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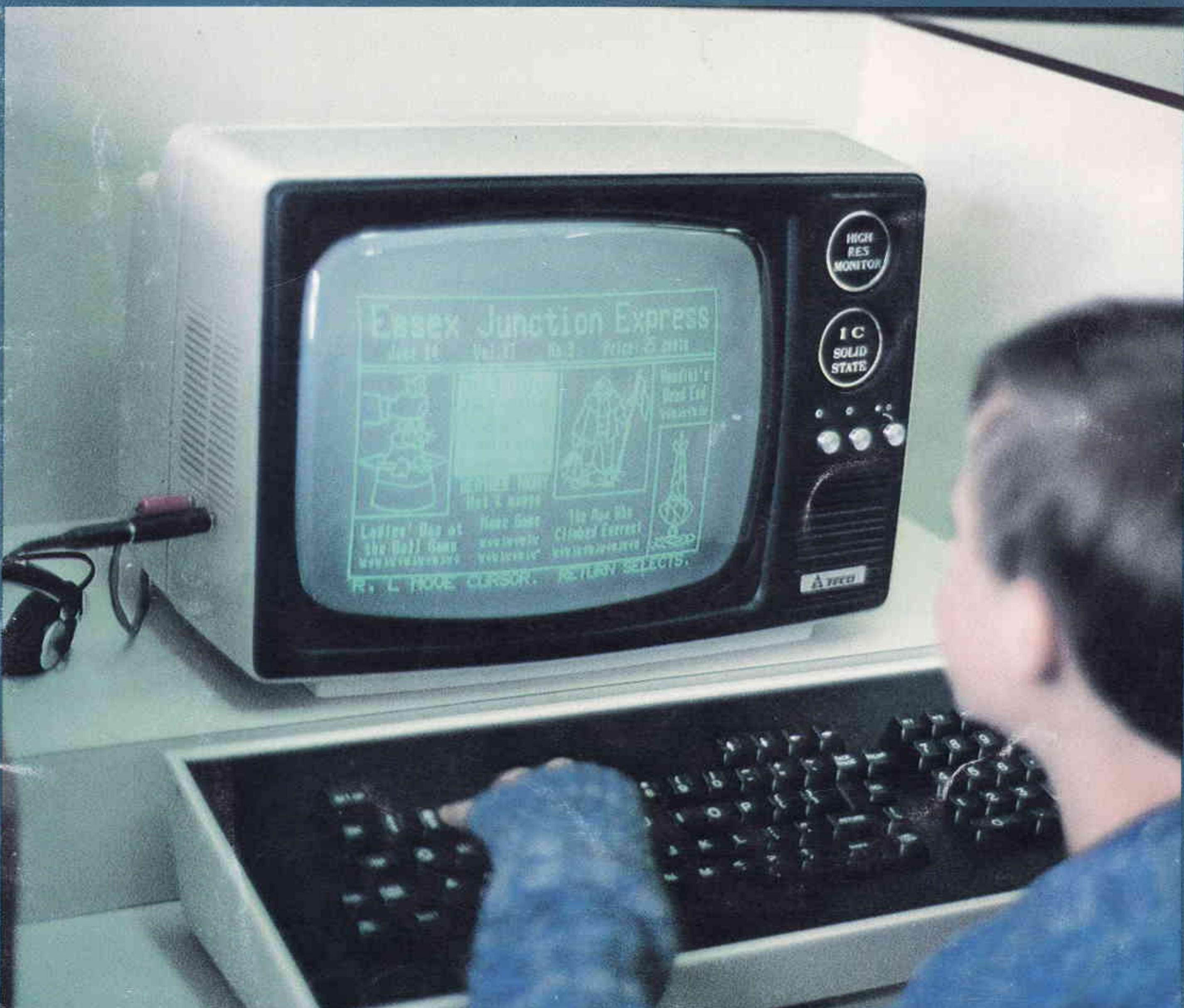

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A REPORT OF A PROJECT ILLUSTRATING THE FEASIBILITY OF VIDEO/COMPUTER INTERFACE FOR USE IN ESL

Vance Stevens

ABSTRACT

This report describes a project whose purpose was to write a brief demonstration lesson in listening comprehension and then deliver that lesson using an Apple II + computer interfaced with a Sony SL-323 Betamax video cassette recorder (VCR) using a Gentech ETS-2000 controller. The listening comprehension lesson and hardware configuration were demonstrated as part of the Rap Session on The Latest Developments in Video ESL/EFL Materials at the TESOL Convention in Honolulu, May, 1982.

