3 minutes for a videocassette recorder). Videodiscs are also far more robust than videocassettes.

THE FUTURE OF INTERACTIVE VIDEO

Interaction with technology is going to become more and more a part of the process of learning. Costs need to be considered, fears that the new interactive systems will replace teachers need to be investigated, methods for controlling the process of interaction effectively need to be developed and adapted to emerging technologies like the videodisc.

The next part of this report will deal with the production process for interactive video, describing in detail the steps through which producers need to go to produce effective educational packages.

PART TWO - PRODUCTION OF INTERACTIVE VIDEO PACKAGES

RESOURCES REQUIRED

The production of effective interactive video packages is much the same as the production of effective educational video programs or of effective CAI packages: that is, their production would normally be beyond the skills of the individual teacher. The cost of the equipment, and the skills of the personnel needed to produce these packages, require that they be made by specialised units responsible for a number of teachers, on a school, college or system basis.

PERSONNEL

Developing effective interactive packages requires the fusion of many fields of endeavour - beyond the skills of any one person. Computer hardware and software experts, media practitioners, instructional designers and subject matter experts are just some of the professionals whose individual skills must be brought together to realise even simple interactive packages. Making a linear video program, or developing a computer assisted instructional package seems quite simple in comparison.

The necessity for an appropriately trained production and course team cannot be over stressed: the skills needed for the production of the package extends beyond those skills needed for both video and programmed instruction text production.

The availability of these sorts of skills is usually limited to those tertiary institutions which happen to teach in the areas of computing, education and media production. This factor, and the nature of the software (both video and computer programs) needed to operate on the system, suggests that a centralised production organisation based in such a tertiary institution would be the only possible way of bringing together the expertise necessary for producing experimental packages in the new medium.

If the experience of CAI packages is to be taken as a guide, many individuals with access to personal computers and video players which may be interfaced will be tempted to produce their own interactive video packages. If there is sufficient time and there are personnel resources available to permit this piecemeal development to go on, then the advantages of having packages specifically designed for a particular situation may outweigh the economic advantages of centralising production.

CENTRALISED PRODUCTION

Where there is a common curriculum across a wide geographical area, in a subject which has clearly definable, concrete objectives, a centralised production organisation producing interactive video productions would be most efficient. Where, on the other hand, topics are taught differently by different institutions, local production may be a better solution, if the expertise and suitable equipment are available.

Piecemeal development of interactive packages has disadvantages specifically related to the advantage of having a package designed for a particular situation - the package may not be able to be transported to new equipment which may be bought in the future, and may not be transferable to other organisations should the package be a marketable commodity. In other words, the application is restricted to the purpose and the place for which it was developed. With all the time and effort required to produce an effective interactive package, it would be a waste of resources if the package was not available to all those who could benefit from it.

It would be too expensive for materials to be produced everywhere only for local consumption. The economies of scale made possible by centralised production would be dependent on the usefulness of the material produced for the whole range of potential users - it would be uneconomic to produce a range of packages in a central organisation for a subject that would only be used by half a dozen students.

One particular area where interactive video package production would need to be centralised is in the development of resources for distance teaching. Interactive video is an ideal medium for teaching at a distance, since it provides a greater level of involvement between the student and learning materials than any other media used to date.

Distance teaching organisations which teach through regional resource centres could be equipped with the necessary equipment without delay, and provided with packages produced centrally. Where distance teaching is targeted at students studying at home, the introduction of interactive video might take a little longer - the resources required to deliver sufficient material to the individual student to make investment in the appropriate hardware worthwhile (for the institution or the individual) will take a long time to develop.

As hardware costs come down, and more packages become available, interactive video may have an increasing role to play in distance education, and may in fact lead to an expansion of the activities of distance teaching institutions at the expense of the more traditional, campus based institutions.

EQUIPMENT STANDARDS

The reasons for the difficulties involved with the wide distribution of interactive video packages revolve around the lack of standardisation between video formats, remote control mechanisms for video players and the differences between competing brands of personal computers: differences in both the machines themselves, and the computer languages used on them.

Equipment standardisation is too large an issue to be discussed here: what is important is that the time and effort put into the development of the new medium should be usable with existing technology and any new technologies which are developed in the future. Procedures and processes should be developed not with a particular type of personal computer or video player in mind, but with a view to them being used with as many different types of equipment as possible.

APPROPRIATE SUBJECT MATTER

Initially, the usefulness of interactive video would not extend to all facets of education. Interactive techniques are most simply applied in teaching facts and demonstrating techniques, rather than teaching higher-order mental skills of deduction and integration.

Work is being done on the possibilities of more student-control in the presentation of interactive video material. The techniques required for this type of interaction are much more sophisticated than the techniques required to display sequences in an order predetermined by the producer of the interactive package. The more complicated techniques are required if interactive video is to be a useful device in teaching higher-order skills.

Dede (1981, p207) differentiates between "'education' and 'training', with education being done by people and training by machines."

He says that, with training, there are a limited number of right answers, and so training is readily adapted to machine teaching. Although 'education' could also be taught this way, "the difficulties and cost of doing so are prohibitive compared with using human teachers" (Dede, 1981, p207).

Like any medium (or any teaching style, for that matter), it should only be used where appropriate. Interactive video is no different from other media in this regard - educators need to assess the medium to determine what it is good at teaching, and use it for that. Teaching any subject requires a mix of approaches, and interactive video could be one approach that is used along with a number of others.

Whatever the tasks to be taught using this new technology, it is important to remember that interactive video is a new medium of instruction: one that has great potential to increase the efficiency of the transfer of skills and knowledge to students and to the community at large. The technology is available, or will be very soon, and the onus is on those who understand the educational process to examine how they may effectively use interactive video. "As educators and trainers, we must exercise prudent management to ensure that this sophisticated technology finds effective applications" (Butler, 1981, p18).

In circumstances where teaching is being done at a distance, any role for interactive video must also be assessed in relation to other methods of delivery of instruction. Distance education is a fertile field for interactive video applications, but it should be considered as an additional part of the mix of strategies used now to teach, not as a replacement for them. Besides, apart from the question of what may and what may not be taught well using interactive video, developing sufficient material to teach a subject using only interactive video would be extremely expensive.

TECHNOLOGICAL DEVELOPMENTS

What has made this new medium (or is it just a combination of old media?) possible is the development of interactivity - not only the interactivity of the learner with the available teaching resources, but also the interactivity of the technologies themselves.

The microprocessor is responsible for this interactivity: not only microprocessors in microcomputers, but also microprocessors in other audio-visual equipment. It is now possible to remotely control all manner of a/v equipment using a microcomputer as the controlling device. Slide projectors, 16mm movie projectors, videotape and videocassette recorders, videodisc players and audio players (tape, cassette and disc) can all be linked to the microcomputer, and added to the more traditional output devices: the video display unit (VDU), printer or speaker. Robotics is another area where development is currently taking place - in a sense, robots are another output device for the computer.

This development of the ability of microcomputers to remotely control external devices has been matched by an increase in the variety of input devices available for the user. It is now possible to "communicate" with the computer through keyboard, light-pen, touch-sensitive screen, mouse and voice. Robots can be "taught" how to manipulate materials by recording the movement of the device while it is being guided by a human hand.

Hon (1982) has already described the development of an interactive learning package using computer display (alphanumeric and graphic), videodisc and audio replayer as output devices, and light-pen and model as input devices. The package teaches students the basics of cardiopulmonary resuscitation, and saves an immense amount of teacher time in the instruction of this life-saving technique.

The computer's ability to "communicate" with the outside world is being enhanced all the time, and these developments will add to the range of channels now available for interaction between the user of an instructional package and the computer which controls it. Building these new channels of communication into interactive learning packages will require producers to be aware of developments, and be able to incorporate relevant techniques into their products.

COMPUTER PROGRAMMING AND INTERACTIVE VIDEO

The mechanics of the interface between the video player and the computer is immaterial for the purposes of the development of the instructional package, merely a detail to consider when the package is in production. What is important is the development of techniques for interaction between users and computers.

One aim of the present investigation is to design a series of computer program modules which would satisfy the basic requirements of an interactive video package, and which could also be expanded easily at later stages to allow for the addition or replacement of input or output devices.

Although the detail of this approach from a computer programming point of view will not be discussed here, it should be noted briefly that there is a system which can cross the boundaries between different brands of computers and indeed different computer languages - making it possible for CAI packages to be transported between computers.

The system is called the UCSD p-system, an operating system for microcomputers developed at the University of Southern California (San Diego) (hence UCSD). The UCSD-p system, in effect, acts as a translator between different languages and the particular machine's native code language. Packages developed using the p-system will run on most personal computers, so that transferability of the CAI may be possible if the p-system is used.

Interfacing the personal computer with the videorecorder is another problem, but if the system used to develop the CAI package has an 'interactive video' facility, video can be included and the tying together of the particular computer and video player becomes a minor problem at the replay end.

The UCSD Pascal language system is preferred because of its modular nature. Use of UCSD Pascal would go some of the way towards overcoming machine incompatibility problems, since the program modules should be able to be implemented without too much difficulty on any microcomputer using the UCSD-p system, and also more modules could be added to receive input from new sources, and control further output devices, as required.

MAJOR STAGES IN THE PRODUCTION PROCESS

Making interactive video packages requires involved planning - much more so than is required for linear film and video productions. The production of effective packages requires far more in the way of professional skills - media producers and production personnel, computer programmers, instructional designers and subject matter experts - than the more traditional forms of moving image media require.

The production process does, however, follow major steps similar to those necessary for the production of video and film programs.

ANALYSIS

Analyse needs, objectives, tasks, resources and set strategy

DESIGN

Outline package script, with interactivity flowchart

PRE-PRODUCTION

Prepare production lists, final script

PRODUCTION

Prepare, shoot and review
- video text frames,
- artwork, photos and print materials,
- location and studio video, and
- write computer program.

POST-PRODUCTION

Edit, review and revise master tapes, and master coded package

REVIEW

Field-test final package and revise as necessary

Analysis

The analysis stage of the package production process covers the original planning for the entire project - definition of the needs and the setting of the strategies for the final package. During this stage, the overall objectives of the package will be developed, a strategy for measuring performance will be devised and the production schedule will be finalised.

Delivery hardware requirements will be discussed and a selection of equipment made. Any existing material should be investigated with a view to including it within the final package. Responsibility for the production of the various materials to go into the package are allocated, and the personnel to carry out the production are identified. Facilities needed for the production are identified and organised.

Design

In the Design phase, the script is written, graphic material is designed, and the computer programming is begun with the development of the design for the final product. Any special effects required (animation, computer graphics, etc) are also planned and organised. At this stage as well, it may be decided to conduct formative tryouts of various parts (or the whole) of the package.

Once the original designs (for the script, computer program and any effects) are produced, they are reviewed for content, feasibility and style, and redone if necessary.

Pre-production

The Pre-production phase covers the final preparation and planning for the production of all the material to go into the final package. Masters of existing materials are obtained, any talent and music required are selected, and the order in which the video material will be organised in the final package is worked out.

The plan for the shooting of all material, and the writing of the computer program, is finalised.

Production

Production of:

- text material, animation, graphics and photos
- location video
- studio video, and
- computer program

all go ahead during the production phase.

Post Production

Graphics, text, animation, photos, location and studio video are edited together and a final edit approved. The video is frame or time coded for accurate access to those scenes in the tape required for the interaction to take place. The computer program is completed and the package is integrated for the first time.

Review

The Package is field tested, and, if any shortcomings are noted, the original package may be revised.

Final distribution and delivery are carried out.

PRODUCTION CONSIDERATIONS FOR INTERACTIVE VIDEO

Producing an interactive video package is not the same as producing a standard linear video or film program. There are also differences in the production process of interactive video packages depending on whether final distribution is to be on videodisc or videotape.

Linear vs. Interactive

In addition to the obvious extra requirements made necessary by the involvement of a computer in the delivery of the interactive package, there are some less obvious differences. The video scenes which make up the interactive packages will not be presented to all users in the same order. Therefore, the producer cannot make the same assumptions about what the viewer has seen at any point in an interactive presentation as s/he can in a linear film or video program.

To some extent, therefore, the structure of the individual scenes presented to the user of the interactive package will need to be considered more carefully, since to some extent they will have to stand on their own.

On the other hand, the producer does not necessarily have to aim the content of the program at the lowest common denominator of viewer, since because of the nature of the interactive process, those viewers who cannot understand the presentation the first time round can be identified and, if the package is sufficiently sophisticated, treated accordingly. "Remedial" material, provided from either the computer or the video, can supplement the main presentation for those users who require it.

The provision of supplementary material increases the production load. If such material is part of the video presentation, extra scenes must be written, produced and edited. Additional material to be supplied by the computer needs to be developed and included in the programming driving the package. The more sophisticated the branching possibilities are, the greater the production load.

An alternative to developing a new computer program for every new package is the use of an authoring language, such as Super Pilot. This approach is inflexible, since using such a system locks the user into the approach determined by the producer of the authoring program. Maintaining control over the development of the computer program as much as possible means increased opportunity to vary the approach for particular applications. It also facilitates the addition or deletion of input and output devices as required.

Quality

Quality must be a consideration as well. While a producer might be prepared to live with a less than perfect presentation in a linear program, the same small faults in a scene that a user might see several times can become increasingly disturbing. The vastly increased complexity of the package as compared with the linear presentation also provides a much greater scope for error, and the "debugging" of a sophisticated interactive package can take a significant amount of time.

Technical quality of material destined for videodisc is also a most important consideration. In order to gain full benefit from the facilities offered by the videodisc, the material used, and the processes through which it goes leading to the mastering of the disc, must take account of its final destination - the videodisc.

Because of the high quality reproduction offered by the videodisc, the material used should be of the highest quality possible. For this and other technical reasons related to the use of freeze frames, 35mm film is the ideal medium for the production of material destined for videodisc. Unfortunately, the cost is rather prohibitive.

To use the still-frame capability offered by the videodisc, colour framing and field dominance must be correctly maintained throughout the editing process (for a clear explanation of what this means, see David R. Clark's article "Requirements for quality" in the

October 1983 Videodisc Newsletter, p2). In essence, these requirements mean that only high quality, "broadcast" equipment can be used for producing master tapes for videodisc production.

Production for interactive applications where a videocassette player will be the delivery format is not restricted by these expensive constraints. At the same time of course, the shortcomings of the videocassette system, poorer quality image and limited freeze frame and search facilities for example, will have to be endured.

Personnel

The sorts of expertise required for the production of interactive packages was discussed previously. Their availability for a production is a major consideration when analysing the requirements of the job - if there are no programmers, the job, if it can be done at all, will not be carried out as efficiently as it could be if a programmer was available.

Interactive video needs the skills of media producers and production personnel, instructional designers who are aware of the processes and possibilities of interaction between learners and machines, computer hardware and software people, and subject matter experts. Without all these people, designing interactive packages will be a slow and inefficient process.

Communication

One of the major obstacles to the development of new technologies, especially in education, is the lack of effective communication amongst those who wish to develop skills in the use of the new techniques. Co-invention is inevitable, and the two (or more) ways of doing the same thing, developed at opposite ends of the earth, or across the road, may not be completely identical - not necessarily a bad thing, since one may add something to the other, one might be more elegant a solution than another.

It does, however, lead to the duplication of expensive resources, and indicates the necessity for people involved in the use of interactive video to keep informed, through newsletters, the post, professional journals, conferences and personal contact, of what others are doing and how they are doing it.

In the third part of this report, the experiences the writer of this report had during the production of his first interactive package will be discussed in detail. The package uses a videocassette player for the replay of the video scenes required by the package, and the computer programming was done by the writer himself.

PART THREE : THE DEVELOPMENT OF AN INTERACTIVE PACKAGE

'BASIC 35mm PHOTOGRAPHY'

INTRODUCTION

This study began as an investigation into the use of interactive video using videocassette players - it was to be an overview of the field, and was to include the development of an interactive video package designed to run on the Apple II microcomputer linked to a National NV-8200 videocassette recorder.

Since the beginning of the project, in February 1982, the continued development of interactive video has made it sometimes difficult to concentrate on the task in hand: as with any new medium, and especially with one as complicated as interactive video, the field is changing continuously as it develops, and always new avenues are opening up.

The investigation was to have concentrated on interactive video using the videocassette tape format, to the point of ignoring interactive videodisc. This has proved impossible, since the two are inextricably linked. In fact, the existence of established input and output devices, and the continued development of new ways of interacting with computers, has made it increasingly important to ignore the form of the medium and concentrate on the conceptual aspects of interaction.

OUTLINE

The overall structure of what was intended for the present study is as follows:

- DESCRIBE the process of developing an interactive video package, including
  - selection of a suitable topic
  - research
  - cost considerations
  - production process
  - formative evaluation
  - limitations of the medium;
- DEVELOP a sample package script on a suitable topic;

- if possible, PRODUCE the video program, and the computer program; and
- EVALUATE the potential of the technology as a teaching tool, with particular regard to
  - .. its effectiveness as an educational technology
  - .. the possibility of it being used effectively in an educational setting, and
  - .. economic and pedagogical considerations.

PRODUCING THE PACKAGE

The package developed during this study is designed to teach tertiary students the basics of using a 35mm still camera. It is intended to be experimental: used to provide experience in the design and the development of interactive video packages. The rest of this paper describes the development of the script for the package and the production of the material required to set up an experimental presentation. It also includes comments arising from the experience.

The typical stages in the production process cover analysis, design, pre-production, production, post-production and review.

Analysis

The choice of the topic for the practical part of the study was based on several factors:

- The college had a demonstrated need for individualised instruction in the basic operation of 35mm cameras, in the Schools of Education and Liberal Studies,

- A script for a tape/slide program on the topic had already been written, and could be adapted to the new format easily, and
- Graphic material for the tape/slide program had been produced, and could be used in an interactive video package.

NEEDS

Several units on offer in Canberra CAE's Schools of Education and Liberal Studies require students to use 35mm cameras proficiently. Not all students enrolled in the relevant units require instruction in the use of 35mm cameras, which means that traditional methods of teaching students the skills necessary to use cameras takes up lecturers' and tutors' class time, time which could be used in building on the skills already possessed by some of the group.

A package capable of individualised instruction for those students needing a basic introduction to the use of 35mm cameras would therefore free the lecturers and tutors from the need to teach these basic skills to the whole of the group.

OBJECTIVES

After a student has completed the package, the student should be able to:

- identify and distinguish between the various component parts of the camera
    - camera body
    - lens

- viewfinder
- diaphragm
- shutter
- shutter speed selector
- focus control
- aperture control
- film-winding mechanism
- light meter

. be familiar with the procedures for
  - loading and unloading film from the camera,
  - setting the film speed indicator on the light meter
  - reading the light meter
  - setting the shutter speed and aperture
  - focus
  - shutter release
  - winding on

. be aware of the common photographic concepts of
  - framing and composition
  - movement
  - depth of field

. understand the basic principles of photography: specifically
  - the photochemical process
  - film speed
  - exposure

COMPUTER CONSIDERATIONS

Use of a computer in an interactive video package to control the presentation provides many opportunities for incorporating different materials and for different presentation structures to be used. The range of such possibilities is endless, which creates a problem in the selection of materials and of a structure that can be implemented within the time and resources available for a particular project.

The videotaped material, although developed specifically for this package, was put together in such a way that it could be used as a linear video program - that is, played back from beginning to end and still make sense. The control structure for the package is represented in Figure 3.

Each of the fourteen sections of the script would be replayed to the user straight through on their first contact with the section. After the replay, several questions might be asked. If the users' answer to the question is incorrect, only the relevant part of the section is repeated. The relevant section may be the entire section in some cases, especially if the section is short. As discussed elsewhere, after a section has been completed satisfactorily, the user has the option of choosing what to see next.

