

## “THINK IT THROUGH”: AN INTERACTIVE VIDEODISC FOR THE HEARING IMPAIRED

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*The feasibility of interfacing a videodisc player with an external microcomputer is discussed.*

From 1978 through 1980, the Media Development Project for the Hearing Impaired (MDPHI) at the University of Nebraska worked under a mandate from the Office of Special Education (formerly the Bureau of Education for the Handicapped) to discover how the new laser videodisc technology could best be used in the education of the hearing impaired.

This widely touted new medium was being promoted as the answer to the educator's dream. It presents both high quality visuals and dual-track audio through an ordinary television set and is virtually indestructible. It has high-density storage and can contain approximately 30 minutes of motion, 54,000 individual still frames, or a combination of the two on a single side. It can play in either forward or reverse at slow, normal, or accelerated speeds and can hold in a still mode any one of the 54,000 frames without harming either the disc or the player. It can also search accurately from one frame on the disc to any other in a matter of seconds.

The first seven videodisc programs developed by this project explored various aspects of this new technology's potential for educating the hearing impaired; they include strategies ranging from fairly linear programs designed for the home to more complex materials for individualized instruction at the junior and senior high school level. All the programs, however, were designed for use on a stand-alone videodisc player without an external computer interface.

With the eighth disc, the Project decided to develop a more highly interactive program to explore the feasibility and practicality of interfacing the video-

disc player with an external microcomputer. In this way the realistic, high quality visuals of the videodisc could join with the memory and branching capabilities of the computer to provide the hearing impaired with an interactive and individualized visual communication medium.

The project used an MCA DiscoVision 7820 videodisc player and a Radio Shack TRS-80 microcomputer to achieve this union of technologies. An IEEE port, a standard feature of the 7820 player, allows easy access for a two-way interface between the videodisc and the computer. Basically, the computer can be programmed to operate the player, and the player can indicate to the computer when it has executed one command and is ready for the next.

Unfortunately, this interface requires two monitors because of the incompatibility of the two video signals. One monitor displays the videodisc picture, while the other displays the computer graphics. For a young audience, and owing to the complex nature of the proposed disc, it was determined that the double monitor approach would be ill-advised, and therefore a prototype “black box” interface was purchased from the Nebraska Videodisc Group at the Nebraska Educational Television Network. This box is connected to both the videodisc player and the computer. The video signals are taken from the player and the computer, are made compatible, and are mixed before they are output through a standard RF cable to a television monitor. This enables both pictures to be displayed simultaneously on a single screen.

“Think It Through,” the videodisc that emerged to take full advantage of this hardware configuration, is designed to help develop independent thinking skills in intermediate-age, hearing-impaired students. Children, who often jump to conclusions or rely on others for the “right” answer, are carefully led through a structured and guided exploration of the decision-making process.

After the student is presented with a fully dramatized situation on the videodisc, he or she is asked to define the problem in terms of a question. The answer to this question is also the answer to the problem. Once the problem is defined, the student must select a hypothesis or solution that answers the question and then work through the proposed solution to see whether it is correct. This is known as hypothesis evaluation. Finally, the student is led by the correct solution to a conclusion and is congratulated for a job well done.

All the segments requiring motion and/or realistic visuals are on the videodisc, while print frames are



Videodisc/microcomputer system showing computer text overlay.

computer generated. As the student proceeds through the testing of solutions, the computer controls the branching logic and sends the videodisc player to the next visual segment. These visual segments can be motion sequences that freeze on the last frame, still pictures, or solid-colored still frames. The latter is used when the visual might interfere in one way or another with the overlaid computer graphics. Although single print frames can be placed on the videodisc and use a minimum of disc space, it was decided to use the computer in order to facilitate possible modification following field testing. Once a master videodisc has been made, whatever was placed on it is permanent and cannot be changed in any way. However, text generated by the computer can be easily modified, deleted, or added to.

Basically, three different types of instructional segments are computer generated. The first is information segments that present the user with additional information about the visual segment or about the decision that must be made next as students work their way through the evaluation of hypotheses. The second type is the menu or decision points. These segments present the student with a list of possible choices that can be made at a particular point in the program. By making a choice, the user selects the next branch he or she will follow. The branch might be a forward one to further explore a solution, a backward one to return to some previous point and start on a new path, or an informational one to clarify or define an issue at hand. Finally, the computer also generates help segments. When a student asks for "Help," the computer recounts the path already taken and spells out the choices that are now available.

Because the intended audience for these programs is the hearing impaired, the videodiscs themselves are also captioned by using an electronic character generator during the development of the videotape pre-master. The difference between the captions and the computer-generated text is that the captions are specific to the visuals on the disc and never change unless the visuals change. For example, when charac-

ters speak, their lines are captioned on the disc itself. Since the content of the speech cannot change, the content of the captions need not.