The report is in three parts: (1) a brief survey of video tape vs. videodisc technology, (2) a rationale for the use of interactive video in ESL, and (3) a description of the project itself. It is intended in this report to provide some background in computer interfaced video and then to give insights into some difficulties that may be encountered by computer-naive ESL instructors wishing to prepare interactive video lessons.

There are many who believe that computers will soon alter on a major scale ways that people will be able to learn. However, existing educational and media design systems may be inadequate in dealing with the demands of technologically enhanced education. Therefore, new approaches to lesson design will have to be considered. It is believed that interactive video, insofar as it is highly compatible with recent theories of learning, will be able to play a dominant role in these new approaches. However, there are technical limitations on video tape equipment which, fortunately, have been largely overcome with the development of videodisc systems. Thus, although the present project deals with video tape, both systems are compared and discussed in this article.

Before embarking on a description of this project, some crucial differences between video tape and videodisc should be mentioned. Just as data can be loaded into a microcomputer either from a disk or from a cassette tape, so can a program of video material be accessed either by means of a video tape or, with the proper equipment, by means of a videodisc. Disk access has several major advantages over tape access. For one thing, the maximum amount of time needed to traverse the two most distant points on the disk is five seconds, whereas to rewind a video tape over its entire length can take several minutes. If the tape is being used as part of an interactive video program, then this waiting time can seriously distract from the impact of the lesson.

Another advantage of videodisc over video tape access is the frame-perfect accuracy of the former. Some video tape controllers, such as the one used in this project, detect pulses emitted for each frame as the video tape is played. The computer keeps track of these pulses and can rewind, play, or fast forward the tape to any given pulse. However, there is a problem in that the tape player itself may of its own momentum rewind (or fast forward) slightly farther than desired, so that the tape begins a few frames out of kilter. This problem can be so compounded after a few rewinds that, although the computer is counting accurately, the tape is significantly displaced. Videodisc technology, on the other hand, is such that the disk is read at precise points. Frames can be replayed accurately no matter where they are on the videodisc. In fact, it is possible for the user to be presented a seamless program despite the fact that the videodisc is being accessed at non-contiguous points (Allen, 1981:83).

There are many other advantages (and disadvantages; see Nugent, 1979) to using a videodisc as opposed to a video tape player in serious interactive video development. However, the two just mentioned are most pertinent to understanding limitations on the present project. Santoro and Pollak (1980:50), in reporting on an interactive video authoring system developed for the Navy, note that "It has become clear that the video cassette player is the weakest link in the CAVE hardware configuration, and we look forward to its eventual replacement by video-disc technology." But perhaps the greatest advantage to using videodisc is the virtual freedom it offers to lesson creators. As Woolley (1979:81) concisely puts it, "One of the advantages of computer-based education with a microcomputer videodisc system is simply that it is not technologically clumsy." Video tape recorders, despite their great sophistication, are, relative to videodiscs, technologically clumsy, and those who create CAI lessons using them must keep in mind their limitations while attempting to exploit their advantages.

(More complete descriptions of videodisc systems can be found, to name just two sources, in Woolley, 1979, and Onosko, 1982. Also, a VCR interface system with much improved accuracy, called CATI, has been developed by Whitney, 1777 Borel Drive, Suite 402, San Mateo, California 94402.)

Rationale

The potential of computer-assisted instruction (CAI) for the enhancement of learning has excited some and disappointed others. Many of those excited by the potential inherent in CAI have yet to witness or experience what they may envision as the ideal battery of CAI programs for their own learners' needs. This is because proper implementation of CAI takes more of a commitment in time and resources than most individuals or institutions are prepared to give. Therefore, when computers are purchased or made available and CAI is planned and implemented, short cuts are inevitably taken which seriously compromise the final product. Hence, disillusionment can easily occur, preventing all but the most committed from exploring and eventually exploiting the pedagogic power of CAI.

One of the most prevalent mistakes in generating CAI materials is the propensity of lesson authors to be, as Bork puts it, "imitative of other media" (1981:10). Bork cites in particular attempts by CAI lesson authors to present text on the computer screen as if it were pages from a book. Many English lessons on PLATO suffer from this deficiency, and I myself have watched CAI lesson authors work directly from grammar books. Thus, there is a tendency for educators confronted with a new medium to fail to make use of the unique characteristics of that medium, mainly through failure to shake off the constraints of old ways of doing things, and this failure can result in imimproper application of what would otherwise be an innovative educational process.