Using a control structure of this sort, not much greater effort needs to go into the production of the videotaped scenes for the interactive package than would be required for a linear video program on the same subject. On the other hand, an interactive package which has branches into scenes not always seen by all users would require a greater production effort in the making of the videotaped sections.

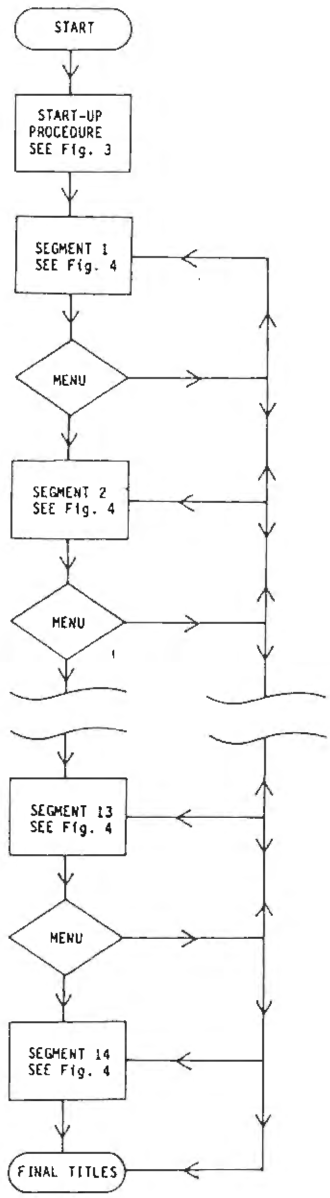


FIGURE 3 : OVERALL CONTROL STRUCTURE

This control structure also gives the user some measure of control over the presentation of material, so that they are not locked into the one path as dictated by a package producer.

MEASUREMENT OF PERFORMANCE

Assessment of the package user's ability to use a camera, after going through the package, was originally to be incorporated in the package itself. Routines to store the user's pattern of responses would have been stored on disk for later analysis, to not only indicate the proficiency of a particular student, but also to indicate whether there were any problems with the structure of the package. If a certain question was always answered incorrectly (or correctly) the first time around, then such a question would be looked at closely in relation to the material presented, possibly leading to modification to the package.

A little investigation showed that this would be difficult to do within the time, and the scope of the other resources available for the production of this package, and so assessment of the user was left out of the design. As developed, the package is designed so that a user cannot progress through the barrier of the questions presented without correctly answering any questions included in the presentation. There are no inbuilt routines to assess the pattern of responses the user makes to the questions, nor to show the path taken by the user through the package. This needs to be implemented at some later stage.

PRODUCTION SCHEDULE

The production was scheduled to be completed in time for the package to be tested with users, before the final report was due for presentation.

OTHER CONSIDERATIONS

It was decided to use, wherever possible, existing materials and equipment. Sources for any materials or equipment not immediately available were sought out. The facilities of the Instructional Media Centre (IMC) at the Canberra CAE where available for the production of the materials necessary for the videotape section of the package.

One of the first practical difficulties encountered in the project was access to appropriate equipment with which to develop an interactive video package. It was envisaged that the package would use a videocassette recorder (National NV-8200) to provide video and audio material, and an Apple II microcomputer to provide computer control, text and graphic output and student input, via a keyboard. The National videorecorder was available from the IMC (where the writer is employed as Media Programs Officer), and the computer, a 64k Apple II plus with 1 disk drive, belongs to the writer.

Investigation of various solutions for this problem were begun, and continued until after the video program had been completed. The process of finding appropriate technology will be outlined later.

Design

The existing tape/slide script was originally written by a former producer at the Canberra CAE. It was redrafted and adapted for interactive video by the writer of this report (a copy of the script is included with this report as an appendix). The need for extra graphic material was identified, and that extra material was designed and its production organised. The script contained information not only on the picture and sound material to be contained within the final package, but also branching information and a complete description of computer-generated material (text, graphics and questions).

The content of the script was checked for accuracy with the IMC's photographer, and with some teachers of photography, but no further tryout of the material was included in the design phase. The objective of the whole exercise was to produce a package to find out what problems were involved, so it was considered more appropriate to trial the package after production.

At this stage, the details of the control structure used by the computer to manage the package needed to be developed. The following areas required some consideration:

(a) the development of guidelines for the presentation of information and the collection of data using the videorecorder and computer,
(b) writing a script for the package in such a way that it would show the computer programmer all branching possibilities,
(c) the design of units to present written and graphic materials to students using the interactive package; to collect, assess, and store data input by students; and to control the operation of the videorecorder,
(d) if possible, the production of computer code (in Pascal and Basic) to put into effect the above units, and
(e) the production of the video and computer graphics segments required by the script.

GUIDELINES

Guidelines for the interaction between the computer, the videorecorder and the user are an integral apart of the project.

These guidelines need to cover such topics as

(a) media attributes and media selection,

(b) the presentation of information from the computer on the screen, including guidelines covering content, amount on the screen at any one time, length of time allowed for the presentation of frames of material (and whether this time is user-controlled or computer-controlled),
(c) use of computer graphics in interactive video productions,
(d) input error and data handling, including acceptance of mis-spellings, multiple correct answers, variations accepted, helpful prompting, storage of <u>all</u> responses, etc.,
(e) use of branching to cope with different learning abilities, and
(f) keyboard literacy.

A Canberra CAE computing student doing a special elective course in Media, David Roarty, was given the development of guidelines as a project. His paper was to form the basis of the control of input to and output from the interactive package while it was in operation.

It was decided that a control structure for the package would be developed in such a way as to show clearly how the interaction of computer and student is handled. It was hoped that this interaction would be described fully, and not hidden in undecipherable code. Presentation of descriptions of the design of units used would also provide for the easy development of program code in any computer language.

Pre-production

WRITING THE SCRIPT

Writing the script for an interactive package is a major technical obstacle in itself. For this project, although the tape/slide script had been written already, converting the script into an interactive video package required a major amount of work. In the first place, a linear program, such as the original tape/slide program, represents the final program literally - the script starts at the beginning, and moves to the end, reflecting the way the final program will appear.

In interactive packages, the final presentation for any one student may be unique, and it's portraying the template for the design of all the elements which will go into this package that is difficult. A new set of rules for script writing based on the requirements of all members of the package development team had to be developed, and little in the way of assistance was available from the literature (although Hon's article (1982) does provide basic guidance).

The solution was to develop guidelines which would be used in this project, and form the basis for future projects. As already noted, writing a script for an interactive video package is not the same as writing a script for a normal film or television program. The most obvious difference is that the interactive package is non-linear in nature - branching can take you along a number of dissimilar paths in the presentation of the package.

In addition, there are more sources with which to deal. At the most simple level, the interactive package can have output from the computer (as text or graphics, or a mixture of text and graphics), or from the video player. The script must contain the details necessary for the production of the various elements of the package, in a manner suitable to ensure that, when all the elements are put together, the presentation makes sense to the user.

Initially, the major problem is defining the elements of the presentation. In a normal film or television script, the program is divided into segments and the segments into scenes. Each scene consists of a number of discrete shots. The standard film and television script is laid out in order with a description of the picture on the left hand side of the page, and a description of the sound accompanying the picture to the right of the picture description. In film and television scripting, this basic layout is adequate for all people involved in the production to understand what is required in each scene.

In the development of the script for an interactive package, the same words, the same layout would be confusing, and would not contain sufficient information for all the people working on the package to provide the necessary input. Terminology is another problem: does "program" refer to the package as a whole, to the videotaped material, or the computer program developed to control the package? Is "frame" a frame of videotaped material, or text output from the computer?

To overcome this confusion, it is necessary at the beginning to define the terms which will be used to describe the various elements of the package.

PACKAGE	refers to all the elements necessary for the presentation of the material to the user. It includes the videotaped material, the computer program and text and graphics material presented.
SCENE	same as for a film and television script - a segment of the video program all of which will be replayed.
SEGMENT	a section of material (videotaped and computer generated), which presents and examines a particular point. A segment is the smallest section of the package which can be presented on its own - any smaller divisions will not make sense presented out of context. A segment will contain a number of units (q.v) which may or may not be presented (as required), and the order of presentation is not necessarily fixed.
UNIT	the smallest division of the package. A unit could be computer generated graphics, a text page, or a scene of videotaped material. Each unit is indivisible: when presented, <u>all</u> of it is presented, in one, serial order. Each unit will be entered from one or a number of other units, and may lead to one or a number of other units.

Unless qualified by "film" or "video" or "tape/slide", the use of the word PROGRAM will be restricted to its meaning in the sense of a <u>computer</u> program, that is a series of instructions a computer needs to carry out its assigned tasks.

Instead of being presented as a script in the normal, page by page, manner used in film and television scripting, the script for the interactive video package is presented as a card system: one card or script page representing a unit of the package.

Each unit has its own number, and reference is made to previous units (those which may come immediately before it), and to following units (those which may come immediately after it). The unit description includes

- the source of the unit (computer generated graphics, text or both, or videotaped material),
- an outline of the contents of the unit (the display), and
- any instructions necessary for the programming of the computer.

Following is an example of how the script of a unit would look.

Unit No. : 1 Source : COMPUTER - GRAPHICS

Segment : INTRODUCTION

Previous Units : Ø

Following Units : 2, 3

(On Start-up, computer checks to see if videocassette is in replayer, and rewinds it to zero. If there is no videocassette in the player, program routes to Unit 2 before displaying Unit 1.)

IMAGE

OUTLINE OF THE CAMERA IS DRAWN BY THE COMPUTER ON THE SCREEN. OPENING TITLES DISPLAYED OVER THE CAMERA IMAGE.

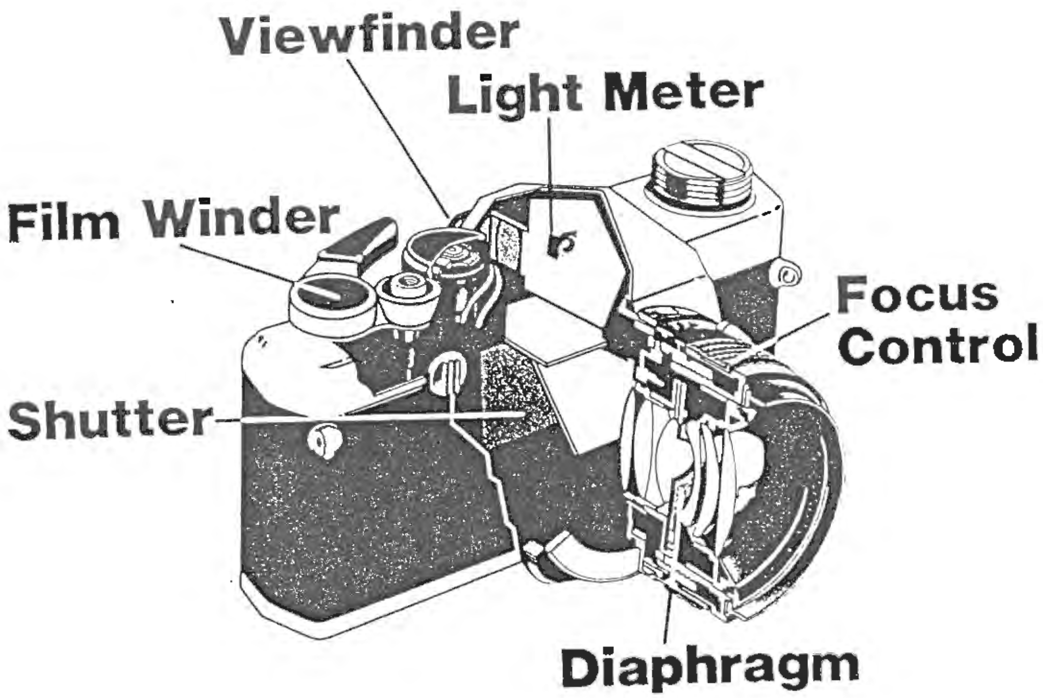
SOUND

(COMPUTER GENERATED SOUND IN SYNCH. WITH GRAPHIC)

(When graphic is completed, program advances to Unit 3.)

A copy of the script is included as an appendix to this report.

Once the script for the package had been written, and extra graphics prepared, production crew and facilities were booked for the recording and editing of the video portion of the package. Two half days of studio time were booked for the recording of the presenter's material, and several bookings for video editing spread over a week were made.



In practice, it proved too confusing to include all the information necessary for the production of the package on the one script. A separate script for the video scenes, in the manner of usual video scripts, was used, and the computer programmers used a separate script, like the example outlined above but without the detailed description of the contents of each video scene. It was sufficient for the programmer to know which particular scene was required at any point. The techniques for writing scripts for interactive packages requires more thought, and, for the sake of standardisation, there need to be some common practices developed.

Production

Studio recording of the presenter and link material took place during the two half-day sessions booked for the purpose. Extra photographs and graphics were produced, together with some of the special effects sequences used to demonstrate focus and other concepts as called for in the script.

Graphics were produced by the Graphics section of the IMC, and photographs by the Photography section. The presenter was played by the writer, and other parts by friends.

Post Production

Editing of the material was spread over one week, when the graphics and photographs were incorporated into the video program, together with electronically-generated text material.

The video program was edited in such a way as to be useful as a linear video presentation, that is, it could be used in a class or individually by students without the need for the computer.

Once the editing of videotape was completed, the writing of the computer program began. This was to take more time than originally thought (see below), and delayed the testing of the package until after its first presentation.

There was a problem procuring the appropriate hardware to link the microcomputer to the videorecorder. Advice was received from various quarters (mainly technical, and some sales) that the devices available in the US were unsuitable for use with the television system in use in Australia (Australia uses the PAL system, which is different to, and incompatible with, the US NTSC system). In the face of this lack of information, it was decided to go ahead and build a simple device which would provide basic computer control of the functions of the videorecorder.

Unfortunately, the development of this device took too long for it to be of particular benefit, and in the mean time, further information from contact with various US manufacturers of devices for the Apple II computer which provide control of a videorecorder (BCD Associates and CAVRI), and from contact with others in Europe (where the television system is also PAL), revealed that the boards available would work quite effectively with the PAL system. On this basis, a BCD

450 Videotape interface board was ordered from the US, and used in the development of the trial package.

SELECTING THE SCENES

Once the videotape had been edited, it had to be logged to locate those scenes which would be replayed when the package was in operation.

The BCD interface board came with the software necessary to log the tape. It requires the addition of a time code address track to the videotape - using the spare audio channel on the tape. Although the videotape was originally recorded and edited on 3/4" BVU format videocassette, adding the time code had to be done on VHS because the interface board could not control a BVU recorder (a separate lead was needed for connecting the board to a BVU recorder).

In order to retain a master of the highest quality, from which all subsequent copies of the video program material could be made, the time code was recorded onto the master 3/4" BVU tape by taking a split of the time code output signal from the computer and inserting it onto the spare audio track of the BVU machine while the computer was writing time code to a scratch VHS copy of the material.

When subsequent copies of the material are made from the BVU master, the time code on each will be exactly the same as that on every other copy. The time code references used to determine individual scenes on the tape will be the same for all copies.

Therefore, making copies of the package for distribution only requires the making of a copy of the BVU master material and a copy of the master computer disk containing the computer programs necessary to run the package.

The exercise of logging the tape consisted of cabling up the computer to the player and a suitable monitor, placing a videocassette with the time coded video material on it in the player and running the BCD provided program LOGGER I. Playing through the videotape, in-points and out-points for each scene were entered into the computer. Labels for each scene were added, and a file containing the time code addresses of the in- and out-points and labels for each scene was recorded onto the master computer disk containing the programs which control the presentation of the package. Several back-ups of this file were also saved easily, using the facilities of the LOGGER I program.

Logging was an unnecessarily tedious process because of the design of the LOGGER I program supplied by BCD. It was necessary to do the logging in real time (that is, with the videotape running in play at normal speed), which means that if the in- or out-point of the scene is missed the videotape must be rewound a little and another attempt made to hit the appropriate key at just the right moment.

Some of the in- and out-points logged in this way still need to be redone - the accuracy of the technique leaves a little to be desired.

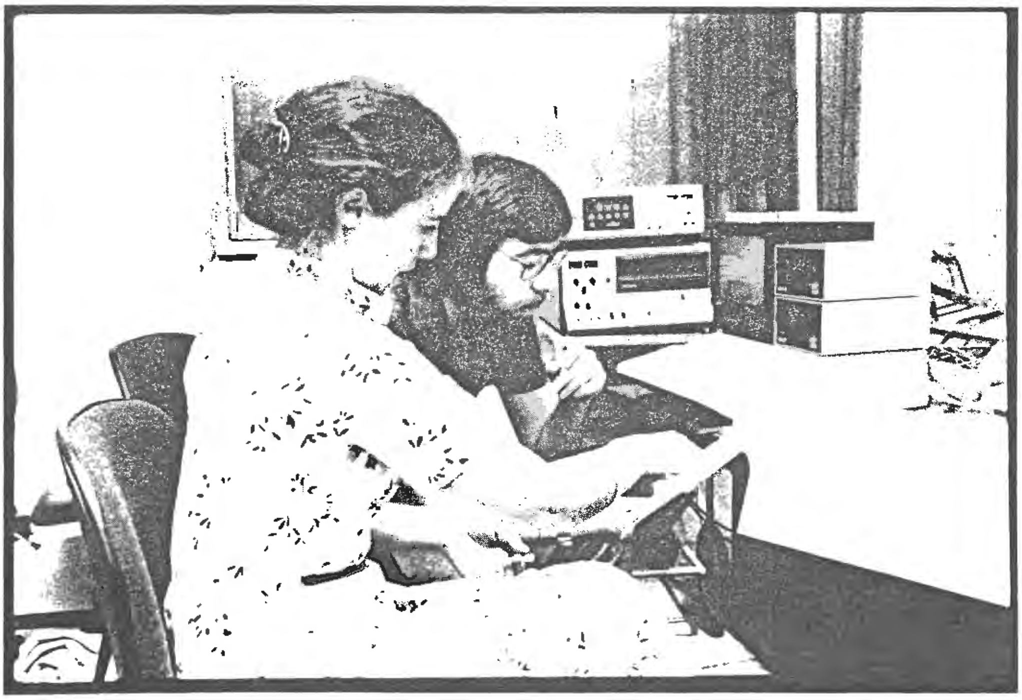
A few simple changes to the LOGGER I program could overcome this difficulty. It should be possible to add a few more options to the main menu, one to trim the actual time code numbers of a scene in the list built up by the program, and another which would rewind the videotape just a little so an unsuccessful attempt to register the right point could be attempted again without rewinding the tape the minute or so that the tape rewinds when one does it manually (VHS and Beta players rewind tape very quickly compared with 3/4" systems - one of the advantages of using VHS and Beta players for interactive video). Although these should be relatively simple changes to make to the program, the writer had neither the skills nor the time to do it. Another area for future work, if the LOGGER I system is persevered with.

PRESENTATION OF TEXT

Early on in the development of the package, the decision was made to use large lettering on the screen to display the text messages from the computer to the user of the package. The decision was based on a desire not to use normal Apple output to the screen, because of its computer-type, upper-case only display (with Apples before the IIe model, anyway) display.

A commercially available program, HI-WRITER by Beagle Bros Micro Software Inc., could be used to display strings of characters in large lettering on the Apple's high-resolution screen. The software was written such that it could be incorporated in a user's program (if the user's program was in BASIC).

The lettering makes the program appear more like a traditional television or videotape production, with the questions, menus and other displays from the computer looking more like electronically generated television titles than computer output. Students who will use the package are unlikely to be familiar with computers, so the less the presentation appears like computer output, the less likely are the users to feel put off by it. The HI-WRITER program was used to make the package more attractive in this way.