Each side of the videodisc contains a different program or problem, but both follow the same pattern and emphasize the same skills. By providing two entirely different situations, it is hoped that students will understand the decision-making process and be able to generalize it to other problem-solving situations in their lives.

The first program is a mystery concerning some missing food coloring. Mr. Jones, a grocery store owner, has suddenly discovered he is all out of food coloring and he can't figure out why, so he asks the student for help. It is then up to the student to work through the problem and discover what has happened to the food coloring. The program is not traditional computer-assisted instruction in the sense of programmed learning but rather is intended as a simulation of a real-life problem-solving situation. Instead of being given small, incremental instructional units with continual evaluation, reinforcement, and remediation, the student can explore various avenues of thought, changing paths at will, and there is nothing "wrong" with taking a path that does not lead to a successful conclusion. However, the student must constantly evaluate the validity and feasibility of the path he or she is following, and the instruction utilizes a guided approach to promote systematic testing and elimination of incorrect hypotheses.

After the students view the introductory sequence, the computer presents them with a short explanation of what it means to define a problem and then proceeds to list three possible definitions for Mr. Jones' problem. Because "Think It Through" tries to treat problem solving realistically, it generally avoids the concept of a single right answer. In this case, two of the three possible definitions that the student can choose are acceptable.

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Depending on the selected definition, the computer branches to a set of possible solutions. Once again, two of the choices will lead to successful conclusions. And within each solution there are several paths that will lead to an answer. In this way, it is hoped that the students will begin to understand that problem solving and decision making involve more than cut-and-dried, black-or-white responses.

Another aspect of this program is the character of Mr. Jones. Like most of us, hearing-impaired children tend to ask authority figures for the "right" answer rather than work through the problem themselves. In the mystery of the missing food coloring, Mr. Jones is set up as an authority figure and

students are frequently given the option of asking him for answers. However, more often than not, Mr. Jones does not know the answer and the student must find another way to get the desired information.

The second program, on the reverse side of the videodisc, concerns a young deaf girl who takes the bus alone for the first time in order to visit a friend. Her mother carefully explains how to get to the friend's house, but the girl does not pay attention on the bus and gets off at the wrong place. At this point the student is asked, via the computer, to define the problem. Once again, there are two acceptable definitions and several successful solutions for each definition.

Field testing to date has shown that students react positively to the instruction and find it fun. They generally like playing "detective" and solving the food-coloring mystery, and they identified with the young deaf actress who portrayed the lost child in the second program. In general, the programs prompted student involvement and positive response, and field testing showed that the instruction had an educational impact.

Examination of the student responses revealed that the learner used certain decision-making strategies,

especially in evaluating hypotheses. After realizing that a particular branch or path was leading nowhere, students would often retrack and select another path that appeared more promising. The structure of the program prompted testing and elimination of hypotheses in a systematic manner, and students were able to work toward a correct solution.

As with most software, however, field testing revealed some problems. Some of the computer-generated segments contained linguistic structures that were difficult for hearing-impaired students to comprehend. In addition, portions of the branching structure in the food-coloring program were found to be too complex, and a few students became frustrated when they did not appear to be making progress toward a correct solution.

The positive aspect about the program and hardware design is that the computer-generated text and computer-controlled logic can be modified fairly easily by rewriting certain sections of the computer program. The visual material on the videodisc can remain intact, while changes in the computer software modify the instructional program to more adequately meet the unique learning needs and styles of hearing-impaired students.

## MICROCOMPUTER AUGMENTATIVE COMMUNICATION DEVICES

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*The computer programs described here turn personal microcomputers into comprehensive communication and control prostheses for the most profoundly motor-handicapped, nonverbal individuals. A*

*wide variety of switches has been developed to allow for almost any handicapped individual's residual skills. The simply modified computer accepts the switch input and allows the individual to use a variety of selection techniques to form messages. Optional versions of the programs allow the printing of messages, speech synthesis, and environmental control. The evaluation, training, and prescription of an augmentative communication device for the handicapped individual is facilitated by the automated evaluation system.*

### Introduction

It is estimated that ten thousand children are born with cerebral palsy every year. Muscular dystrophies, dystonias, and other degenerative neuromuscular diseases affect thousands more annually. Diseases such as multiple sclerosis and amyotrophic lateral sclerosis claim adult victims. Other adults join this population of severely handicapped individuals by suffering internal neurological accidents such as strokes or externally induced brain or spinal cord injuries. Of this large population, many can be classified as profoundly handicapped because of their inability to interact with their world: they cannot communicate.