Indeed, it is very difficult for teachers brought up in one educational system to conceive of, let alone prepare materials for, a system which, to accommodate the recent developments in computer enhanced learning, will have to become radically different from the one that has sufficed throughout their own education. Yet the call for the re-structuring of educational paradigms is one echoed frequently in recent CAI literature. Educators must not only develop materials for technologically advanced media, but they must also take into consideration recent trends in research into how humans learn. Bork, for example, cites recent split brain research in support of his argument that the visual component of instructional materials should be enhanced, even to the point of having artists join programmers and instructors in CAI creation (1981:16). Molnar (1979:13) asks if we can "create new instructional paradigms that will permit us to combine the various features of the media to take advantage of differential brain functions and thereby facilitate and amplify human reasoning."

As if on cue, technology has produced a breakthrough which seems to intersect neatly with the latest theories of learning psychologists, and which has provided proponents of CAI with yet another cause for excitement over the potential of interactive learning. This new breakthrough is interactive video; that is, video whose sequencing is controlled by a microprocessor which in turn makes possible CAI capabilities.

Although the idea of coupling computers and video devices has been around for the past decade (manufacturers of each were brought together at a conference in 1975), devices allowing actual interface have been on the market for only a few years. As is inevitable when a new toy hits the market, a plethora of articles has quickly followed highly touting the potential of interactive video. As always, educators need to question the basis of these claims; but the number of writers reporting success with interactive video is impressive. According to Woolley (1979:81), "Obviously the market will be moving rapidly in the direction of digital audio and digital video." Kadesch (1981:301) says, "It seems clear that stand-alone systems employing interactive video and computer graphics will emerge as the system of choice . . . The videodisc coupled to improved microcomputers can add to the learning situation powerful capabilities simply not present in traditional environments." Molnar notes that at a recent (1975) Human Resources Resource Organization (HumRRO) conference, held under the auspices of the National Science Foundation, "The conference participants considered videodisc to have the most promising near-term technological applications for education and recommended the NSF explore the possibility of combining computers with videodisc" (1979:13). This is just a sampling of some of the very positive comments made in favor of interactive video by people who have had the opportunity to work the new medium into their educational programs.

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The need to revise paradigms by which CAI is used has been most apparent with the advent of interactive video, particularly videodisc, technology. If the differences between instructional strategies using computer and those using traditional means have been so subtle that they have escaped some materials developers for the past 20 years, video interface is at least obviously in need of a new approach. With regard to this need, Molnar reports that it was agreed at the HumRRO conference that "while technology had undergone orders of magnitude improvement, our instruction paradigms had not and . . . current paradigms for computer-assisted instruction and problem solving could not be extended to take full advantage of tomorrow's technology" (1979:13). Leveridge (1979:38) says that old habits of linear program design must yield to "new kinds of creative thinking . . . To gain the benefits inherent in this new system, it will be necessary to think in new terms for program design and production."

One of the assumptions Leveridge makes in visualizing this future paradigm was mentioned by Kadesch, and that is that the "system of choice" will be stand-alone (unlike other systems which work via cables or telephones off a central mainframe). Leveridge would add that these stand-alone systems will be personally owned: "Eventually, each learner will have his own microcomputer with attached videodisc player and television set" (1979:38). The assumption that reduced costs and ubiquitous application will result in computers (and videodisc players) proliferating like calculators is widely held, and those who believe that this will come about feel that the resulting changes in educational possibilities will necessitate new approaches to teaching.

Of course, there are forces from within society acting in favor of change in the way education is carried out. Bork thinks that the sheer numbers of students demanding education these days are thwarting the efforts of existing systems to cope. Thus there has arisen "a new force . . . in the educational scene," the "major driving force behind which is the computer, particularly . . . the personal computer" (1981:8). The nature of this force is a demand for interaction in education, an urge to return to the ideal of Socratic learning that was possible when education was available only to a privileged few. Bork believes that intelligent videodisc systems can bring multimedia capabilities to bear on the problem, bringing active learning to students individually, regardless of their numbers.

Allen mentions the trend in education toward "demassification," a term he has borrowed from Alvin Tofler's book, *The*

Third Wave. Demassification is the use of computers to approach smaller and smaller clusters of people. When demassified computers are coupled with intelligent video, "the concept of the 'personalized' film is born—a unique configuration of video segments instantaneously assembled on the basis of the viewer's needs, wants, and capacities" (1981:92).