The writer (right) explains the operation of LOGGER I

PROGRAMMING THE COMPUTER

In the absence of professional expertise, the programming for the computer was done by the writer. If nothing else, the experience has confirmed the need to employ computing professionals in the development of interactive packages. The programming required to put the original script into practice was far too sophisticated for the writer's limited experience and knowledge of programming. Nevertheless, a lot was learned along the way and the next time the difference between what is possible and what is practical will be in better perspective.

As a result of the inexpert programming, the programs themselves leave a lot to be desired, and should not be considered models for the implementation of interactive video. Print-outs of the programs HELLO and FIELD STUDY (the main program) are included as an appendix to this report.

As pointed out earlier, the UCSD-p system running Pascal is the desired approach to programming of this sort, because of its modular nature, and its ability to allow the transfer of programs developed on one system to other systems. In the present project the use of Pascal had to be abandoned because of lack of expertise in the language. In addition, the BCD board came complete with control programs in BASIC and Apple machine language routines for controlling the videorecorder. The program which provided the large lettering was also available in BASIC, with no known Pascal routine capable of doing the same thing.

In the original script, it was envisaged that the users would have to type their own constructed answers to the questions on the computer keyboard. This approach was abandoned for two reasons: firstly, the type of user at whom the package is aimed is unlikely to have keyboard skills. Requiring them to use the keyboard would introduce an unnecessary extra element into the process of teaching them how to use a 35mm camera. The time they would take entering responses would be significant, and they would no doubt make a number of typing errors. The second reason for abandoning the approach outlined in the script was the difficulty of programming for such techniques - the simple multiple choice questions actually used in the package were in comparison simple to implement and did not take up much memory space on the computer. The advantages and disadvantages of this approach are discussed elsewhere in this report.

An alternative to developing a program from scratch would be the use of an authoring language, which allows non-programmers to develop computer assisted instruction packages easily. Although extensions to Super Pilot (an authoring language for the Apple) to control the videorecorder are available from BCD, these would have cost more, and the use of an authoring language to some extent restricts the range of possibilities available when the programming is able to be done in-house. If this particular package was done again, without expert computing assistance, it might be easier to use an authoring language to implement it. Certainly it would be quicker.

In the general case, organisations which wish to produce interactive packages, and which have video production facilities but no easy access to computing expertise, would be well advised to use an authoring language (with extension to allow for the incorporation of video material in the presentation) to develop their packages.

The BCD extensions will be bought in the future, because besides being extensions to Super Pilot, the routines can also be used with the standard Pascal programs planned for future development (using expert computer programmers!).

The rest of this section contains material which may seem incomprehensible to those readers not familiar with operation of microcomputers. It is included for those who plan to produce their own interactive packages using similar technologies, to help them avoid some of the problems encountered in this project. For those who will not follow the discussion, suffice it to say that some problems were encountered in the development of the computer programs used to operate the interactive package, demonstrating most forcefully the need to have available expert computing services in the development of interactive packages. Nothing will be lost by skipping the rest of this section if computers are still unknown to you.

Once the videotape had been logged using the LOGGER I program supplied by BCD, the rest of the programming of the computer was achieved by merging two programs: one (HI-WRITER, Beagle Bros Micro Software Inc.) to provide large lettering for computer-generated material, and the other (OPSUBS 3.Ø, BCD Associates) to control the functions of the player. The two programs are commercial programs written in BASIC and available for utilization in the purchaser's programs.

Some rewriting was necessary to merge the two programs successfully, and there were a few problems (mainly due to the way in which the Apple II computer utilizes memory, and the non-relocatable nature of the CTL 3.Ø routines needed for the control of the videocassette player). Memory usage proved a difficult problem to solve while at the same time still keeping the package within the limits of a standard 48K Apple II with one disk drive. It is the intention of the writer that the development of packages of this sort should always take account of what the minimum, standard system is for running the package, not what is possible with a "fully-optioned" computer system. Keeping the resources required for the utilization of the package simple will promote the possibility of it being used by those for whom it is intended.

Once the two programs were operating together successfully, other routines were written. One of these makes the package self-booting, on the understanding that users of the package would not necessarily have any knowledge of the way in which computers work, and that someone with such skills would not necessarily be available when the package was in use. Another displays a graphic at the beginning of the package to give the student something to look at (and to assure them that something relevant is happening) while the computer reads all the necessary information from the disk.

MENUS

Within the program itself, menus were developed which are used between the display of video scenes. After the student has responded successfully to any questions posed, the main menu appears. This menu gives the user the choice of either ending the package, continuing, or seeing the previous scene again. Choosing to continue, the student is then asked whether s/he wants to see the next scene. If the answer is yes, the following video scene is played. If the answer is no, the student is then given a choice of randomly accessing any section of video material in the package. This random access function is not given in the main menu because it is hoped the student will follow the path from the beginning of the package to the end (there being a development of skills and knowledge in the earlier parts of the package which are built on as the package progresses). Experience will show if this is in fact the case.

QUESTIONS

The questions posed at the end of each section of video material are simple multiple choice type questions, with four options. Option Ø is always "don't know". A "don't know" response results in the display of a message saying "watch this part of the program again". The part of the package relevant to the particular question being asked is then replayed, and the question asked again. The part of the video program replayed is not necessarily a whole section, just sufficient to provide the user with the correct answer to the question.

The use of a "Don't Know" option is considered important because it provides the user with a non-threatening option if s/he cannot answer the question. The type of skills being taught in this package, the technical operation of a piece of complicated (to new users) equipment, can be just the type of skills that some students find it at first difficult to grasp in the classroom, and some teachers find it difficult to understand that a student cannot follow the simple procedures being demonstrated. The package overcomes the problem by presenting to the student, over and over again if necessary, a demonstration of the appropriate technique. In the privacy of the replay environment, the student can ask to see the technique demonstrated as often as s/he likes, and indeed cannot proceed with the package until the questions asked are answered correctly.

One possible benefit of the private nature of tuition offered by interactive video is the opportunity it provides for teaching students who normally would be insufficiently assertive to indicate that the message is not getting across. With a subject like the use of the 35mm camera, this can be a particular problem with males teaching females. The traditional assertiveness (arrogance?) of and the assumptions made by the male showing female students the correct way of using pieces of technical equipment often cause tensions and create an environment which is not conducive to the effective transmission of information and skills.

If the user enters an incorrect response to the question, a message indicating that the answer was not correct is displayed, and the relevant piece of the video program is replayed. Following the replay the question is posed again.

When a question is answered correctly, a suitable message is displayed on the screen, and the package either goes on to the next question (if there is one) or displays the main menu.

Multiple choice questions were chosen because it was felt unlikely that the sort of students using the package would be proficient in the use of a keyboard. Multiple choice questions require only the use of the number keys on the keyboard, which can be found relatively easily by even the most keyboard-illiterate. All other keys on the keyboard are locked out - pressing an invalid key results in an immediate "beep" from the computer.

The text for the questions and answers is stored on disk as individual text files, which are loaded into memory during the replay of the relevant section of the videotape. The text files are created using a separate program ("INPUT ROUTINE"), and can be edited simply as required. Using the INPUT ROUTINE program limits the types of questions asked to the multiple choice type, which is not a problem in this case as discussed above. It would be a simple matter to change the style of the question asked by changing the relevant subroutine in the main program, but this is for a later revision.

There are a few bugs still with the INPUT ROUTINE program, resulting in the lack of questions in the package as it stands at the moment. It is intended that the problems with this package be ironed out before completing the 35mm Photography package.

A greater problem with the restricted type of question format is the difficulty of asking questions requiring a depth of understanding of the subject. With the limited amount of space available using the system here, where the question cannot be longer than three or four lines, and the alternatives not more than about 25 characters in length, it is difficult to ask the user complicated questions.

Comments from users of this and a subsequent interactive package developed by the writer have revealed that the short questions are not necessarily a restriction. Longer questions requiring the use of standard computer output on the screen have proved unpopular with users, because the screen is difficult to read and unattractive. The message from the users was that the simply presented questions using the large lettering were preferred.

Users of the package are given no instructions on the use of the keyboard. When input is required from the user, the options are displayed and, in some cases, the screen prompts for input. When the questions are presented, no prompt is given, because of lack of room on the screen. In future, an extra routine will be added to provide instructions on keyboard entry requirements if the user enters two successive inappropriate responses to screen prompts or questions. The routine will take the form of a computer generated display explaining what the required input should be, with appropriate examples. The routine will not require mastery of the keyboard for the user to benefit from it, like some interactive video keyboard tutor routines.

The zero (Ø) option will also be removed from the menu listing. Some users of the package have complained that the zero with a slash through it is not necessarily identified as "Ø", and its use could lead to confusion on the part of computer-naive users.

USE OF COLOURS

Within the limits of the colours available on the Apple's high-resolution graphics screen (the HI-WRITER program puts its big characters on the screen using high-resolution graphics), menus and questions are colour-coded. General headings, directions to the user <u>not</u> requiring input to the computer and the message to the user indicating that a question has been answered correctly are in blue. General text (alternatives in a menu or question, for example) are in white, while questions, and the message indicating that an incorrect answer to a question has been entered, are in green. Instructions to the user requiring input from her/him are in orange.

GRAPHICS

No additional material has been added to the videotaped information available to the user: in the implementation so far there is no use of the graphics capability of the computer, and no supplementary text material to add to the video presentation. A look at the original script for the interactive package (included in the appendices to this report) will show how optimistic the writer was at an earlier stage of the development of the project. It is a rich area for expansion in a package such as this one, and the script describes some of the ways in which these capabilities could have been used.

Other particular subjects that could be expanded or supplemented with text and graphics material generated by the computer include the demonstration of the concept of depth of field, especially to those users who find some difficulty understanding the description in the videotape.

Some users have commented that the description of depth of field as provided in the package at the moment could be augmented with an explanation of how depth of field works. Such an explanation can be added to the program later.

There is not the time to implement these additional features at this stage, a problem which reveals in yet more sharp relief the complicated nature of the production of interactive video packages, and the need to take account of the human resources necessary to develop packages fully. Computer programming, instructional design (including questionaire design), media production and subject matter expert skills are all required to produce effective packages.

The sophistication of programming required to implement some of the ideas in the script means that a lot of effort would have been needed to put them into the package. This extra effort may or may not have added all that much to the presentation. Also, the length and format of some of the questions and text display from the computer would have required the use of smaller letters on the screen than those provided by the HI-WRITER program. For reasons outlined elsewhere, this would not be desirable.

The amount of memory required to implement some of the suggested techniques for display and quizzing, and the speed (or more likely lack of speed) at which the computer could implement them, ruled out the more complicated ones before programming could begin. Future scripts will need to reflect the lack of sophisticated programs supporting the use of the BCD board.

OPERATION OF THE PACKAGE

In operation, the package is designed to be simple, straightforward and easy to use. Once the equipment is set up, all a user has to do to run the package is place the disk in the disk drive, the videocassette in the player, and turn on the power. It would be even simpler with a dedicated system - one which only replayed the one package - the disk and the videocassette could be already in, and turned on ready to go. Once the package has ended, it begins again at the touch of any key on the keyboard.

On start-up, the package runs itself through procedures to load the control program for the player and the files necessary for the HI-WRITER program and the location of the relevant scenes on the videotape. The user is then required to press a key on the keyboard to run the package, prompted by a display on the screen.

The first scene is then replayed, and the package continues on to the first segment (see Figure 4).

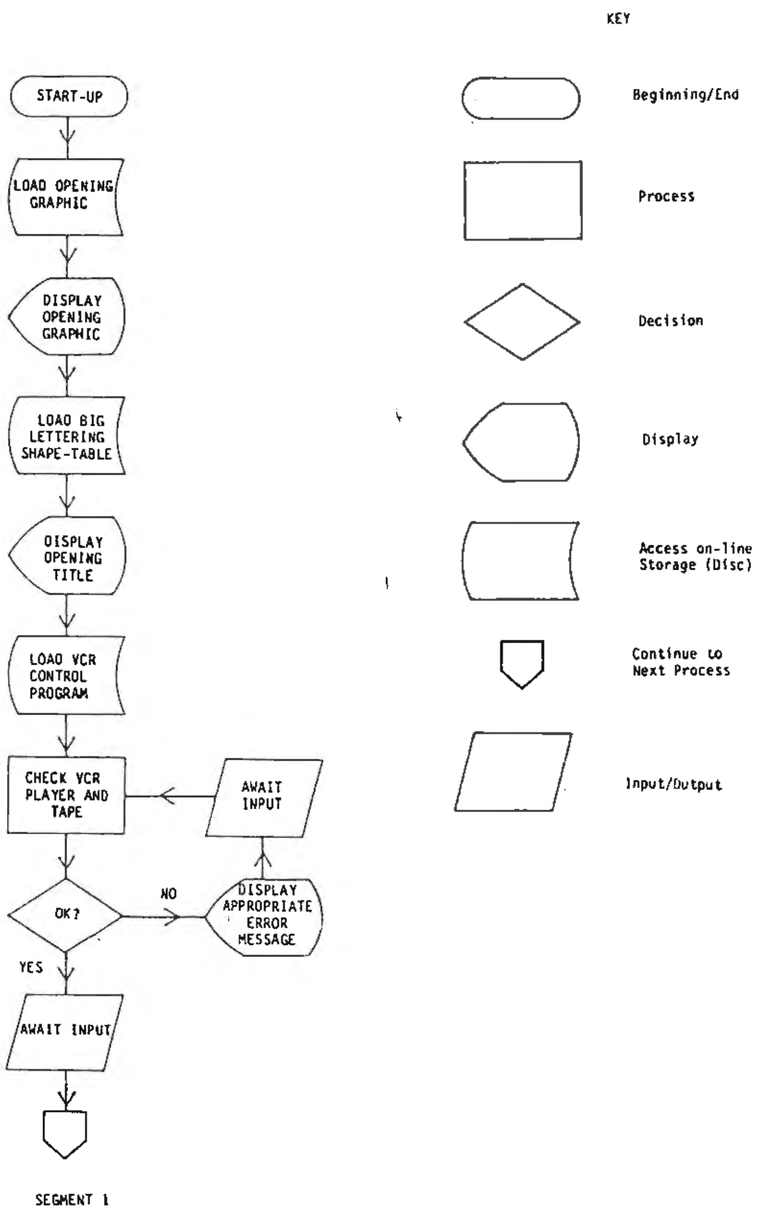


FIGURE 4 : START-UP PROCEDURE

The computer then instructs the videorecorder to play the first scene from the tape (see Figure 5). The structure for the presentation of each segment is exactly the same, so the following description covers all of the segments in the package.

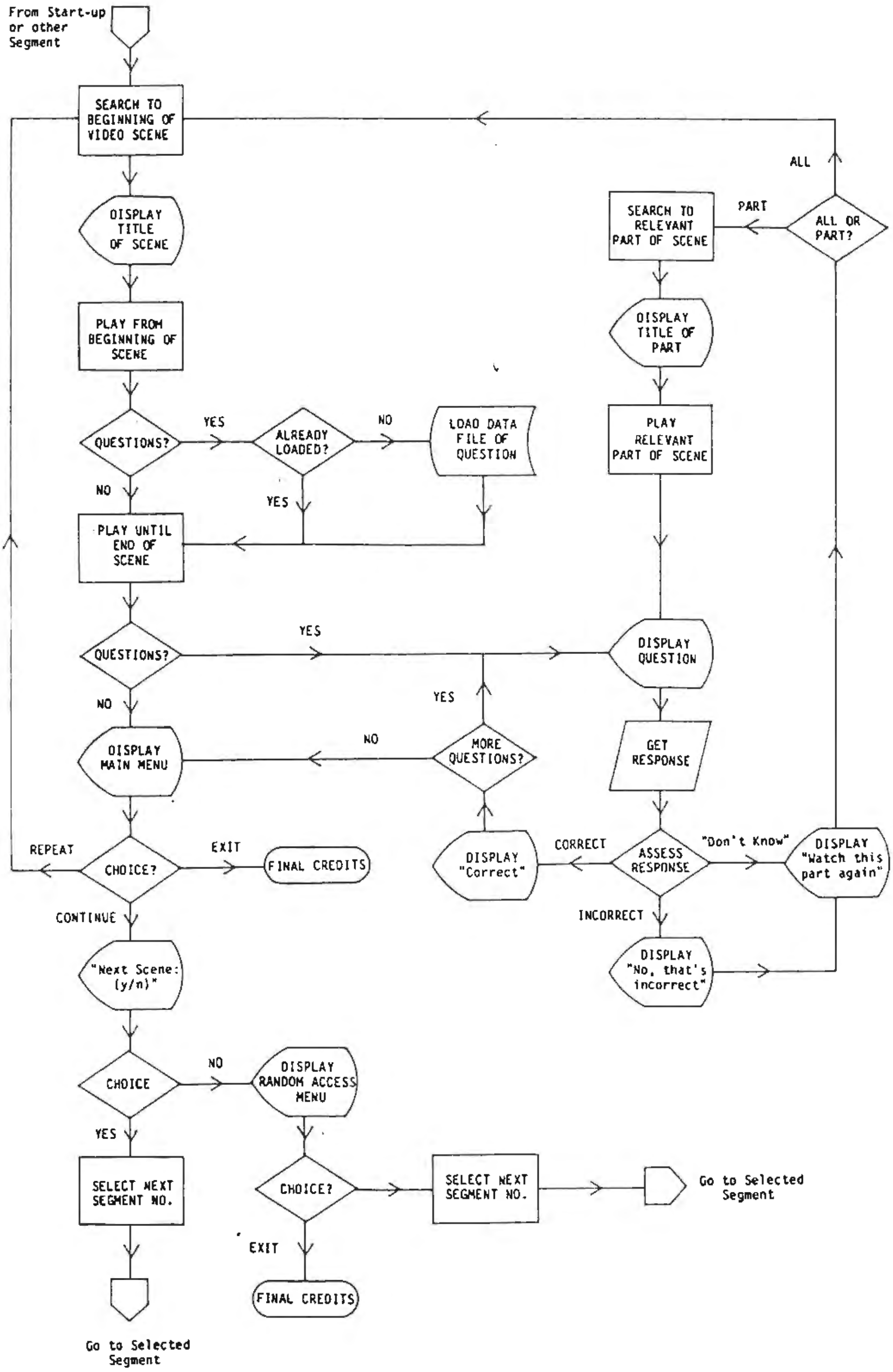


FIGURE 5 : SEGMENT STRUCTURE (COMMON)

Once the relevant scene is found, the computer displays the name of the scene on the screen during the "pre-roll" time - when the videorecorder laces up the tape and plays to the point when the computer cuts to the scene. The graphic is wiped from the high resolution screen as soon as the computer has switched to the image from the videotape, so that when the tape is finished, a new graphic can be put onto the screen without the distraction of seeing the old graphic wiped first.

Once the graphic has been wiped, and while the scene from the videotape is playing, the program checks to see if there are any questions required for display after the scene is completed. If there are questions, the text file with the necessary information is loaded from disk while the videorecorder is still playing.

At the end of the scene the computer stops the player and switches the screen back to computer video, displaying the high resolution screen. If there is a question to be answered, it is displayed and the user's response is awaited. If the response is correct, "correct" is displayed on the screen and the program continues on to the next question, if there is one, or to the main menu.

If the user's answer to the question is incorrect, a message to that effect is shown, and the user is asked to watch a part of the program again. The part then shown will include enough information for the user to answer the question correctly. The scene may be the same scene shown previously, or it may be only a part of it. If the user had used the "Don't know" response, s/he would see the same part of the videotape shown to users who entered an incorrect response.