If there is indeed a trend in education, driven by advances in computer/video technology, which will make possible widely varied options in future student/teacher interaction, then perhaps DeBloois' (1979:34) "comparison of model assumptions" is a good barometer of how educational paradigms might change in the future. DeBloois compared "current instructional design model assumptions" with "probable new instructional design model assumptions" and notes eight differences in the two. These are (1) mosaic/multi-dimensional (as opposed to linear) development of materials and strategies, (2) heterogeneous (as opposed to homogeneous) audience planning, (3) interfacing, subsystem (as opposed to sequential) component development, (4) multiple and continuing (as opposed to one-time) selection of material and format, (5) eclectic (as opposed to dominant) media options, (6) unlimited (as opposed to limited) validation cycles, (7) integration (as opposed to separation) of resource and presentation materials, and (8) extended (as opposed to limited) dissemination capacity.

DeBloois' specification of areas where change in media design will likely occur should be useful for those contemplating taking advantage of the new technologies in creating materials for teaching programs. Nevertheless, Molnar cautions against over-reliance on theory in coping with the advent of advanced teaching technology. Noting that "Conventional approaches to research and development are generally inappropriate if one wishes to foster innovation," he suggests that "No amount of paper studies or traditional equipment evaluations are likely to produce answers." The only way that educators will be able to develop materials using the new media will be "by building a prototype and using it" (1979:15).

It is with all these thoughts in mind that the present project was conceived. Exercising some of DeBloois' design assumptions, such as eclecticism in media options and interfacing of components, and in an attempt to appeal to both sides of the brain while engaging students in cognitive interaction with their lesson material, a prototype intelligent video ESL lesson as described below has been designed and demonstrated to be workable.

Implementation

The project, undertaken mainly as an illustration of applications to ESL of computer/video interface, had at least two auxiliary goals. The first of these was simply to see if it would be possible, using a Gentech ETS-2000 Video Controller and Gentech software on floppy disk, to interface two machines, an Apple II+ computer and a Sony SL-323 Betamax video cassette recorder, in such a way that the computer would control the VCR and interject text and question frames at appropriate points in the lesson. It is always a challenge to explore the potential of new equipment, but something of a risk too, since computerware does not always perform as its manufacturers claim. Therefore, it could not be assumed as given that the parts would actually fit together properly; hence, a major part of the project was to test the parts in relation to each other.

"While technology had undergone orders of magnitude improvement, our instruction paradigms had not and . . . current paradigms for computer-assisted instruction and problem solving could not be extended to take full advantage of tomorrow's technology."

In this regard, the project was a test of Gentech's equipment. However, the project had also the goal of seeing whether an ESL instructor, albeit one with about a year and a half's exposure to computers, could approach complex electronic devices, glance over a manual, hook up an interface card, and within an hour or two be designing a lesson he could himself input into the computer without outside assistance from a computer specialist. Since much of getting started in CAI is a matter of overcoming fear of frustration and impotence at the hands of complex and unfeeling machinery, it was this second goal that may be of most significance to the average ESL instructor.

In bringing the project to fruition, several steps were followed. First, all the equipment mentioned above had to be brought together. Second, a video tape had to be selected, reviewed, and then transcribed. Third, target learning for the lesson had to be ascertained and an interactive CAI lesson teaching the desired skills had to be conceptualized and integrated with the film. Next, the lesson had to be fully conceived on paper before inputting it into the computer for eventual storage on disk. This last operation, inputting into the computer, was in turn a three-step procedure involving (1) input of text and question frames, (2) division of the accompanying film into video blocks, and (3) specification of logic flow.

It would be interesting to recount the adventures involved in realizing the first step, that of accumulating the equipment, but anecdotes of that nature are clearly outside the scope of this report. However, it might be worthwhile to mention, in light of present day economic exigencies, that around $3,600 worth of gadgetry was enlisted in this project. The video controller card and accompanying software, worth $550, was loaned by Gentech. The $850 VCR was the property of the Department of ESL at the University of Hawaii, and this particular VCR was selected for purchase by the department because of its ability to accept interface with a computer. The other equipment (the Apple II+ computer and disk drive) cost about $2250.