Upon seeing the scene again, the user is given another opportunity to answer the question, and the cycle continues. Once the question is answered correctly, the main menu, giving the user the options of continuing, ending the lesson, or seeing again the scene s/he has just seen (the whole of the scene), is displayed.

If the "Continue" option is selected, the user is asked whether s/he wants to see the next scene. If the "No" option is selected, s/he is presented with an inner menu, a random access menu which allows the user to select which scene s/he wants to see next. The inner menu also allows the user to finish the presentation.

Responding to the "Continue" question with a "Yes" response results in the next segment in order being shown.

Responding with one of the other options contained in the inner menu would have the obvious result.

Very little input is required from the user, only pressing the occasional key, or entering a response to a question or selecting an option from a menu. Ideally, the user should have a 35mm camera and a few rolls of film available to practice the techniques shown as they are demonstrated. At the end of each segment, the user has the opportunity to replay any part of the presentation for review or clarification.

The presentation finishes when the user selects that option from one of the menus. The computer displays final credits for the production of the package, and then awaits input before repeating the whole package from the replaying of the first scene.

The videotape is structured so that scenes which in the normal course of events would follow on from one another follow each other on the tape, with a sufficient gap to ensure enough pre-roll so that after the player has stopped it need not rewind before lacing up to show the following scene. If the videotape is shown as a linear video program, these gaps appear as titles which introduce the scene coming up, a function taken over by display of computer graphics during pre-roll in the interactive presentation.

Occasionally during the presentation, there may be a wait while the videorecorder shuttles to find the beginning of the scene required for replay. This can be up to about thirty seconds if the required scene is at the other end of the video program (which is about twenty five minutes long). If the user selects an option from the random access, inner menu, or if an answer is incorrect and the player must rewind to the appropriate place to replay a scene, "Please wait ..." is displayed on the screen while the tape is shuttling. Knowing something is happening satisfies the user to some extent, and they appear to accept the wait quite well.

Review

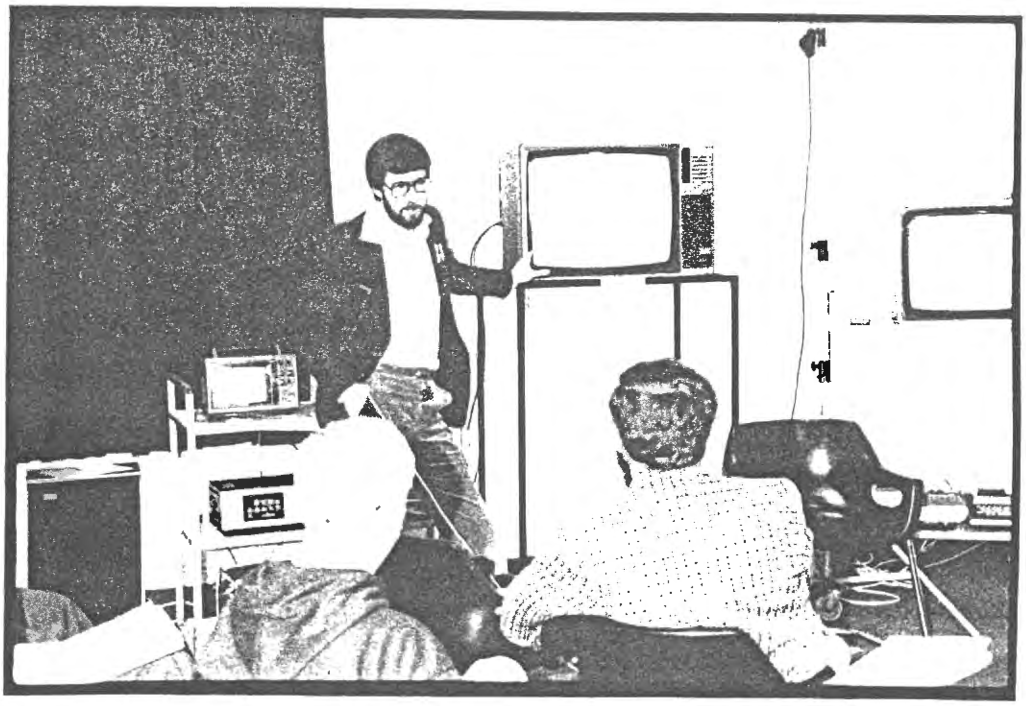
RESPONSE TO THE PACKAGE

The package as it stands at the moment has been received enthusiastically by the media teaching staff at the College. They see it as an effective resource that could be made available for students in the media laboratory, for initial instruction for those students who come into media courses without any experience using 35mm cameras, or for revision for those students who want it. They feel the package to some extent could free them from the necessity to teach very basic skills to those members of their classes who have had no experience of using 35mm cameras. At the moment, these basic skills must be taught to some while others who already have a basic idea of photography are left to wait.

The most public display of the package so far was at an Interactive Video Seminar organised by the IMC. The Seminar was open to all interested parties, and up to 60 people from a number of educational institutions around Canberra came to see demonstrations of various systems during the day.

The systems being demonstrated were the Philips LaserVision System, comprising a Philips LaserVision player controlled by a Philips P2000 microcomputer; the WICAT system operating one of the Smith/Kline Diagnostic Challenges in Gastroenterology series; the Pioneer system, running a number of videodiscs; and the 35mm Photography package, the only videotape-based system demonstrated.

After the demonstrations, comments from media producers in other institutions like the CAE reflected the view that, although videodisc is wonderful, videotape is possible. It appears to take little more resources than these institutions possess now for them to get into the production of interactive video packages using videotape, and so they see it as an area into which possibly they can venture. What they fail to realise is that if linear video packages take a lot of resources to produce, making them interactive takes a lot more.



Explaining the 35mm Photography package at the IMC's Interactive Video Seminar

IMPLEMENTATION

Unfortunately, there is not much likelihood that, in the near future, the 35mm Photography package will be available for the use of students enrolled in media studies courses. The problem for the media laboratory is not with the design of the package (although that is not to say that there are no problems!), but with equipment - the equipment necessary to run the package is not available.

It is possible to provide a working interactive video set-up for a little over $2,000, if a cheap Apple look-alike is used instead of the real Apple. Even if the Apple is used, the $4,000 required then for the necessary gear is not a lot, especially considering the potential savings in staff time that the package represents. However, getting the money for the necessary equipment is harder than organising staff to be available to provide the necessary tuition.

This is always going to be a problem with the development of new media (or any sort of technology in teaching): finding the resources required to implement them. In the case of the media laboratory, there would need to be a dedicated microcomputer and player set-up available to students, although several packages on the use of different sorts of equipment could be available for students to use as and when they like.

EDITING

Special consideration needs to be taken in editing a videotape program which is destined for an interactive package, when the video program is also designed to be used in a linear fashion. What will be the in- and out-points of the interactive scenes must be suitable. It may be only a matter of a personal aesthetic judgement, but cutting in and out of the video scenes from or to the computer display can at times be quite disturbing subconsciously to the user, when these points are tight, when the cut comes almost before the presenter is finished speaking, or before the demonstration is quite over. In the linear video program, the construction of a flow of images and sounds can overcome the problem of tight editing if it is done properly, but tight editing leaves little space for the selection of appropriate scenes for display to the user when the videotape is made interactive.

This may be a problem with the particular method used for switching between the two sources - the video image and the computer output, and may disappear when the two sources can be made synchronous (so that there is no roll of the image when switching between the two). With some videodisc systems, this is possible now.

However, while the present equipment is being used, the editor of the video material may need to leave more space for the in and out points of the scenes to be used for interactive display, ignoring any problems of timing in the video program when it is viewed straight through.

BUGS

There are still some problems with the package, problems which must be corrected before it is completed.

1. The keyboard is not locked out when entry is not required, and touching some keys can make the program appear to "hang", with the screen blank. In fact the computer is only awaiting input - there is a problem with the display routines which needs to be isolated and corrected. The keyboard should be cleared before any input is prompted for.

2. Because of problems with the INPUT ROUTINE program, more questions still need to be added to the package.

3. The package is not handling the last segment correctly. It appears to get into a loop if the user wants to continue the lesson onto the next sequence (it does not exist). To fix it, following the replay of segment 14 (the last one), the program should be changed to display a message to the user that the last segment has been replayed, and then go straight into the inner, random access menu, offering the user the choice of finishing the presentation or going back to any segment.

4. Some of the in- and out-points of the videotape scenes have not been entered accurately during the logging process (see above). These scenes must be re-logged.

There are some other things about the design of the package in its present form which should be refined when the opportunity arises.

1. The package does not reflect the scope of instruction envisaged when the original interactive script was written (see appendix). There are some elements of that script which should be included in the package. These include such things as supplementary information for users who are having difficulty understanding particular points, and the use of the graphics capability of the Apple II computer. As mentioned elsewhere in this report, the skills necessary to implement these additions to the package are beyond those possessed by the writer.

2. There needs to be a short keyboard tutorial presented before the first question is to be answered. The tutorial would consist of instructions on how to enter a response to a question when it is asked. This display should also be shown at any time during the presentation when the user enters more than two illegal responses in a row.

3. In the present program the computer's response to the user's request from the inner menu to continue is to display the message "Next scene (y/n)?". The expected reply is a "Y" or an "N". At no other time in the presentation is the user expected to enter anything other than a number, the space bar or the return key, and observing the difficulties naive keyboard users had seeking out the "Y" or the "N" key in response to the prompt during demonstration of the package convinced the writer that the prompt should be changed to a question similar in style to the other questions, that is in the form

Next scene

1. Yes
2. No

and take either "Y" or "1" as a "yes" response and "N" or "2" as a "no" response.

4. Responses to most prompts are handled by the Applesoft GET command, which takes a single key response and acts on it immediately it is entered on the keyboard without waiting for the RETURN key to be pressed. In the random menu however, because there are more than 9 possibilities to choose from (the user can elect to go to any of the 14 segments of the package), the RETURN key needs to be pressed before any action is taken by the computer. After more field testing it might be necessary, for the sake of consistency, to change all the GETs to statements that require the RETURN key to be pressed.

5. The program now is a woeful mess - it has been changed and patched so much that it needs to be re-ordered (and in some cases rewritten) to tidy it up somewhat. To make it a more useful skeleton for other interactive packages (using different video programs and questions) some of the specific references to the 35mm Photography package should be removed from the main program and fed to it from other files. If this was done the program could be used to control other packages simply by changing the relevant files, rather the rewriting the whole of the program every time a new package is produced.

6. The demonstrations in the video program of loading and unloading the camera need to be redone, and a more understandable explanation of both depth of field and the depth of field guide need to be included.

LIMITATIONS OF THE FIELD STUDY

Briefly, the objectives of the field study were to:

- DESCRIBE the development of an interactive video package,
- DEVELOP a sample script on a suitable topic,
- if possible, PRODUCE the package, and
- EVALUATE the potential of the technology as a teaching tool.

The description of the development, scripting and production of an interactive video package is contained in this report. Evaluation of the potential of interactive video for teaching is, however, another matter.

EVALUATION

If film, video and television now used in teaching are effective methods of instruction, then interactive video has the potential to be better. Certainly it has the potential to teach those lower order skills which require drill and practice or repetitive demonstration better than other media. Evaluation of how effective interactive video can be requires some form (or forms) of investigation beyond the resources and the scope of this study.

The effectiveness of the 35mm Photography package in relation to more traditional methods of instruction could, for example, be shown by organising two "identical" groups of students who had to be taught the use of a 35mm camera. All students would be pre-tested to establish their levels of expertise and to provide a point of comparison for another test to be given to them after they had been exposed to either the traditional method of instruction, or using the interactive package. Comparisons between the groups' changes in scores between the two tests would give a measure of the relative effectiveness of the two methods.

Evaluation of interactive video as a technology poses similar problems to the evaluation of any medium as a technology. Should the content of the presentation be evaluated, or the form? Both need to be considered. Questions such as -

- Will users want to interact with a machine?
- How can this interactivity be managed most effectively? and
- Will the vicarious experience of the interactive presentation transfer to real-life?

are all questions about the form more than the content, whereas questions like -

- How long should each scene in the video presentation be? and
- How much material can be placed on one text or graphic screen produced using the

computer?

are questions which relate more to the content of particular packages. Both the form and the content of interactive video packages will have a bearing on the effectiveness of any individual presentation, and all aspects of production and presentation must be considered when developing packages.

What can be said from observing those who have experienced the 35mm Photography package is that users have learned from it - learned the skills the package was intended to teach. As is the case in the evaluation of any medium of instruction, the complexity of the elements making up an interactive package make the development of appropriate research paradigms exceedingly difficult.

The effectiveness of teaching particular skills using interactive video as opposed to teaching those skills using traditional methods of instruction is only one part of the story. One point in favour of interactive video is its potential cost effectiveness compared with the traditional methods of instruction. If interactive video can be shown, by comparison, to be at worst equally as effective as traditional methods of instruction in teaching particular skills, and if indeed interactive video is found to be cheaper overall than other methods, it must be the preferred choice, all other things being equal. The question of the cost-effectiveness of interactive video as a teaching tool does, however, need careful evaluation, considering the amount of human and technical resources necessary for the production of packages.

OTHER SHORTCOMINGS

Memory management in the Apple is still a problem, reinforcing the need for programmers with more expertise than the writer being involved in the production. However, while staff resources are limited, it is highly unlikely that staff or contract programmers would be available to write the code.

Implementation of the package using the BASIC computer language was necessary in order to produce the package within the resources available. The choice to use the BCD board and large lettering in the displays (not to mention the writer's lack of expertise in computer programming) required that BASIC was the language used. One future area for development is the use of the UCSD-p system and the Pascal programming language to implement future packages: it is unfortunate that the manufacturer does not provide support for using the board when programming in Pascal.

The demonstrations used in the videotape scene should be redone. Although seen as adequate by the IMC photographer and others, they could have been (with more time) done more effectively. This is not a problem so much with the interactive package - more with the production of the video material in the first place. Complicating the production with the interactivity aspect, however, cannot forgive poor video production: if anything, the increased amount of work makes it all the more important for the individual elements to be as good as possible. Compromise is a limitation of any project that involves utilization of expensive resources like video studios and editing equipment, and the amount of time it takes to put it all together leads to further compromise. A comparison of the original script for the interactive package, and the reality of it now, reflects the limitations lack of expertise, experience and time placed upon the project.

Major implementations still to be developed include the use of the graphics capabilities of computers, built-in assessment and record-keeping functions, use of the UCSD-p system and Pascal, provision of supplementary text and graphic material generated by the computer, additional styles of asking for response from the user (for example open-ended questions, use of other input devices such as joysticks, paddles and touchscreen), use of supplementary video material and more control over the presentation for the user.

It is a limitation of the field study that all the work (or most of it - television production of any more than the simplest material requires a number of people to be involved) is done by the one person. The solution? More resources or less ambition! The problem highlights the difficulties of developing uses for new technologies in education - their complexity discourages individual work.

THE FUTURE

As it progressed, the field study was a fair reflection of how an interactive package might have been prepared if it had been a normal project for the IMC, except that, since it was the first time, there were a number of problems that needed to be solved that would not normally be expected to arise.

On a more positive note, interactive video is now possible for people at the Canberra CAE, partly as a result of this field study. One teaching centre at the CAE has obtained the hardware necessary to deliver interactive video packages to students, and is currently developing packages to be used on the system, with the IMC doing the production necessary for their development.

In fact, the IMC has now produced an interactive package using the same set-up used for this field study. This second package was requested as a result of the demonstration on the 35mm Photography package during the IMC's Interactive Video Seminar.

After some advice from the IMC, the script was written by the member of the academic staff who requested that the package be produced. Its production progressed much more quickly than the production of the first package - the programming of the computer took days rather than weeks. The computer program was based on that developed for the 35mm Photography package, but was not as complicated.

Because of the requirements of the person requesting the package, it is more didactic and limited in its presentation - once a user is in the package, the only way to stop it before it is completed is to turn the power off. This approach is to be avoided if possible, in fact, it is the intention of the writer to build into the program the ability to stop the presentation at any time, merely by touching a key on the keyboard.

Once stopped, the user would have the choice of continuing, seeing the scene again, or ending the presentation.

Despite its shortcomings, the 35mm Photography package is workable and impressive. It is a good start for interactive video, and as a result of the experience, future productions will reflect that experience and correct some of the deficiencies contained in the first.

REFERENCES

James J L'Allier "Some Basic Questions About Interactive Video" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 13 no 6 June 1981 p30

Simple practical questions about the production and use of interactive video, and a useful list of elements to be considered when evaluating the various hardware systems available for interactive video

David W Butler "Five Caveats for Videodiscs in Training" INSTRUCTIONAL INNOVATOR vol 26 no 2 February 1981 pp16-18

David R Clark "Requirements for Quality" VIDEODISC NEWSLETTER no 2 October 1983 p2

Clark's articles provides a very clear explanation of the manner in which video programs have to be produced and edited so that the best quality videodiscs can be made from them

Rod Daynes "The Videodisc Interfacing Primer" BYTE vol 7 no 6 June 1982 pp48-59

Learn how to develop interactive videodisc programs - hardware expose, but also includes the program design and production process

Christopher Dede "Educational, Social and Ethical Implications of Technological Innovation" PROGRAMED LEARNING AND EDUCATIONAL TECHNOLOGY vol 18 no 4 November 1981 pp 204-213 LB 1028 .A1 S13

Dede appears to view the future of technology in the classroom through rose-coloured glasses. He does, however, outline some useful distinctions between the role of the teacher and the role of the machine

Louise S Grinstein and Rina J Yarmish "The computer in education: Myth and reality" EDUCATIONAL HORIZONS vol 59 no 4 Summer 1981 pp158-164

Grinstein and Yarmish argue that the computer is not the 'bogey' some would have it to be. Will be an interesting article to read in ten years, in the perspective of the development of the computer in education.

David G Gueulette "Visions of Spectres" ADULT EDUCATION vol 32 no 1 pp37-43, Fall 1981

Gueulette sees new technologies leading to the creation of a government or other central body controlled "super school" which imposes a school for life on the population.

David Hon "Interactive Training in Cardiopulmonary Resuscitation" BYTE vol 7 no 6 June 1982 pp108-138

Good case study of the development of an interactive videodisc solution to the problem of teaching mouth-to-mouth resuscitation and cardiac massage

Diana M. Laurillard "The Potential of Interactive Video" JOURNAL OF EDUCATIONAL TELEVISION vol 8 no 3 1982 pp173-180

Roland Meighan and William Reid "How Will the 'New Technology' Change the Curriculum?" JOURNAL OF CURRICULUM STUDIES vol 14 no 4 pp353-358, 1982

Lana Pipes "What's New in Video" INSTRUCTIONAL INNOVATOR vol 26 no 2 February 1981 pp9-11

Sorel Reisman "What is 'Interactive Video'?" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 13 no 6 June 1981 p29

Potted history of the development of computer and video interface. Short and basic

Leslie Wagner "Educational Media: the new scepticism and need for caution" OPEN LINE no 37 pp5-7, September 1983

> The economics of using media in education will lead eventually to the replacement of teachers with mediated instruction. The task is to make educational media effective.

BIBLIOGRAPHY - INTERACTIVE VIDEO

Over the last two years while researching and writing this report, more articles and other sources of information than are referenced have been read and have contributed to the writer's store of knowledge on the subject of interactive video. Following is a more complete list of source material built up during the study, which may be of interest to some readers.

James J L'Allier "Some Basic Questions About Interactive Video" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 13 no 6 June 1981 p30

> Simple practical questions about the production and use of interactive video, and a useful list of elements to be considered when evaluating the various hardware systems available for interactive video

Ganine Amada "Why Educators Should Take the Interactive Media Plunge" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 15 no 6 June 1983 pp45-46, 56

Kamala Anandam and Dennis Kelly "GEM. Guided Exposure to Microcomputers: An Interactive Video program" ERIC ED205238 April 1981

JJ Andriessen and DJ Kroon "Individualised Learning by Videodisc" EDUCATIONAL TECHNOLOGY vol 20 no 3 pp21-25 March 1980

Association for the Development of Computer-Based Instructional Systems "Mission of the Future" Proceedings of the Annual Convention of the Association for the Development of Computer-Based Instructional Systems . Vol I: General Session Papers and Project Reports (San Diego, California February 27 to March 1, 1979) ERIC ED175447 [For related documents, see IR 007 614-616]

AUDIO VISUAL No 117 Aug 1981

Isaac I Bejar "Videodiscs in Education, Integrating the Computer and Communication Technologies" BYTE vol 7 no 6 June 1982 pp78-1Ø4

Hardware oriented, discussing some of the limitations of interactive systems, and existing hardware solutions

Junius L Bennion "Possible Applications of Optical Video Discs to Individualised Instruction Systems" 14 February 1974 ERIC ED158721

Junius L Bennion and Edward W Schneider "Interactive Video Disc Systems for Education" Paper presented at the Society of Motion Picture and Television Engineers Conference Los Angeles California 3 October 1975 ERIC ED158719 [for related documents see IR ØØ6 175-176]

Robert K Branson and Richard W Foster "Educational Applications Research and Videodisc Technology" JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS vol 8 no 3 pp241-262 1979-198Ø

Alfred Bork "Instruction for the Future - The Computer Video Interface" Paper presented to the Annual Convention of the Association for the Development of Computer-Based Education San Diego California February 27 to March 1 1979 ERIC 175447frame c2Øff

C Victor Bunderson "Instructional Strategies for the Videodisc: The McGraw Hill Disc" JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS vol 8 no 3 pp2Ø7-21Ø 1979-198Ø

Ludwig Braun "Microcomputers and Video Disc Systems: Magic Lamps for Educators?" PEOPLE'S COMPUTERS vol 6 no 4 pp14-15, 47 Jan-Feb(?) 1978 [ERIC ED154839]

David W Butler "Five Caveats for Videodiscs in Training" INSTRUCTIONAL INNOVATOR vol 26 no 2 February 1981 pp16-18

Murdo Cameron "An Interactive Training Environment for Pilots" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 15 no 6 June 1983 pp34-36

David R Clark "Requirements for Quality" VIDEODISC NEWSLETTER no 2 October 1983 p2

Clark's articles provides a very clear explanation of the manner in which video programs have to be produced and edited so that the best quality videodiscs can be made from them

Peter Copeland "CAVIS - From Concept to System" MEDIA IN EDUCATION AND DEVELOPMENT vol 16 no 2 June 1983 pp74-79

PCL Croxton and LM Martin "The Application of Programmed Learning in Higher Education" In eds AJ Bajpai and J Leedham ASPECTS OF EDUCATIONAL TECHNOLOGY IV Pitman London 1970

Dr Thomas R Dargan "Computer Management for a Videodisc Production" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 15 no 6 June 1983 pp37-38

Rod Daynes "The Videodisc Interfacing Primer" BYTE vol 7 no 6 June 1982 pp48-59

Learn how to develop interactive videodisc programs - hardware expose, but also includes the program design and production process

Christopher Dede "Educational, Social and Ethical Implications of Technological Innovation" PROGRAMED LEARNING AND EDUCATIONAL TECHNOLOGY vol 18 no 4 November 1981 pp 204-213 LB 1028 .A1 S13

Dede appears to view the future of technology in the classroom through rose-coloured glasses. He does, however, outline some useful distinctions between the role of the teacher and the role of the machine

"Design and Development of Programs for the Videodisc" JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS vol 9 no 3 pp277-285 198Ø-81

Sandra Devlin "Premastering for an Interactive Videodisc" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 14 no11 November 1982 pp38-39

Devlin gets into the detail of the process of preparation of material for inclusion into a videodisc. Also provides a list of current jargon, called a glossary of terms. Not a very useful article!

John Duke INTERACTIVE VIDEO: IMPLICATIONS FOR EDUCATION AND TRAINING CET Working Paper 22 Council for Educational Technology London 1983

Mainly disc - good sourcebook for technical background information on the different systems, but doesn't really live up to its title.

Lester F Eastwood, Jnr "Motivation and Deterrents to Educational Use of 'Intelligent Videodisc' Systems" JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS vol 7 no 4 pp3Ø3-335 1978-79 [also ERIC ED157516]

EDUCATIONAL AND INDUSTRIAL TELEVISION December 198Ø August 198Ø August 1979 June 1983

ERIC ED 181 887 "A Study of Authoring Alternatives for Training Oriented Videodisks"

Steve Floyd "Designing Interactive Video Programs" TRAINING AND DEVELOPMENT JOURNAL vol 34 no 12 pp73-77 December 198Ø

S and B Floyd HANDBOOK OF INTERACTIVE VIDEO Knowledge Industry Publications, New York 1982

Allen D Glenn and Kent T Kehrberg "The Intelligent Videodisc: An Instructional Tool for the Classroom" EDUCATIONAL TECHNOLOGY vol 21 no 10 October 1981 pp60-63

Robert A Gray "Watch out for Videodiscs in your Future" AUDIOVISUAL INSTRUCTION vol 23 n 9 p19 December 1978

Louise S Grinstein and Rina J Yarmish "The computer in education: Myth and reality" EDUCATIONAL HORIZONS vol 59 no 4 Summer 1981 pp158-164

> Grinstein and Yarmish argue that the computer is not the 'bogey' some would have it to be. Will be an interesting article to read in ten years, in the perspective of the development of the computer in education.

David G Gueulette "Visions of Spectres" ADULT EDUCATION vol 32 no 1 pp37-43, Fall 1981

> Gueulette sees new technologies leading to the creation of a government or other central body controlled "super school" which imposes a school for life on the population.

DH Heuston A COMPARISON BETWEEN THE VIDEOTAPE AND VIDEODISC AS EDUCATIONAL DEVICES New York WICAT INC Inc 1978

Joan Hiraki and Oscar N Garcia "Setting the Stage for the Interactive Classroom of the 1980's" EDUCATIONAL COMPUTER MAGAZINE vol 1 no 1 pp20-22 May-June 1981

John J Hirschbuhl and Robert Seeman "Future Review of CAI and the Coming of Videodisk Technology" 1975 ERIC ED144526

David Hon "Interactive Training in Cardiopulmonary Resuscitation" BYTE vol 7 no 6 June 1982 pp108-138

Good case study of the development of an interactive videodisc solution to the problem of teaching mouth-to-mouth resuscitation and cardiac massage

"How a 'Country Broker' Uses Interactive Video" EDUCATIONAL AND INDUSTRIAL TELEVISION vol15 no 6 June 1983 p87-88

Richard E Ingalls "Intelligent Video Disc as a Major Component of Individualised Instruction" 1977 ERIC ED 154837

INSTRUCTIONAL INNOVATOR "Interactive video programs" (various articles) vol 26 no 2 February 1981 LB 1043 .A1 S2

RR Kadesch "Interactive Computer Learning in Physics" JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS vol 9 no 4 pp291-301 1980-81

Diana M. Laurillard "The Potential of Interactive Video" JOURNAL OF EDUCATIONAL TELEVISION vol 8 no 3 1982 pp173-180

Aimee Dorr Leifer "Teaching with Television and Film" in NL Gage (Editor) THE PSYCHOLOGY OF TEACHING METHODS (NSSE Yearbook 1976) Chicago, University of Chicago Press)

Leifer presents the arguments for the use of film and television in the classroom. The arguments are also valid for consideration of the use of interactive video.

Robert Mager PREPARING INSTRUCTIONAL OBJECTIVES Mager 1962

Roland Meighan and William Reid "How Will the 'New Technology' Change the Curriculum?" JOURNAL OF CURRICULUM STUDIES vol 14 no 4 pp353-358, 1982

Paul F Merrill and Junius L Bennion "Videodisc Technology in Education: The Current Scene" NSPI JOURNAL vol 18 no 9 pp18-19, 22-26 November 1979

Paul F Merrill and C Victor Bunderson "Guidelines for Employing Graphics in a Videodisc Training Delivery System. ISD for Videodisc Training Systems. First Annual Report. Vol III" ERIC ED196413 July 1979

Good on graphics usage for video

Andrew R Molnar "The Intelligent Videodisc and the Learning Society" JOURNAL OF COMPUTER-BASED INSTRUCTION vol 6 no 1 pp11-16 August 1979

Andrew R Molnar "Microcomputers and Videodiscs: Innovations of the Second Kind" TECHNOLOGICAL HORIZONS IN EDUCATION vol 7 no 6 pp58-62 November 1980

Gwen C Nugent and Casey G Stone "Videodisc Instructional Design" EDUCATIONAL TECHNOLOGY vol 20 no 5 pp29-32 May 1980

Eric Parsloe "Interactive Video" MEDIA IN EDUCATION AND DEVELOPMENT vol 16 no 2 June 1983

Roger Pawley "It's Becoming an Interactive World" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 15 no 6 June 1983 pp80-81

Lana Pipes "What's New in Video" INSTRUCTIONAL INNOVATOR vol 26 no 2 February 1981 pp9-11

Sorel Reisman "What is 'Interactive Video'?" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 13 no 6 June 1981 p29

Potted history of the development of computer and video interface. Short and basic

AJ Romiszowski DESIGNING INSTRUCTIONAL SYSTEMS Kogan Page London 1981 LB 1028 .3 R65 1981

Edward W Schneider "Applications of Videodisc Technology to Individualised Instruction" September 1975 ERIC ED158722

Wilbur Schramm "What the Research Says" in W Schramm QUALITY IN INSTRUCTIONAL TELEVISION Honolulu, University of Honolulu Press, 1972

Marc D Schwartz "Integrating CAI and Videotape" CREATIVE COMPUTING vol 6 no 9 pp116-117 September 1980 QA 76 .S129

MB Sousa "Computer Augmented Video Education" EDUCATIONAL TECHNOLOGY vol 19 no 2 pp46-48 February 1979

"Survey Shows Disc Training Works Well for American Bell" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 15 no 6 June 1983 p57

David L Roper et al. "PSI Quantum Mechanics with Optional Lectures on Videocassettes" AMERICAN JOURNAL OF PHYSICS vol 45 no 5 pp476-484 May 1977

Willard Thomas "Interactive Video" INSTRUCTIONAL INNOVATOR vol 26 no 2 February 1981 pp19, 20, 44

Thomas claims that Interactive Video is a new medium, being different from the some of the parts used to make up the system. A producer in the new medium, Thomas talks about the equipment and his experiences

VIDEODISC NEWSLETTER nos. 1 (April 1983) and 2 (October 1983) University of London Audio-Visual Centre and British Universities Film & Video Council

Leslie Wagner "Educational Media: the new scepticism and need for caution" OPEN LINE no 37 pp5-7, September 1983

> The economics of using media in education will lead eventually to the replacement of teachers with mediated instruction. The task is to make educational media effective.

CL Walker "Computer Controlled Videodisc/Videoplayer Systems" JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS vol 8 no 3 pp201-206 1979-1980

"What Trainers Think about Interactive Video" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 15 no 6 June 1983 p82,86

Gene L Wilkinson MEDIA INSTRUCTION: SIXTY YEARS OF RESEARCH (ISBN 0-89240-041-2) AECT Productions 1126 16th Street, NW Washington DC 20036 $US5.95 (Not ordered)

Kenneth W Wood et al. "An Electronics Course Using an Intelligent Video Format. A Progress Report" COMPUTER AND EDUCATION vol 4 no 1 pp59-66 1980

R Kent Wood and Robert D Woolley AN OVERVIEW OF VIDEODISC TECHNOLOGY AND SOME POTENTIAL APPLICATIONS IN THE LIBRARY, INFORMATION, AND INSTRUCTIONAL SCIENCES Information Resources Publication (IR-50) Syracuse University Printing Service NY 1980

Michael Yamplosky "The Next Generation of Interactive Videodiscs" EDUCATIONAL AND INDUSTRIAL TELEVISION vol 15 no 6 June 1983 pp40-44

CONTENTS - APPENDICES

APPENDIX ONE

PACKAGE SCRIPT

APPENDIX ONE : PACKAGE SCRIPT

35 MM PHOTOGRAPHY

INTERACTIVE PACKAGE SCRIPT

JAMES STEELE

March 1983

Unit No. : Ø.1 Source : COMPUTER - GRAPHICS

Segment : INTRODUCTION

Previous Units : -

Following Units : Ø.2, 1.Ø

(On Start-up, computer checks to see if videocassette is in replayer, and rewinds it to zero. If there is no videocassette in the player, program routes to Unit Ø.2 before displaying Unit Ø.1.)

IMAGE

OUTLINE OF THE CAMERA IS DRAWN BY THE COMPUTER ON THE SCREEN. OPENING TITLES DISPLAYED OVER THE CAMERA IMAGE.

SOUND

(COMPUTER GENERATED SOUND IN SYNCH. WITH GRAPHIC)

(When graphic is completed, program advances to Unit 1.Ø.)

. . o O o . .

Unit No. : Ø.2 Source : COMPUTER - TEXT

Segment : INTRODUCTION

Previous Units : Ø.1

Following Units : Ø.1

IMAGE

"PLEASE PLACE THE VIDEOCASSETTE IN THE PLAYER, AND PUSH THE CASSETTE-HOLDER DOWN."

(Program WAITS until CASSETTE IN, then returns to Unit Ø.1.)

. . o O o . .

Unit No. : 1.Ø Source : VIDEOTAPE

Segment : INTRODUCTION

Previous Units : Ø.1

Following Units : Random selection from 1.1 to 1.6

IMAGE

REPLAY VIDEOTAPE SCENE 1

. . o O o . .

Unit No. : 1.1 - 1.6 Source : COMPUTER - GRAPHICS

Segment : INTRODUCTION

Previous Units : 1.Ø

Following Units : 1.7 or 2.Ø

IMAGE

CAMERA OUTLINE IS DRAWN BY COMPUTER - SHOWING ONE PART OF THE CAMERA IN DETAIL (OUTLINE OF ANOTHER COLOUR? SHADING?)

TEXT : What is the name of the highlighted part of the camera?
CASE OF Correct answer TEXT - Right!!!
ANY OTHER RESPONSE - Unit 1.7.

. . o O o . .

Unit No. : 1.7 Source : COMPUTER - TEXT

Segment : INTRODUCTION

Previous Units : 1.1 - 1.6

Following Units : 1.Ø or 2.Ø

IMAGE

TEXT : [INCORRECT RESPONSE GIVEN PREVIOUSLY] is not the highlighted part. Choose the correct answer from those listed below, and enter the letter corresponding to it:

(a) - (e) 5 of VIEWFINDER
LENS
CAMERA BODY
LIGHT METER
DIAPHRAGM
SHUTTER
FILM WINDING MECHANISM
SHUTTER-RELEASE BUTTON

NOT INCLUDING THE RESPONSE GIVEN PREVIOUSLY, BUT INCLUDING THE CORRECT ANSWER.

CASE OF ANOTHER INCORRECT ANSWER, REPLAY UNIT 1.Ø.
CASE OF CORRECT ANSWER, TEXT - Right!, PROCEED TO NEXT UNIT - 2.Ø

. . o O o . .

Unit No. : 2.0 Source : VIDEOTAPE

Segment : LOADING

Previous Units : 1.1 - 1.6

Following Units : 2.1

IMAGE

REPLAY VIDEOTAPE SCENE 2

. . o O o . .

Unit No. : 2.1 Source : COMPUTER - GRAPHICS

Segment : LOADING

Previous Units : 2.Ø

Following Units : 3.Ø

IMAGE

A GRAPHIC DISPLAY OF THE CAMERA, FOLLOWING THE PROCEDURE OF LOADING THE CAMERA THROUGH

THE STUDENT IS ASKED WHAT THE NEXT STEP IS - IF ENTERED ANSWER IS INCORRECT, PROMPTING IS GIVEN. IF ANSWER IS STILL NOT CORRECTLY GIVEN, RETURN TO THE VIDEOTAPED DESCRIPTION OF THE RELEVANT LOADING PROCEDURE

. . o O o . .

Unit No. : 3.Ø Source : VIDEOTAPE

Segment : UNLOADING

Previous Units : 2.1

Following Units : 3.1

IMAGE

VIDEOTAPE SCENE 3

. . o O o . .

Unit No. : 3.1 Source : COMPUTER - GRAPHICS

Segment : UNLOADING

Previous Units : 3.Ø

Following Units : 3.Ø,4.Ø

IMAGE

A GRAPHIC DISPLAY OF THE CAMERA, FOLLOWING THE PROCEDURE OF UNLOADING THE CAMERA THROUGH

THE STUDENT IS ASKED WHAT THE NEXT STEP IS - IF ENTERED ANSWER IS INCORRECT, PROMPTING IS GIVEN. IF ANSWER IS STILL NOT CORRECTLY GIVEN, RETURN TO THE VIDEOTAPED DESCRIPTION OF THE RELEVANT UNLOADING PROCEDURE

. . o O o . .

Unit No. : 4.Ø Source : VIDEOTAPE

Segment : TAKING THE PHOTOGRAPH

Previous Units : 3.1

Following Units : 4.1

IMAGE

VIDEOTAPE SCENE 4

. . o O o . .

Unit No. : 4.1 Source : COMPUTER - GRAPHICS

Segment : TAKING THE PHOTOGRAPH

Previous Units : 4.Ø

Following Units : 5.Ø

IMAGE

THE COMPUTER DRAWS A SCENE USING THE WORLD CO-ORDINATE SYSTEM, AND THE STUNDENT IS ABLE TO REPOSITION THE FRAME AROUND THE SECTION TO THE FRAMING HE OR SHE BELIEVES IS MOST APPROPRIATE FOR THE SCENE.

STUDENT CAN MOVE THE FRAME L(EFT R(IGHT U(P D(OWN C(LOSER OR F(URTHER.

DEPENDING ON THE FINAL POSITION OF THE FRAME, THE COMPUTER ASSESSES THE FRAMING, AND RESPONDS WITH A 'JUDGEMENT' OF THE FRAME CHOSEN. THERE IS NO BRANCHING HERE, THE PACKAGE CONTINUES TO THE NEXT UNIT AFTER THE STUDENT RESPONDS TO A QUESTION 'Do you want to continue the framing exercise, or go onto the next Segment?'

. . o O o . .

Unit No. : 5.Ø Source : VIDEOTAPE

Segment : FOCUS

Previous Units : 4.1

Following Units : 5.1

IMAGE

VIDEOTAPE SCENE 5 - FOCUS

. . o O o . .

Unit No. : 5.1 Source : COMPUTER - GRAPHICS

Segment : FOCUS

Previous Units : 5.Ø

Following Units : 5.2 or 6.Ø/7.Ø

IMAGE

COMPUTER DISPLAYS IMAGE OF CAMERA WITH THE PARTS LETTERED, AND ASKS 'Which is the focus ring? (Enter the letter corresponding to the correct answer)'

IF THE ANSWER IS INCORRECT, ALLOW ANOTHER ATTEMPT, AND THEN BRANCH TO A SUPPLEMENTARY SCENE OF THE VIDEOTAPE, UNIT 5.2 - SCENE 5A, EXPLAINING THE LOCATION OF THE FOCUS RING, AND DEMONSTRATING HOW IT IS USED.