The second step was choice of video material. Since the goal of the project was not to try to develop the ideal intelligent video lesson around the ideal video tape, the choice of taped material was not crucial. Selection of a tape of a lecture on the renewal of the controversy between the evolutionists and creationists, a topic discussed in listening comprehension classes at the University of Hawaii, was made on the basis of its being locally produced and readily available. Thus a taped lecture was used instead of a program developed especially to illustrate the unique properties of the medium. The latter would of course be more appropriate if serious development of interactive video were eventually to take place.

Bork warns particularly against using lectures in developing materials for interactive video, on the grounds that "Lectures are not an interactive learning mechanism . . . They are a passive or negative method of learning . . ." (1981:19). On the other hand, Hallgren

(1980), in an article written about computer controlled video tape recorders, reports success with use of intelligent video at a medical college where "considerable use" is typically made of videotaped lectures, with or without computer interface. Perhaps the situation with ESL listening classes at the University of Hawaii more closely parallels Hallgren's, since one purpose of the listening comprehension course is to expose students to academic lectures in English and subsequently to help students to analyze these lectures.

In working from a lecture, it was therefore logical to write a CAI program directed at an ESL student whose aim was to improve his listening comprehension by developing awareness of certain skills helpful in fostering better listening habits. The skills selected were (1) getting the meaning of unfamiliar words from context, (2) understanding the meanings of complex words derived from simpler words, and (3) extracting the main topics from a stream of discourse. These skills were selected because elements in the lecture lent themselves to exploitation of these skill areas. In addition to questions concerning these three skill areas, a fourth question was added which was simply a check that the lecture had been understood up to a certain point.

In developing a battery of lessons utilizing interactive video, it would perhaps be better to drive several lessons, each concentrating on one skill area alone. Then a final lesson might be produced which would review all of the skills taught in the previous few lessons. Of course, it would be very time consuming to produce all of these lessons, and so, for the purpose of this short demonstration, it was decided to include a variety of questions in various formats, and thus demonstrate several possibilities for using the medium.

Having targeted the skills to be taught, it was then necessary to make a transcript of the tape, making special note of the lecturer's topic shifts and pauses. These junctures largely dictated where the division of the tape into video blocks would occur. With a videodisc system, it would have been possible to go every time to an exact frame and start a video sequence at that precisely predetermined point, but the VCR tape transport was not so accurate. After one or two rewinds and fast forwards, the tape would be off by as much as a sentence. So, it seemed prudent to let the video blocks be delimited largely by natural junctures.

The first five minutes of the video tape were subdivided in this way into natural blocks, at which point questions were devised requiring the students to think about what they had heard within each block. (Limiting the length of the demonstration tape to five minutes helped to minimize the rewind error noted above and precluded long delays shuttling from one end of the tape to the other). These questions, along with accompanying text, had to be written out on forms gridded in such a way that there was a space for each of the forty characters per each of the 21 lines of available screen space. In other words, text and question frames had to be planned down to the letter in order that they could be smoothly typed into the computer. This was the most time consuming part of the overall process, and one of the most important too, since editing capabilities on Gentech's software proved to be nearly non-existent. In all, 22 frames of text and questions were prepared. The reader should note that most CAI authoring systems have editing capabilities that are quite forgiving, so such meticulous preparation is not part and parcel of every CAI project.

Any concept which is difficult to contextualize in the classroom would be a suitable subject for an interactive video lesson.

Once the frames had been written out and inserted on paper into the film script, the logic was worked out. Each frame had been given a number, as had each video block, and setting the logic flow was merely a matter of deciding which numbered frame of text was to be placed before or after which video block. When questions were asked, depending on whether the student answered correctly or not, the program could branch to combinations of text and video (but not questions) appropriately. Branching capabilities were rather weak; the student was only allowed one trial, and there was never an opportunity to re-question the student to see if a review of the video portion had succeeded in straightening out whatever misconception had led to an incorrect answer in the first place. It should be pointed out that capabilities lacking in this authoring system would most likely be available in others. For instance, see Keller, 1982.

With the lesson completely worked out on paper, it was time to input it into the computer. As mentioned earlier, this was done in a three-step process: text and question entry, video blocking, and specification of logic. The software had been devised so that someone with no programming abilities could enter the necessary information in response to prompts by the computer. I found there to be no problem with understanding the prompts and with entering the frames as I had written them.