. . o O o . .

Unit No.	: 5.2 Source : VIDEOTAPE
Segment	: FOCUS - SUPPLEMENTARY
Previous Units	: 5.1
Following Units	: 5.1

IMAGE

VIDEOTAPE SECTON 5A - FOCUS (SUPPLEMENTARY)

. . o O o . .

Unit No. : 6.Ø/7.Ø Source : VIDEOTAPE

Segment : EXPOSURE & FILM SPEED

Previous Units : 5.1

Following Units : 6.1

IMAGE

VIDEOTAPE SCENES 6 - EXPOSURE & 7 - FILM SPEED

. . o O o . .

Unit No. : 6.1 Source : COMPUTER - TEXT

Segment : EXPOSURE

Previous Units : 6.Ø/7.Ø

Following Units : 6.2 or 7.1

IMAGE

QUESTION : 'What three things determine the correct setting of the exposure on the camera?'

STUDENTS SHOULD BE ALLOWED A REASONABLE LATTITUDE IN ANSWERING THE QUESTION, EITHER FOLLOWED BY COMMAS, RETURNS, OR SPACES, OR A MIXTURE.

IF, AFTER SEVERAL ATTEMPTS, NONE OR ONLY ONE OF THE ANSWERS IS CORRECT, GO TO UNIT 6.2 FOR EXTRA INFORMATION. IF TWO OR THREE ANSWERS ARE CORRECT FIRST OR SECORD TIME, REINFORCE (SHOWING ALL THREE ANSWERS), AND CONTINUE TO UNIT 7.1.

. . o O o . .

Unit No. : 6.2 Source : VIDEOTAPE

Segment : EXPOSURE

Previous Units : 6.1

Following Units : 6.1

IMAGE

REPLAY VIDEOTAPE SCENE 6B - EXPOSURE
[VIDEOTAPE SCENE 6B EXPLAINS IN A LITTLE MORE DETAIL THE THREE VARIABLES WHICH NEED TO BE CONSIDERED FOR THE CAMERA TO BE SET UP TO EXPOSE CORRECTLY]

. . o O o . .

Unit No. : 7.1 Source : COMPUTER - GRAPHICS

Segment : FILM SPEED

Previous Units : 6.1

Following Units : 7.2 or 7.3

IMAGE

QUESTION: 'Which is the more sensitive film? (A, B, C, OR D?)'

A. 125/ ISO
B. 400/27 ISO
C. 16/ ISO
D. 64/ ISO

IF ANSWER IS CORRECT, REINFORCE AND GO ON TO UNIT 7.3

. . o O o . .

Unit No. : 7.2 Source : COMPUTER - TEXT

Segment : FILM SPEED

Previous Units : 7.1

Following Units : 7.1

IMAGE

TEXT SCREEN EXPLAINING THE NATURE OF FILM SPEED, AND THE RATING NUMBERS

RETURN TO 23 WHEN INDICATED BY STUDENT ('Press any key to continue')

. . o O o . .

Unit No. : 7.3 Source : COMPUTER - TEXT

Segment : FILM SPEED

Previous Units : 7.1

Following Units : 7.4 or 7.5

IMAGE

QUESTION: 'What type of film would you choose if fine detail was important?'

CORRECT ANSWERS: 'Fine grain', 'low speed', 'low ISO', 'slow', 'slower': disregard 'film' in the answer.

IF THE ANSWER IS GIVEN AS A NUMBER (WITH OR WITHOUT '/' OR ISO IN THE ANSWER), RESTATE THE QUESTION THUS: 'You have entered a film speed rating, but what type of film is good for capturing fine detail?'

ANSWERS THE SAME AS ABOVE.

IF THE ANSWER IS INCORRECT, GO TO UNIT 7.4

. . o O o . .

Unit No. : 7.4 Source : COMPUTER - TEXT

Segment : FILM SPEED

Previous Units : 7.3

Following Units : 7.3

IMAGE

TEXT: 'The film speed rating lets us know how much light will need to fall onto the film to expose it correctly. A film with a high speed rating, say ISO 400/27[CHECK], requires less light to record a good image than film rated at ISO 25/16 [CHECK]. The 400/27 film is more light-sensitive or 'faster' than the 'slower' 25/16 film.

'Film is composed on an emulsion containing silver halide crystals on a flexible plastic base. It is the silver halide crystals in the emulsion which are responsible for the film's light sensitivity. The size of these crystals is one factor which determines the speed of the film - the bigger the crystals, the faster the film. Unfortunately, along with greater speed, bigger crystals also mean poorer, 'grainy' images, lacking in fine detail. If fine detail is important, low speed fine is better, but where lighting is a problem, fast film may be a better choice.'

RETURN TO UNIT 7.3

. . o O o . .

Unit No. : 7.5 Source : COMPUTER - TEXT

Segment : FILM SPEED

Previous Units : 7.3

Following Units : 7.4 or 7.6

IMAGE

QUESTION: 'Why use fast film?'

CORRECT ANSWERS: 'Low light', 'poor light', 'more light sensitive', 'problem with light': CORRECT ANSWER, GO TO UNIT 7.6

IF INCORRECT ANSWER GIVEN : GO TO UNIT 7.4

. . o O o . .

Unit No. : 7.6 Source : COMPUTER - TEXT

Segment : FILM SPEED

Previous Units : 7.5

Following Units : 7.7 or 8.Ø

IMAGE

QUESTION : 'How is the camera adjusted to the correct film speed?'

CORRECT ANSWER : A VERSION OF 'Adjust the film speed indicator so that the number corresponding to the correct film speed rating appears in the window.'

IF ANSWER INCORRECT, GO TO UNIT 7.7. OTHERWISE, UNIT 8.Ø

. . o O o . .

Unit No. : 7.7 Source : COMPUTER - TEXT

Segment : FILM SPEED

Previous Units : 7.6

Following Units : 7.6

IMAGE

TEXT : 'The speed rating of the film you are using is printed on the box it came in. You need to know the speed rating of the film you are using to set the light meter on the camera. To adjust the film speed indicator, lift the ring around the shutter speed dial and turn it until the number corresponding to the speed of the film appears in the slot. Let the ring go - it will snap back into place. It's a good idea to set the film speed indicator at the time you load the film, otherwise you may forget to alter it before taking your photographs.

RETURN TO UNIT 7.6 WHEN INDICATED BY STUDENT.

. . o O o . .

Unit No. : 8.Ø Source : VIDEOTAPE

Segment : SHUTTER SPEED AND APERTURE

Previous Units : 7.6

Following Units : 8.1

IMAGE

VIDEOTAPE SCENE 8 - SHUTTER SPEED AND APERTURE

. . o O o . .

Unit No. : 8.1 Source : COMPUTER - GRAPHICS

Segment : SHUTTER SPEED AND APERTURE

Previous Units : 8.Ø

Following Units : 8.2 or 8.3 or 8.4

IMAGE

DIAGRAM OF DIAPHRAGMS OPEN AT VARIOUS f STOPS - WITH f NUMBERS APPERAING BESIDE EACH DIAPHRAGM.

QUESTION: Which of the apertures above would let in the most light? (Enter the appropriate f number).

CORRECT ANSWER: WHICH EVER IS CORRECT, IGNORING 'f' IF ENTERED. GO TO UNIT 8.4.

INCORRECT ANSWER: IF ANSWER < CORRECT ANSWER, GO TO UNIT 8.2. IF ANSWER > CORRECT ANSWER, GO TO UNIT 8.3.

. . o O o . .

Unit No. : 8.2 Source : COMPUTER - TEXT

Segment : SHUTTER SPEED & APERTURE

Previous Units : 8.1

Following Units : 8.1

IMAGE

TEXT: Not an available option: 'f' numbers are a standard set of numbers usually starting around f 1.4 and including f 2, f 2.8, f 4, f 5.6, f 8, f 11, f 16 and f 22. Some higher and lower values are sometimes used, but the values above are the usual ones.

Press any key to continue.

RETURN TO UNIT 8.1

. . o O o . .

Unit No. : 8.3 Source : COMPUTER - TEXT

Segment : SHUTTER SPEED & APERTURE

Previous Units : 8.1

Following Units : 8.1

IMAGE

TEXT: 'f' numbers are a scale of numbers which refer to the size of the aperture created by the diaphragm in the lens. The smaller the number, the larger the aperture. 'f' numbers are a standard set of numbers usually starting around f 1.4 and including f 2, f 2.8, f 4, f 5.6, f 8, f 11, f 16 and f 22. Some higher and lower values are sometimes used, but the values above are the usual ones.

Press any key to continue.

RETURN TO UNIT 8.1

. . o O o . .

Unit No. : 8.4 Source : COMPUTER - GRAPHICS

Segment : SHUTTER SPEED AND APERTURE

Previous Units : 8.1

Following Units : 8.5 or 9.Ø

IMAGE

DIAGRAM OF CAMERA, WITH SHUTTER SPEED DIAL AND APERTURE RING HIGHLIGHTED. PARTS OF THE CAMERA ARE LETTERED.

TEXT: Enter the letter corresponding to (a) the shutter speed dial, and (b) the diaphragm ring.

The shutter epeed dial?

The diaphragm (or aperture) ring?

IF THE ANSWER TO EITHER IS (OR BOTH ARE) INCORRECT, AFTER BOTH QUESTIONS HAVE BEEN ANSWERED, GO TO UNIT 8.5

. . o O o . .

Unit No. : 8.5 Source : VIDEOTAPE

Segment : SHUTTER SPEED & APERTURE

Previous Units : 8.4

Following Units : 8.4

IMAGE

REPLAY VIDEOTAPE SCENE 8A - SHUTTER SPEED AND APERTURE

RETURN TO UNIT 8.4

. . o O o . .

Unit No. : 9.Ø Source : VIDEOTAPE

Segment : LIGHT METER

Previous Units : 8.4

Following Units : 9.1

IMAGE

REPLAY VIDEOTAPE SCENE 9

. . o O o . .

Unit No. : 9.1 Source : COMPUTER - GRAPHICS

Segment : LIGHT METER

Previous Units : 9.Ø

Following Units : 9.2, 9.3 or 1Ø.Ø

IMAGE

VIEW THROUGH THE VIEWFINDER, NO PICTURE, BUT LIGHT METER NEEDLE IS SEEN ON THE RIGHT. NEEDLE IS TOWARDS THE NEGATIVE SIGN.

TEXT: Assuming you were setting up to take a picture, what would a light meter reading like the one above signify?

CORRECT ANSWER: 'Too little light', 'not enough light', 'more light needed', 'more light', 'check the battery'

GO TO UNIT 1Ø.Ø

ALSO ACCEPT 'Take the lens cap off' or 'remove lenscap'

GO TO UNIT 9.2

INCORRECT ANSWER, GO TO UNIT 9.3

. . o O o . .

Unit No. : 9.2 Source : COMPUTER - TEXT

Segment : LIGHT METER

Previous Units : 9.1

Following Units : 9.1

IMAGE

TEXT: When the needle is below the gap in the jaws, towards the minus sign, not enough light will reach the film if the shot is taken with those settings of the shutter speed and aperture, underexposing the photograph.

If the needle is above the gap, on the plus side, too much light would reach the film, overexposing the photograph.

RETURN TO UNIT 9.1

. . o O o . .

Unit No. : 9.3 Source : COMPUTER - TEXT

Segment : LIGHT METER

Previous Units : 9.1

Following Units : 9.1

IMAGE

TEXT : Very smart! Okay, assume there is a scene in the viewfinder, and answer the question.

WAIT SUFFICIENT TIME FOR THE MESSAGE TO BE READ, AND RETURN TO UNIT 9.1

. . o O o . .

Unit No. : 1Ø.Ø Source : VIDEOTAPE

Segment : EXPOSURE SETTING

Previous Units : 9.1

Following Units : 1Ø.1

IMAGE

REPLAY VIDEOTAPE SCENE 1Ø

. . o O o . .

Unit No. : 1Ø.1 Source : COMPUTER - TEXT

Segment : EXPOSURE SETTING

Previous Units : 1Ø.Ø

Following Units : 1Ø.2 or 11.Ø

IMAGE

TEXT : Which combinations of shutter speed and aperture presented are equivalent? (Enter 'y' for yes, 'n' for no)
A LIST FOLLOWS, PRESENTED ONE BY ONE. IF THE CORRECT ANSWER IS GIVEN, THE STUDENT IS TOLD SO, AND Segment GOES ON UNTIL FIVE CORRECT ANSWERS IN A ROW ARE GIVEN, THEN GO TO UNIT 11.Ø. IF THREE CONSECUTIVE INCORRECT ANSWERS ARE GIVEN, GO TO UNIT 1Ø.2.

. . o O o . .

Unit No. : 1Ø.2 Source : COMPUTER - TEXT

Segment : EXPOSURE SETTING

Previous Units : 1Ø.1

Following Units : 1Ø.1

IMAGE

TEXT : A number of combinations of aperture and shutter speed may be possible in any given situation. For example, if the needle indicates that a correct exposure for a particular shot is a shutter speed of one one hundred and twenty fifth of a second and an aperture of f 8, then a shutter speed of one sixtieth of a second with an aperture of f 11 would also give a correct exposure.

A shutter speed of one sixtieth of a second lets in twice as much light as a shutter speed of one one hundred and twenty fifth of a second - the shutter is open for twice as long.

An aperture of f 11 lets in half as much light as an aperture of f 8 the diaphragm closes the aperture down to half the size and so only half the amount of light can get through.

Press any key to continue

RETURN TO UNIT 1Ø.1

. . o O o . .

Unit No. : 11.Ø Source : VIDEOTAPE

Segment : DEPTH OF FIELD

Previous Units : 1Ø.1

Following Units : 11.1

IMAGE

REPLAY VIDEOTAPE SCENE 11

. . o O o . .

Unit No. : 11.1 Source : COMPUTER - TEXT

Segment : DEPTH OF FIELD

Previous Units : 11.Ø

Following Units : 11.2 or 12.Ø

IMAGE

TEXT : At what aperture would you expect to have a greater depth of field? (enter the appropriate number).

A SERIES OF PAIRS OF APERTURES ARE PRESENTED, AND THE STUDENT MUST CHOOSE THE APPROPRIATE ANSWER. AFTER FIVE CORRECT ANSWERS IN A ROW, CONTINUE TO UNIT 12.Ø. IF THREE INCORRECT ANSWERS IN A ROW ARE GIVEN, GO TO UNIT 11.2.

. . o O o . .

Unit No. : 11.2 Source : COMPUTER - TEXT

Segment : DEPTH OF FIELD

Previous Units : 11.1

Following Units : 11.1

IMAGE

SECTION 11 - DEPTH OF FIELD

TEXT : The size of the aperture will effect the depth of field - the distance from the lens over which the photograph will be in focus.

Depth of field at wide apertures, say around f 2, is narrow, but closing down the aperture will deepen the depth of field.

Press any key to continue.

RETURN TO UNIT 11.1

. . o O o . .

Unit No. : 12.Ø Source : VIDEOTAPE

Segment : TAKING THE SHOT (Segment)

Previous Units : 11.1

Following Units : 12.1

IMAGE

REPLAY VIDEOTAPE SCENE 12

. . o O o . .

Unit No. : 12.1 Source : COMPUTER - TEXT

Segment : TAKING THE SHOT (Segment)

Previous Units : 12.Ø

Following Units : 12.1 or 13.Ø/14.Ø

IMAGE

TEXT : Choose from the list below, the first step in setting up the camera to take a photograph. (Enter the letter corresponding to your choice).

a. set exposure
b. set aperture
c. frame
d. focus

CORRECT Segment : c, d, a, b OR c, d, b, a.

ANSWERS ARE PROMTED, IF ANSWER IS INCORRECT, ANOTHER ATTEMPT IS ALLOWED. TWO ATTEMPTS INCORRECT - GO TO UNIT 12.Ø.

WHEN ALL ANSWERS CORRECT, ASK : What else should be done?

CORRECT ANSWER : 'Wind on the film', 'Check the film is wound on' or equivalent.
IF THE CORRECT ANSWER IS NOT GIVEN, GO TO UNIT 12.Ø, AND RETURN TO THE QUESTION.

. . o O o . .

Unit No. : 13.Ø/14.Ø Source : VIDEOTAPE

Segment : COMMON ERRORS & FINAL SUMMARY

Previous Units : 12.1

Following Units : -

IMAGE

REPLAY VIDEOTAPE SCENES 13 & 14

. . o O o . .

APPENDIX TWO

VIDEO SCRIPT

APPENDIX TWO : VIDEO SCRIPT

35 MM PHOTOGRAPHY

VIDEO SCRIPT

JAMES STEELE

1 JUNE 1983

SECTION 1 - PARTS OF THE CAMERA

MLS PRESENTER AGAINST BACKGROUND PAPER, HAS PENTAX K1ØØØ IN HAND

SUPER TITLES (UNDERLINED IN SCRIPT) AS THE APPROPRIATE PARTS ARE MENTIONED)

1.1 Every film camera is basically the same - a light-tight box with a lens in one side and light sensitive film at the other end.

1.2 Cameras also have

GRAPHIC, SUPER TITLES

. a viewfinder, the system for 'aiming' the camera;

. the diaphragm, a device in the lens which controls the size of the aperture through which light in the lens passes;

. the shutter, another light-control device which opens and closes to expose the film in the camera to light for a measured length of time;

. a focus control, on the lens, which allows the operator to focus on objects at varying distances from the lens;

. a film winding mechanism to advance the film for exposure; and

. in most modern cameras, a light meter, to measure the amount of light available in the scene.

SECTION 2 - LOADING

MS PRESENTER

2.1 Single Lens Reflex, or SLR, cameras are different from other types of cameras because the viewfinder uses the picture-taking lens to view the subject.

GRAPHIC

2.2 Using a system of mirrors to compose the shot and set the focus, you see what the camera sees. When you take the photograph, the mirror folds up out of the way, and the shutter opens, exposing the film.

MS PRESENTER DEMONSTRATES

2.3 SLR cameras are easy to use, once a few basic procedures have been mastered.

2.4 The first step is to put the film in the camera - to load it.

2.5 You should practice this procedure with a roll of junked film until you are satisfied that you can load the camera properly.

2.6 Brands other than the Pentax used in this program may be loaded differently, but the procedure will be substantially the same. The manual which comes with the camera will explain how your camera is operated.

CU RELEVANT ACTION

2.7 Open the camera by pulling up on the rewind knob, until the back cover snaps open. Place the film cassette, flat end up, in the cassette chamber, under the rewind knob. Push the rewind knob down again to hold the cassette in place.

2.8 Pull enough film out of the cassette to reach the take-up spool on the right, plus a bit to poke through the take-up spool. Fold about a centimetre (half an inch) of the film at the end back, and put the folded portion into the slot on the take-up spool.

2.9 With the back of the camera still open, wind the film onto the take-up spool by operating the film advance lever a couple of times to check that the film is taking up properly, and that the perforations on both sides of the film engage their sprockets.

2.10 You must press the shutter release button after each operation of the film advance lever, otherwise the film won't wind on.

2.11 Once you're satisfied everything is in order, close the back of the camera firmly. Gently turn the rewind knob clockwise about one-eighth of a turn to take up any slack in the film. You will begin to feel a slight resistance when the film is tight enough.

2.12 Watching the rewind knob, operate the film advance lever again to make sure the film is being wound on. The rewind knob should turn anti-clockwise as the film is being advanced.

2.13 Release the shutter and wind on more film until the counter reads 'one'. Remember to release the shutter after every operation of the film advance lever.

MS PRESENTER

2.14 You cannot use the film at the beginning of a roll of film, because it would have been fogged by light when the back of the camera was still open: winding on a couple more times after the back of the camera has been closed makes sure that the fogged film is not used.

SECTION 3 - UNLOADING

3.1 The camera is now ready to use, but before we go on to the setting of the controls on the camera, I'll show you how to unload the camera.

3.2 Normally, you will know when you're finished a roll of film, when the film advance lever no longer operates. Even releasing the shutter makes no difference -

the film has been wound completely out of the cassette, and will not be advanced further because the end of the film is taped to the inside of the cassette. The film counter will read 12, 20 or 36, depending on the number of exposures available on the roll of film you put into the camera.

3.3 Do not open the back of the camera - you will waste your roll of film immediately if you do. The film must be wound back into the light-tight cassette before opening the camera.

CU RELEVANT DETAILS

3.4 On the bottom of the camera is the rewind button. Press the button in (it should stay in by itself), and wind the film back into the cassette using the crank handle which holds out of the top rewind knob.

3.5 Rewind the film until you feel a slight lessening of the tension, indicating that the film has come off the take-up spool, and is fully rewound. If you're not sure that the film is fully rewound, a couple of extra winds won't hurt.

3.6 Now you can open the back of the camera with safety, although it isn't advisable to do so in bright sunlight. Pull the rewind knob up,and take out the film cassette. Put the cassette into its container ready for processing.

MCU PRESENTER

3.7 Practise the techniques of loading and unloading the camera until you feel satisfied that you can do it properly.

SECTION 4 - TAKING THE PHOTOGRAPH

MS PRESENTER

4.1 Although the camera may at first seem quite complicated, the process of taking a photograph is quite simple.

4.2 Looking through the viewfinder, you point the camera at the subject, compose the shot, focus, set the exposure and take the photograph.

INSERT VIDEO MOCK-UP OF LOOKING THROUGH VIEWFINDER

4.3 On the SLR camera, the viewfinder shows you what the film will see when the shutter is opened. Frame your subject in the viewfinder to include what you want to include, and leave out the rest.

4.4 It's a matter of personal choice how you frame the shot - look carefully at the subject through the viewfinder to make sure the shot is composed the way you want it.

SECTION 5 - FOCUS

MS PRESENTER

5.1 Focus is controlled by the focus ring on the lens. For convenience, most lenses have focus distances marked in both feet and metres. The focus is set by rotating the focus ring until the figure representing the distance of the subject from the lens is opposite the indicator mark.

CU APPROPRIATE DETAIL, EFFECT OF SPLIT IMAGE

5.2 Most cameras have some aid to set the focus. The Pentax has a 'split-image' system. To set the focus, look through the viewfinder and rotate the focus ring until the 'split' image of the subject comes together.

5.3 The microprism is another aid to focus. Rotate the focus ring on the lens until the area in the centre of the viewfinder becomes clear.

SECTION 6 - EXPOSURE

MCU PRESENTER

6.1 Now that the shot is composed and the focus is set, the next step is to set the exposure controls - the aperture of the lens and the shutter speed.

6.2 The correct exposure in any given situation is determined by:

GRAPHIC

. the shutter speed,

. the aperture of the lens, and

. the 'speed', or sensitivity, of the film.

SECTION 7 - FILM SPEED

MCU PRESENTER

7.1 Some films are more sensitive to light than others - film sensitivity is indicated by its speed rating. A film's speed is indicated by its ISO rating, a combination of two older ratings called the ASA rating and the DIN rating.

7.2 The film speed rating lets us know how much light will need to fall onto the film to expose it correctly. A film with a high speed rating, say ISO 400/27[CHECK], requires less light to record a good image than film rated at ISO 25/16 [CHECK]. The 400/27 film is more light-sensitive or 'faster' than the 'slower' 25/16 film.

GRAPHICS

7.3 Film is composed on an emulsion containing silver halide crystals on a flexible plastic base. It is the silver halide crystals in the emulsion which are responsible for the film's light sensitivity. The size of these crystals is one factor which determines the speed of the film - the bigger the crystals, the faster the film.

Unfortunately, along with greater speed, bigger crystals also mean poorer, 'grainy' images, lacking in fine detail. If fine detail is important, low speed film is better, but where lighting is a problem, fast film may be a better choice.

MS PRESENTER WITH BOX OF FILM

CU's AS APPROPRIATE

7.4 The speed rating of the film you are using is printed on the box it came in. You need to know the speed rating of the film you are using to set the light meter on the camera. To adjust the film speed indicator, lift the ring around the shutter speed dial and turn it until the number corresponding to the speed of the film appears in the slot. Let the ring go - it will snap back into place. It's a good idea to set the film speed indicator at the time you load the film, otherwise you may forget to alter it before taking your photographs.

SECTION 8 - SHUTTER SPEED & APERTURE

MCU PRESENTER

8.1 The two things which control the amount of light reaching the film are the shutter speed and the aperture of the diaphragm in the lens.

GRAPHICS AS APPROPRIATE

8.2 The shutter speed is the length of time the shutter remains open, exposing the film to the light coming in through the lens. The longer the shutter remains open, the more light strikes the film.

CU SHUTTER SPEED DIAL

8.3 The shutter speed is set by rotating the shutter speed dial until the chosen speed is opposite the indicator. The numbers on the dial represent fractions of a second, so '500' means one five-hundredth of a second; '60' means one sixtieth of a second, and so on. If you select the 'B' setting, the shutter will remain open for as long as you keep your finger pressed on the shutter release button.

MS PRESENTER, WITH CU's AS APPROPRIATE

8.4 The size of the aperture is controlled by the diaphragm in the lens. The diaphragm can be closed down to restrict the amount of light coming through the lens, or opened up to allow more light in.

8.5 The aperture is set using the aperture ring on the lens. The aperture ring is marked in f-stops - a set of standard aperture sizes. f-stops usually range from around f 2 to f 16 or f 22, with standard f-stops in between.

GRAPHICS

8.6 The smaller numbers, like f 2, f 2.8, f 4 and so on represent the wider apertures, which let more light through. f 16 and f 22 are at the other end of the scale - small openings, less light. The larger the number, the smaller the hole.

8.7 The f scale is such that, as you go up the scale from f 2 to f 22, at each successive f number, the aperture lets in exactly half the amount of light let in by the preceding f stop. f 2.8 lets in half as much light as f 2, f 8 half as much as f 5.6, f 11 twice as much as f 16, and so on.

MCU PRESENTER

8.8 Combining the use of the shutter speed and the aperture size, the amount of light striking the film can be controlled to provide a suitable exposure.

SECTION 9 - LIGHT METER

MS PRESENTER

9.1 You can measure the amount of light in a scene using the light meter. The Pentax has a light meter built into the camera, run by a battery located behind a cover on the bottom of the camera. To turn the meter on, remove the lens cap.

CU's AS APPROPRIATE

9.2 With other cameras, the meter is turned on using a switch, or in some cases by moving the film advance lever slightly, away from the body of the camera.

EFFECT WITH VIEWFINDER MASK

9.3 In the camera viewfinder, there is an indicator needle - connected to the light meter, the aperture ring and the shutter speed dial. Moving the aperture ring or the shutter speed dial will move the needle. When the needle is between the jaws on the right of the viewfinder, the settings of the aperture and the shutter speed will allow the correct amount of light to strike the film during exposure.

9.4 When the needle is below the gap in the jaws, towards the minus sign, not enough light will reach the film if the shot is taken with those settings of the shutter speed and aperture, underexposing the photograph.

9.5 If the needle is above the gap, on the plus side, too much light would reach the film, overexposing the photograph.

9.6 If by moving both the shutter speed dial and the aperture ring you cannot bring the needle into the gap between the jaws, there may be too much or too little light available in the scene for a correct exposure to be made.

9.7 The light meter measures the amount of light in a scene - light which may be evenly spread throughout the scene, such as on a cloudy day, or there may be areas of bright light and areas of shadow in the scene if it is a bright and sunny day.

9.8 Even light presents no real problem for the light meter, but when the scene is unevenly lit, the exposure suggested by the meter may result in a photograph which is overexposed in the bright areas and underexposed in the dark areas.

9.9 If this is the case, take the camera close to the subject in the scene which you want to be correctly exposed. Set the exposure on that subject, and leave it there while you recompose the shot and take the photograph.

SECTION 10 - EXPOSURE SETTING

MCU PRESENTER

10.1 A number of combinations of aperture and shutter speed may be possible in any given situation. For example, if the needle indicates that a correct exposure for a particular shot is a shutter speed of one one hundred and twenty fifth of a second and an aperture of f 8, then a shutter speed of one sixtieth of a second with an aperture of f 11 would also give a correct exposure.

1Ø.2 A shutter speed of one sixtieth of a second lets in twice as much light as a shutter speed of one one hundred and twenty fifth of a second - the shutter is open for twice as long.

1Ø.3 An aperture of f 11 lets in half as much light as an aperture of f 8 the diaphragm closes the aperture down to half the size and so only half the amount of light can get through.

1Ø.4 The choice of which particular combination you choose to take the photograph depends on a number of factors.

STILLS AS REQUIRED

1Ø.5 For example, a slow shutter speed may result in a blurred photograph if the camera or the subject moves while the shutter is open. A fast shutter speed will freeze the action.

10.6 A slow shutter speed may be desirable if a blurring effect is what you want. Select the shutter speed best suited to the situation.

SECTION 11 - DEPTH OF FIELD

MCU PRESENTER

11.1 The size of the aperture will effect the depth of field - the distance from the lens over which the photograph will be in focus.

GRAPHICS AND STILLS

11.2 Depth of field at wide apertures, say around f 2, is narrow, but closing down the aperture will deepen the depth of field.

11.3 You can use this effect when separating an object from those in front of or behind it. Notice how the face stands out in the crowd - using an aperture of f 2 with the focus set on the face, the area in front of and behind it is out of focus.

11.4 The same shot, taken with the aperture set at f 16 (with a greater depth of field) does not have the same effect.

MCU PRESENTER

11.5 Normally, the diaphragm is in the fully open position until the shutter release button is pressed. Looking through the viewfinder to set up the shot, you see the brightest image, and can adjust the focus exactly. But you cannot see the extent of the depth of field unless the diaphragm is closed down to its preset position. Some cameras have a device for closing down the diaphragm manually to check depth of field. Called the depth of field preview button, it can be used to see what effect the chosen aperture has on the depth of field.

CU's AS APPROPRIATE

11.6 Most SLR cameras have a depth of field guide on the lens between the focus ring and the aperture ring. The numbers on the depth of field guide refer to f stops. To read the guide, look at the numbers on the focus scale opposite the numbers on the depth of field guide which related to the selected aperture.

GRAPHICS

11.7 With the focus set at two metres, and the aperture at f 4, the depth of field ranges from a little under to a little over 2 metres from the lens.

11.8 But at f 16, everything in the field of view between one point five and about four metres from the lens will be in focus.

MS PRESENTER

11.9 Depth of field is also a function of the focus setting on the lens - depth of field increases at greater distances from the camera.

SECTION 12 - SEQUENCE

MCU PRESENTER

12.1 It probably still sounds quite complicated, but with a little practice the steps fall into a natural sequence:

GRAPHIC

. frame the shot,

. focus,

. match the needle, considering as you do the effect different shutter speeds and apertures will have,

. press the shutter release button, and

. wind on the film.

SECTION 13 - COMMON ERRORS

MCU PRESENTER

13.1 The following photographs illustrate some common mistakes.

SLIDES AS REQUIRED

13.2 This shot is poorly framed - too much distracting material. Move the subject, the camera, or both to correct the problem.

13.3 Focus is set incorrectly here. Look through the viewfinder carefully and focus the shot. It doesn't hurt to check the focus again just before you press the shutter release button.

13.4 Underexposed shots will look dark not enough light reaches the film.

13.5 On the other hand, overexposure will wash out the image.

13.6 A well exposed shot will have good colour reproduction, and a good range of contrast between dark and light areas.

13.7 Here, the exposure is correct, but the aperture is too wide - there's not enough depth of field. Depth of field can be a particular problem close to the lens with wider apertures. Compensate by moving away from the subject, or closing down the aperture. Don't forget then to slow down the shutter speed to compensate.

13.8 The action has been missed in this shot - a higher shutter speed (and wider aperture) would freeze the action, with the same exposure.

13.9 Alternatively, follow the action with the camera as you take the photo - you may get a pleasing effect.

13.1Ø And .... don't forget to wind on the film!

SECTION 14 - FINAL SUMMARY

GRAPHIC

Check the film is wound on,

. compose,

. focus,

. set the exposure, aperture and shutter speed,

. take the shot, and

. wind on the film.

SECTION 5A - FOCUS - SUPPLEMENTARY

MS PRESENTER

5A.1 The focus ring is located on the lens - usually it's the frontmost knurled ring on the lens.

5A.2 To use the focus ring, look through the viewfinder and turn the ring until the image of the subject in the viewfinder becomes sharp.

EFFECT OF LOOKING THROUGH VIEWFINDER

5A.3 Beyond a certain distance from the lens, beyond say 10 metres, if you set the focus control on infinity, everything further away than about 10 metres will be in focus.

MCU PRESENTER

5A.4 Remember the split-image or microprism systems for helping you focus. The theory is still the same - look through the viewfinder and turn the focus ring until the image of the subject is clear.

SECTION 8A - SHUTTER SPEED AND APERTURE

MCU PRESENTER

8A.1 The two things which control the amount of light striking the film during exposure are the shutter speed - the amount of time the shutter remains open - and the aperture of the lens.

8A.2 The shutter speed is measured in fractions of a second. A 'fast' shutter speed, of about one five-hundredth or one thousandth of a second, opens the shutter for a very brief period, wheras the 'slow' speeds, one thirtieth or one fifteenth of a second, open the shutter for a longer time.

8A.2 The aperture is measured in f stops. The higher the f number, the smaller the aperture in the lens.

APPENDIX THREE

COMPUTER PROGRAM LISTINGS

"HELLO" Program

```
20  ROT= 0: SCALE= 1:HIRES = 49234:D$ =  CHR$ (4):SH = 24576
25  POKE 230,64: HCOLOR= 0: HPLOT 0,0: CALL 62454: HGR2
30  GOSUB 40: GOTO 50
40  POKE 232,SH -  INT (SH / 256) * 256: POKE 233, INT (SH / 256): RETURN
50 :
60  PRINT D$;"BLOAD CAMERA,A";SH
70  HOME
80 Y = 12
90  FOR J = 1 TO 5
100 X = 27
110  FOR I = 1 TO 5
120 HC =  INT ( RND (1) * 7): IF HC = 4 OR HC = 0 THEN 120
130  HCOLOR= HC
140  DRAW 1 AT X,Y
150 X = X + 56
160  NEXT
170 Y = Y + 38
180  NEXT
190 FT$(1) = "]BLOCK"
200 FT$(2) = ""
210 FT$(3) = ""
220 UL$ = "@"
230  SCALE= 1: ROT= 0:CL = 8: HCOLOR= 3:TF = 256:T1 = 31:TXT = 49235:FULL = 49234:HIRES = 49232:UL =  ASC (UL$):G$ =  CHR$ (7):D$
=  CHR$ (13) +  CHR$ (4)
240 J = 800: FOR I = 1 TO 3:LOC(I) =  PEEK (J) +  PEEK (J + 1) * 256:L1(I) =  PEEK (J):L2(I) =  PEEK (J + 1):J = J + 2: NEXT : REM
    STORE FONT LOC         ATIONS
250  PRINT D$;"BLOAD CURSORS,A28561":LOC(1) = 28817: FOR I = 1 TO 3
260  IF  LEN (FT$(I)) THEN  PRINT D$;"BLOAD ";FT$(I);",A";LOC(I)
270 LOC(I + 1) = LOC(I) +  PEEK (43616) +  PEEK (43617) * 256: NEXT
280 J = 800: FOR I = 1 TO 3:X = LOC(I): POKE J,X -  INT (X / 256) * 256:L1(I) =  PEEK (J): POKE J + 1, INT (X / 256):L2(I) =  PEEK
 (J + 1):J = J + 2: NEXT
290  PRINT
300  PRINT  CHR$ (4);"RUN FIELD STUDY"
```