Once the frames had been entered, I returned to the main menu to initiate the next step of the process: the setting off of each video block. This step was begun at the press of a key, resulting in the video tape being automatically rewound and the pulse counter being zeroed. At the stroke of another key, the computer caused the VCR to begin playing the tape, and when the key was touched a third time, the tape stopped. This was video block #1, which was leader material and a segment of the tape that the student would never see. At the touch of another key, the tape began to play again, which it continued to do until I stopped the VCR with another touch of the keyboard. I had just delimited video block #2. In the same way, I was able to block off the eight video segments that I would need for my program.

The final step in the creation of the interactive lesson was entering the logical sequence of questions, text, and video blocks. To initiate this process, I simply returned to the main menu and followed directions. Essentially, the computer asked me what I wanted it to do first. I told it to present a text frame. The computer asked me what I wanted it to do next. I told it to show another text frame, and another, and then to play two video blocks. Then I told it to display a question frame. The computer then asked me what I wanted it to do if the student answered the question correctly. I told the computer that if the student answered by pressing the letter B, which was the correct answer, he should be presented a text congratulating him on his intelligence. The computer then asked what I wanted done if the student answered anything other than B. I told it to present a text frame telling the student his answer had been incorrect and then replay the second of the two video segments it had just shown. The computer likewise continued prompting me for steps until it had been given the entire logic sequence for the interactive lesson.

With all the text and question frames, the video block delimitations, and logical steps preserved on disk, the lesson was ready to run. Fortunately, it worked smoothly. The only problems encountered were that no text editing was

Continued on page 50, column 2

carefully assessed by the individual teacher.

"Do you really think computers can help a student write?" Probably not, if you think of the computer as a cold-hearted or inimical piece of machinery. But if you think of it as a tool, programmed by expert teachers in cooperation with sympathetic and helpful programmers to do what it can do best and free the teacher for further creative student-teacher interaction, then the answer is a definite yes!!!

END NOTES

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[2]Lester S. Golub, "Computer-Assisted Instruction in English Teacher Education." Paper presented at Conference on English Education, National Council of Teachers of English, St. Louis, April 6-8, 1972.

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[4]For more information, write William Wresch, Ph.D., UWC-Marinette County Bayshor, Marinette, WI 54143.

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Anastasia Wang's Index to Computer-Based Learning is available from the Instructional Media Laboratory at the University of Wisconsin at Milwaukee.

Continued from page 30

possible, and also that the video segments all began prematurely as a result of the tape rewind that occurred after the blocks had originally been marked off. I was able to partially correct the latter problem by redoing the video blocking, this time anticipating the rewind lag by letting the tape play on for about a second before stopping it. The final result was acceptable, but as noted previously, this problem would not have occurred at all had the work been done with videodisc instead of video tape.

Conclusion

Although the project was rather limited, it was shown that computer/video interface was workable and that software exists which will allow someone with minimal computer skills to design and implement an interactive lesson without undue effort and frustration. Furthermore, it appears that the medium could be usefully exploited by ESL instructors. The lecture analysis/listening comprehension format opted for here is only one possibility for lesson development. Any concept which is difficult to contextualize in the classroom would be a suitable subject for an interactive video lesson.

Use of interactive video is certainly consistent with recent theories of language acquisition, especially with theories recommending engaging both hemispheres of the brain in the learning process. In addition, utilization of intelligent video meets needs for more personalized instruction. Demand for materials appropriate to computerized video should increase as the availability of system components is improved, although this may present a hardship for teachers who find it hard to adapt to the design paradigms best suited to the new technologies.

In spite of the limited success reported here in creating a video tape/CAI lesson to be used with ESL students, it may be that the video tape medium is fatally flawed. Videodisc, on the other hand, has fewer technical limitations. As the price of the components involved and the price of producing and mastering the videodiscs themselves declines, this may be considered to be too powerful a medium to be ignored by educators. Therefore, it would behoove educators to learn what they can about interactive video in order to be ready to imaginatively take advantage of the unique potential inherent in intelligent video systems when they do finally become widely available.

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RESOURCE NOTES

As part of a research project on English-Persian computer-aided lexicography, a system called 'Farsi' has been developed at the University of Exeter, which produces Farsi (Persian) script on a 'Qume' daisy wheel printer. It accepts mixed English/Persian texts as input and prints them simultaneously. The character set contains all of the Farsi letters, all diacritics and some special letter combinations. The input text is prepared in single codes and the shape of letters in connection with their contextual positions is decided by the system software, which also takes care of their proportional spacing and special combinations. Further information from S.M. Assi, The Language Centre, University of Exeter, Queen's Building, The Queen's Drive, Exeter EX4 4QH, U.K.