"FIELD STUDY" - Main program

```
9  GOTO 2000
10  POKE 33,40: POKE 34,0
20  PRINT  CHR$ (4);"BLOAD CTL 3.0"
30  HIMEM: 37119
40 AO = 37130:A1 = 37131:A2 = 37132:BL = 37133:BM = 37134:BH = 37135:CI = 37367:CS = 37121:OC = 37756:EL = 37136:EM = 37137:EH = 3
7138:ER = 37147:NC = 37122:PI = 37694:PU = 37861:PR = 37767
50 RO = 37402:RL = 38199:WR = 37120:SI = 37369:SL = 37145:SH = 37146:TI = 38106:TO = 37123:TW = 37124:TV = 37990:WI = 38056:PC = 2
14:PQ = 128:D$ =  CHR$ (4)
60 KR =  - 16384:KS =  - 16368:ST = 33:TP = 34:FF = 36:RW = 40:PS = 16:CV = 32:D$ =  CHR$ (4): POKE 33,40: POKE 34,0:AU = 192:VC =
 49355:VS = 49347:X2 = 32
70 PL = 60:PG = 0:W2 = 38082: REM     WRITE/READ & WRITE2 FOR VTR RECORD
75 VT = 16:HC = 6:HT = 9.43:A$ = "Please wait ...": GOSUB 2070
80  CALL PI
110  NOTRACE
120  DIM L(100),B(100),E(100),DE$(100),QU$(5),A1$(5),A2$(5),A3$(5),QC(5),NL(5)
130  GOTO 1190
160  IF  PEEK (VS) > 1 THEN 160
170  RETURN
180  REM
190  IF ( PEEK (VS) = RW AND CD <  > RW) OR ( PEEK (CS) <  > RW AND CD = RW) THEN  POKE VC,ST: POKE VC,0:A =  PEEK (AO): FOR D = 1
 TO 5:AA =  PEEK (AO): IF AA <  > (A) THEN 190
200  IF CD <  > ST THEN  POKE CS,CD
210  IF AD = 1 THEN  POKE WR,1: REM   READ CODE
220  IF AD = 0 THEN  POKE WR,0: REM   DON'T READ
230  POKE VC,CD
240  IF AD = 1 AND (CO = TP OR CO = NP) THEN  CALL RD:EC =  PEEK (ER): IF EC > 0 AND EC < 8 THEN LN = 475: GOTO 300
250  RETURN
300 :
310  TEXT : HOME : POKE VC,ST: POKE VC,CV: VTAB 10: PRINT "ADORESS CODE ERROR #";EC;" AT LINE #";LN: PRINT : PRINT "PLEASE NOTIFY
YOUR": PRINT "MEDIA SUPERVISOR.": END
340  REM
350  IF L = 0 THEN  RETURN
360  REM  ?    "SEARCHING FOR SCENE # ";L
370 B = B(L): REM   THE BEGINNING FRAME NUMBER OF SCENE # L
380  POKE PR,75: REM    PREROLL AMOUNT
390  IF B <  PEEK (PR) THEN B =  PEEK (PR) * 20: REM   IF WE'RE AT THE ABSOLUTE FRONT OF THE TAPE THEN REDEFINE 'B' AS PREROLL * 2

400 N2 =  INT (B / 256 ^ 2):X2 =  INT (B - N2 * (256 ^ 2)):N1 =  INT (X2 / 256):NO =  INT (X2 - N1 * 256)
410  POKE BL,NO: POKE BM,N1: POKE BH,N2
420  POKE NC,NP: REM   POKE 'NORMAL PLAY' INTO 'NEXT COMMAND'
430  IF L = LO THEN  RETURN
440  CALL OC
460  IF  PEEK (VS) > 1 THEN 460
470 AC =  PEEK (AO) +  PEEK (A1) * 256 +  PEEK (A2) * 256 ^ 2: IF AC > B -  PEEK (PR) THEN  CALL OC
480  IF  PEEK (VS) > 1 THEN 480
490  VTAB 23: HTAB 31: CALL  - 868
500  RETURN
S10 :
520  IF NV = 1 OR L = 0 THEN  RETURN
530 E = E(L): REM   ENDING FRAME NUMBER  OF SCENE # L
540 N2 =  INT (E / 256 ^ 2):X2 =  INT (E - N2 * (256 ^ 2)):N1 =  INT (X2 / 256):NO =  INT (X2 - N1 * 256): POKE EL,NO: POKE EM,N1:
 POKE EH,N2
550  CALL PU: CALL  - 3086: GOSUB 1600: IF F$(N,1) = "T" THEN  POKE VS,128: POKE VS,0: POKE WR,255: CALL W2: REM      ACTI
   VATE VTR RECORD & JAM SYNC CODE
560  VTAB 22: CALL  - 868
570  IF  PEEK (VS) > 1 THEN 570
580  RETURN
650  HOME
660  IF NV = 1 THEN  RETURN : REM   YOU SET NV TO 1 IF NO VIDEO      FOR THE LESSON
670  POKE VC,ST: POKE VC,CV:
680  VTAB 18: PRINT "SYSTEM INITIALIZATION IN PROGRESS": GOSUB 860: IF NV = 1 THEN  RETURN
690  POKE VC,ST: POKE VC,CV
700 S =  PEEK (VS):KK =  PEEK (KR): POKE KS,0: IF S = 0 OR KK > 127 THEN  NORMAL : VTAB 10: CALL  - 868: VTAB 12: CALL  - 868: GOT
O 730
710  TEXT : VTAB 10: FLASH : PRINT "PLEASE INSERT VIDEO CASSETTE. . . . .": NORMAL : VTAB 12: PRINT "...THEN PRESS SPACE BAR.": GE
T Z$: PRINT : POKE 49232,0: POKE 49237,0
720  GOTO 690
730  CALL TV: REM   OETERMINE     VTR TYPE SONY/PANASONIC
740  IF AD = 1 THEN CO = TP: PRINT "READING CODE": GOSUB 180:CD = ST: GOSUB 180:RI = 1: VTAB 12: CALL  - 868: PRINT "FILE TAPE #";
TN$: PRINT "VIDEO TAPE#"; PEEK (TO) +  PEEK (TW) * 256
750  IF AD = 1 AND  VAL (TN$) <  >  PEEK (TO) +  PEEK (TW) * 256 THEN WT = 1: POKE VC,ST: POKE VC,CV: REM    TAPE ID # IN   FILE D
OESN'T AGREE WITH ACTUAL TAPE ID #
760  IF WT = 1 THEN  TEXT : HOME : PRINT : INVERSE : PRINT " WRONG TAPE ! ": NORMAL : PRINT : PRINT "YOUR VIDEO TAPE # IS DIFFEREN
T FROM": PRINT "THE I.D. # IN THE FILE.": PRINT : PRINT "PLEASE INSERT TAPE # ";TN$
770  IF WT = 1 THEN  PRINT : PRINT "FOR '";LS$;"'": PRINT : PRINT "THEN PRESS SPACE BAR...": PRINT : PRINT "(PRESS THE 'ESC' KEY":
 PRINT : PRINT "IF YOU WANT A DIFFERENT LESSON.)
780  IF WT = 1 THEN  GET Z$: PRINT : IF  ASC (Z$) = 27 THEN 1190
790  IF WT = 1 THEN WT = 0: HOME : GOTO 690
800  IF AD <  > 1 THEN  CALL TI
810  IF RI = 1 THEN  RETURN
820  IF NV = 1 THEN  RETURN
830 S =  PEEK (VS): IF S > 1 THEN 830
840  HOME
850  RETURN
860 :
```

.../ (cont.)

```
870  IF NV = 1 THEN  RETURN
880  PRINT D$;"OPEN" + LS$ + "-DATAFILE,L50"
890  PRINT D$;"READ" + LS$ + "-DATAFILE,R0"
900  INPUT EV
910  INPUT PR$
920  PRINT D$;"CLOSE"
930 AI$ =  LEFT$ (PR$,1):AD$ =  MID$ (PR$,2,1):VTR$ =  MID$ (PR$,3,4):TN$ =  MID$ (PR$,7,5)
940  IF  VAL (AD$) <  > 0 THEN AU = 1
950 AU = 192: IF AI$ = "1" THEN AU = 64
960  IF AI$ = "2" THEN AU = 128
970 NP = 2 + AU
980  VTAB 5: PRINT : PRINT LS$
990  VTAB 12: PRINT "LOADING VIDEO SCENE # "
1000 FC$ = "INACTIVE.": IF  VAL (AD$) <  > 0 THEN FC$ = "ACTIVE."
1010  VTAB 20: PRINT "FRAME CODE IS ";FC$
1020 FC$ = AI$: IF  VAL (AI$) = 0 THEN FC$ = "1 & 2."
1030  PRINT "AUDIO IS ON CHANNEL ";FC$
1040  PRINT D$;"OPEN" + LS$ + "-DATAFILE,L50"
1050  FOR I = 1 TO EV
1060  PRINT D$;"READ" + LS$ + "-DATAFILE,R";I
1070  INPUT L: INPUT B(L): INPUT E(L): INPUT OE$(L)
1080  VTAB 12: HTAB 23: PRINT I
1090  NEXT
1100  PRINT D$;"CLOSE"
1110  POKE VC,CV
1130  RETURN
1190 :
1200  HOME
1210 LS$ = "PHOTOGRAPHY"
1240  GOSUB 650: REM    READ TAPE    LOG, READ CODE, INIT TAPE
1250 L = 1:LC = 0
1255 VT = 16:HC = 0:HT = 9.43:A$ = "Please wait ...": GOSUB 2070:HC = 5
1256 HT = 1.43:A$ = "Press any key to continue": GOSUB 2070: IF HC = 0 THEN 1260
1257  GET Z$: PRINT :HC = 0: GOTO 1256
1260  IF L > 22 THEN 2400
1262  GOSUB 340: REM   SEARCH TO START OF THEME
1265 CL = 0: GOSUB 2070:CT = 1:HC = 3:VT = 12:A$ = DE$(L): GOSUB 2070
1270  GOSUB 510: REM   PLAY UNTIL   END OF SCENE
1271 K =  FRE (0)
1273  GOSUB 1670: GOTO 2400
1276 CL = 0: GOSUB 2070:Q = 0
1278 HC = 3: IF Q = 1 THEN HC = 0:Q = 0
1280  IF L > 13 THEN 2400
1285 VT = 12:HT = 4.7:A$ = "NEXT SCENE...? (Y/N)": GOSUB 2070: GET Z$: IF Z$ <  > "N" AND Z$ <  > "Y" THEN  PRINT  CHR$ (7):Q = 1:
 GOTO 1278
1290 LC = 0: IF Z$ = "Y" THEN L = L + 1: GOTO 1260
1295  GOTO 3000
1300  GOSUB 2140:Q =  FRE (0):CT = 1:VT = 10:HC = 6:A$ = "Camera": GOSUB 2070
1305 VT = 16:HC = 3:CT = 1:A$ = "DAVID REID": GOSUB 2070
1307  GOSUB 4000
1310  GOSUB 2140:CT = 1:VT = 4:HC = 6:A$ = "Production": GOSUB 2070
1315 VT = 10:HC = 3:CT = 1:A$ = "BARRY LAMBERT": GOSUB 2070
1320 VT = 14:CT = 1:A$ = "DON JAMES": GOSUB 2070
1322 VT = 18:CT = 1:A$ = "DAVID ROARTY": GOSUB 2070
1325  GOSUB 4000
1330  GOSUB 2140:VT = 10:HC = 6:CT = 1:A$ = "Graphics": GOSUB 2070
1335 VT = 16:HC = 3:CT = 1:A$ = "RON JUBB": GOSUB 2070
1340  GOSUB 4000
1342 CL = 0: GOSUB 2070:VT = 10:HC = 6:CT = 1:A$ = "Stills": GOSUB 2070
1343 VT = 16:HC = 3:CT = 1:A$ = "DAVID REID": GOSUB 2070
1344  GOSUB 4000
1345  GOSUB 2140:VT = 7:HC = 6:CT = 1:A$ = "Script": GOSUB 2070
1350 VT = 11:HC = 3:CT = 1:A$ = "JENNY JACOBS": GOSUB 2070
1355 VT = 15:CT = 1:A$ = "JAMES STEELE": GOSUB 2070
1360  GOSUB 4000: GOSUB 2140
1365 VT = 8:HC = 6:CT = 1:A$ = "Produced & Presented": GOSUB 2070
1370 VT = 11:CT = 1:A$ = "by": GOSUB 2070
1375 VT = 16:HC = 3:CT = 1:A$ = "JAMES STEELE": GOSUB 2070
1380  GOSUB 4000: GOSUB 2140
1385 VT = 8:HC = 6:CT = 1:A$ = "Instructional Media Centre": GOSUB 2070
1395 VT = 15:CT = 1:HC = 6:A$ = "Canberra CAE": GOSUB 2070
1400 VT = 18:CT = 1:HC = 6:A$ = "1983": GOSUB 2070
1410  GOSUB 4000: GOSUB 4000:VT = 22:CT = 1:A$ = "Press any key to restart":HC = 5: GOSUB 2070: GET Z$: PRINT : IF Z$ =  CHR$ (27)
 THEN  TEXT : HOME : END
```

.../ (cont.)

```
1420 CL = 0: GOSUB 2070:CT = 1:VT = 12:HC = 6:A$ = "Please wait ...": GOSUB 2070:L = 1:LC = 0: GOTO 1260
1600 D$ =  CHR$ (4): IF LC > 0 THEN  RETURN
1605  IF L > 3 THEN  RETURN
1610 LC = LC + 1
1620 N$ = DE$(L)
1630  PRINT  CHR$ (4);"OPEN ";N$
1640  PRINT D$;"READ ";N$
1642  INPUT QN
1645  FOR I = 1 TO QN
1650  INPUT QU$(I)
1652  INPUT A1$(I)
1653  INPUT A2$(I)
1654  INPUT A3$(I)
1655  INPUT QC(I)
1656  INPUT NL(I)
1657  NEXT
1660  PRINT D$;"CLOSE ";N$
1665  RETURN
1670  IF L > 3 THEN  RETURN
1671 U = L
1672  FOR K = 1 TO QN
1675 R = 1:C = 27:TQ$ = QU$(K)
1680  IF  LEN (TQ$) < 27 THEN LR$(R) = TQ$: GOTO 1740
1690 LR$(R) =  LEFT$ (TQ$,C)
1700  IF  LEN (TQ$) < 27 THEN LR$(R) = TQ$: GOTO 1740
1710  IF  RIGHT$ (LR$(R),1) <  >  CHR$ (32) THEN C = C - 1: GOTO 1680
1720 LR$(R) =  LEFT$ (TQ$,C - 1):TQ$ =  RIGHT$ (TQ$, LEN (TQ$) - C)
1730 R = R + 1:C = 27: GOTO 1690
1740 VT = 1:HT = 1:HC = 1: FOR I = 1 TO R:A$ = LR$(I): GOSUB 2070:VT = VT + 3:HT = 1: NEXT
1750 HC = 3:VT = VT + 1:A$ = "O. Don't know": GOSUB 2070:VT = VT + 3:HT = 1
1760 A$ = "1. " + A1$(K): GOSUB 2070:VT = VT + 3:HT = 1
1762 A$ = "2. " + A2$(K): GOSUB 2070:VT = VT + 3:HT = 1
1764 A$ = "3. " + A3$(K): GOSUB 2070
1770  GET Z$: IF  ASC (Z$) < 48 OR  ASC (Z$) > 51 THEN  PRINT  CHR$ (7): GOTO 1770
1772 CL = 0: GOSUB 2070
1775  IF Z$ = "0" THEN HC = 6:CT = 1:VT = 12:A$ = "Watch this part again": GOSUB 2070: GOTO 1790
1778  IF Z$ =  CHR$ (QC(K) + 48) THEN HC = 6:CT = 1:VT = 12:A$ = "Correct": GOSUB 2070: GOSUB 4000:CL = 0: GOSUB 2070: NEXT K:L =
U: RETURN
1780 HC = 1:CT = 1:VT = 10:A$ = "Sorry, that's incorrect": GOSUB 2070:VT = VT + 4:HC = 6:CT = 1:A$ = "Watch this part again": GOSU
B 2070: GOTO 1790
1790 L = NL(K): GOSUB 340:CL = 0: GOSUB 2070:CT = 1:HC = 3:VT = 12:A$ = DE$(L): GOSUB 2070: GOSUB 510:CL = 0: GOSUB 2070: GOTO 174
0
2000  LOMEM: 24576
2010 FT$(1) = "]BLOCK"
2020 FT$(2) = ""
2030 FT$(3) = ""
2040 UL$ = "@"
2050  GOSUB 2140: GOTO 2240
2060  GOTO 2140
2070  POKE 232,L1(FT): POKE 233,L2(FT): IF  LEN (FT3$) THEN  PRINT D$;"BLOAD ";FT3$;",A";LOC(3):FT$(3) = FT3$:FT3$ = "": RETURN
2080 X = 7 * HT - 6:Y = 8 * VT - 8: ROT= RT * 16: IF CL < 8 THEN BG = CL: HCOLOR= BG:CL = 8: HPLOT 0,0: CALL 62454:VT = 1:HT = 1:F
T = 1: RETURN
2090  IF CT THEN X = 0:YT = 176:XR = 0: HCOLOR= BG: FOR Z = 1 TO  LEN (A$): DRAW  ASC ( MID$ (A$,Z,1)) - T1 AT X,YT: DRAW 99: CALL
 62923:XR = XR +  PEEK (224): NEXT :X = (280 - XR) / 2
2100  HCOLOR= HC: DRAW 100 AT X,Y: FOR Z = 1 TO  LEN (A$): DRAW  ASC ( MID$ (A$,Z,1)) - T1: XDRAW 99: NEXT : CALL 62923:XO = X:X =
  PEEK (224) +  PEEK (225) * TF:CT = 0:RT = 0:HT = (X + 6) / 7: IF  NOT (IN) THEN  RETURN
2110  POKE 232,0: POKE 233,64:XR = X:YB = 8 *  PEEK (LO(FT) + 1):SC = XR - XO: IF SC < 256 THEN  SCALE= SC: ROT= 0: FOR I = Y - (Y
 > 0) TO Y + YB: XDRAW 3 AT XO,I: NEXT : GOTO 2130
2120  SCALE= YB: ROT= 16: FOR I = X TO XR: XDRAW 3 AT I,Y: NEXT
2130  ROT= 0: SCALE= 1:IN = 0: RETURN
2140  SCALE= 1: ROT= 0:CL = 8: HCOLOR= 3:TF = 256:T1 = 31:TXT = 49235:FULL = 49234:HIRES = 49232:UL =  ASC (UL$):G$ =  CHR$ (7):D$
 =  CHR$ (13) +  CHR$ (4)
2150 J = 800: FOR I = 1 TO 3:LOC(I) =  PEEK (J) +  PEEK (J + 1) * 256:L1(I) =  PEEK (J):L2(I) =  PEEK (J + 1):J = J + 2: NEXT : RE
M  STORE.FONT.LOCATIONS
2210 J = 800: FOR I = 1 TO 3:X = LOC(1): POKE J,X -  INT (X / 256) * 256:L1(1) =  PEEK (J): POKE J + 1, INT (X / 256):L2(1) =  PEE
K (J + 1):J = J + 2: NEXT : GOTO 2230
2220  REM
2230 HC = 3:HT = 1:VT = 1:FT = 1:CT = 0:IN = 0:CL = 8:RT = 0:FT3$ = "": HGR2 : RETURN : REM  STARTING DEFAULTS
2240  REM
2250 HC = 1:CT = 1:VT = 4:A$ = "Basic Photography": GOSUB 2070:HC = 3:CT = 1:VT = 8:A$ = "...an interactive program": GOSUB 2070
2265  GOTO 10
2400 VT = 1:HT = 5:HC = 6:A$ = "DO YOU WANT TO :": GOSUB 2070
2410 VT = 5:HC = 3:HT = 1:A$ = "0. End the lesson": GOSUB 2070
2420 VT = 9:HT = 1:A$ = "1. Continue, or": GOSUB 2070
2430 VT = 13:HT = 1:A$ = "2. Repeat previous sequence": GOSUB 2070
2431 HC = 5:Q = 0
2432 VT = 18:HT = 7.7:A$ = "WHICH? (0,1 or 2)": GOSUB 2070: IF Q = 1 THEN 2431
2435  GET Z$: IF  ASC (Z$) < 48 OR  ASC (Z$) > 50 THEN  PRINT  CHR$ (7):HC = 0:Q = 1: GOTO 2432
2440  IF Z$ = "1" THEN 1276
2450  IF Z$ = "2" THEN  GOSUB 2140:HT = 9.43:VT = 12:HC = 6:A$ = "Please wait ...": GOSUB 2070: GOTO 1260
2460  GOTO 1300
```

.../ (cont.)

```
3000  REM  RND MENU
3010 L = 1:CL = 0: GOSUB 2070
3020 VT = 1:HT = 3.14:HC = 5:A$ = "WHICH? enter no. and RET": GOSUB 2070:HT = 1:HC = 3:VT = 5:A$ = "0. FINISH THE LESSON": GOSUB 2
070
3030  FOR I = 1 TO 4:VT = VT + 3.5:HT = 1
3040  IF L < 10 THEN L$ =  CHR$ (L + 48)
3050  IF L > 9 THEN L$ =  CHR$ (49) +  CHR$ (L + 38)
3060  IF L < 15 THEN A$ = L$ + ". " + DE$(L): GOSUB 2070:L = L + 1
3070  NEXT
3080  IF L < 15 THEN VT = VT + 4:HT = 6:HC = 5:A$ = "<SPACE> FOR MORE": GOSUB 2070: GOTO 3200
3090 L = 1
3200  HOME
3210 Z1 = 0:Z2 = 0:X = 0
3220 Z =  PEEK (49152): IF Z < 128 THEN 3220
3230  POKE 49168,0: IF Z = 160 THEN CL = 0: GOSUB 2070: GOTO 3020
3240 X = X + 1
3250  IF Z = 176 AND X = 1 THEN 1300
3260  IF Z = 141 AND X = 1 THEN  GOTO 3500
3270  IF Z = 141 AND X = 2 THEN L =  VAL ( STR$ (Z1)): GOTO 3520
3280  IF Z = 141 AND X = 3 THEN L =  VAL ( STR$ (Z1) +  STR$ (Z2)): GOTO 3520
3290  IF Z < 176 OR Z > 185 THEN 3500
3300  IF X = 1 THEN Z1 = Z - 176: GOTO 3220
3310  IF X = 2 THEN Z2 = Z - 176: GOTO 3220
3320  IF X = 3 THEN 3500
3500  PRINT  CHR$ (7):HC = 0:Q = 0
3510 VT = 1:HT = 3.14:A$ = "WHICH? enter no. and RET": GOSUB 2070: IF Q = 1 THEN 3210
3515 Q = Q + 1:HC = 5: GOTO 3510
3520  IF L > 14 GOTO 3500
3530 CL = 0: GOSUB 2070:HT = 9.43:VT = 12:HC = 6:A$ = "Please wait ...": GOSUB 2070: GOTO 1260
4000  FOR P = 1 TO 1000: NEXT : RETURN
```