Interactive Videodisc Training for Roadway Maintenance

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An interactive videodisc system and training program developed for FHWA by the North Carolina Institute for Transportation Research and Education is described. The program includes instruction on various pavement structure repair techniques, including pothole patching, crack sealing, maintenance of gravel roads, ditch maintenance, shoulder maintenance, asphalt chip seals, and basic traffic control. The system hardware has been mounted in a heavy-duty container suitable for shipping. The system is designed to be used with minimal setup. The program is directed toward the highway maintenance worker.

An interactive videodisc training program, "Pavement Structure Repair Techniques," has been developed by the North Carolina Institute for Transportation Research and Education (ITRE). The program was designed for highway maintenance workers in local highway agencies and is intended to instruct the workers in the proper method of performing various pavement maintenance activities. Many millions of dollars are spent annually on the maintenance of roads, streets, and highways across the United States. Performing the maintenance in a proper and cost-effective manner will prolong their lives and benefit the public. It is therefore important that the highway maintenance workers performing these activities be instructed in the proper techniques to be followed. In the past, highway maintenance training has not been a high-priority item in many highway departments.

In January 1988, ITRE was awarded Rural Technical Assistant Project (RTAP) 46A, Pavement Structure Repair Techniques, by FHWA. The original contract required the preparation of seven professional-quality videotapes, each 15 to 20 min in length, for instruction on seven different highway maintenance activities: pothole patching, crack sealing, maintenance of gravel roads, ditch maintenance, shoulder maintenance, asphalt chip seals, and basic traffic control.

FHWA had previously completed an interactive videodisc training program on work zone traffic control. That training program had received a favorable response from FHWA and local highway agencies. Therefore, FHWA was interested in developing other interactive videodisc training programs. It was decided that RTAP 46A was an excellent project to further utilize the interactive videodisc training technique. In addition to producing the seven videotapes, ITRE was responsible for preparing an interactive videodisc training program on the same subject areas. Ultimately, the intent is to compare the effectiveness of the interactive videodisc training with that of videotapes. All seven videotapes have been completed and are being widely distributed. The development of the interactive videodisc program will be described.

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PROGRAM DESIGN

It was desirable to have all seven subject areas included on one side of a single videodisc. Compressed audio was a necessity to achieve the end product. ITRE subcontracted with United States Video Corporation in Vienna, Virginia, to assist in the technical preparation of the videodisc. By using the EECO compressed audio technology, it is possible to place up to 40 sec of audio into one stillframe on the videodisc. This was a key factor in being able to present all seven subject areas on one side of a single videodisc. The final disc contains 864 slides and video stills, 674 character-generated text screens, 100 segments of video totaling 21 min, and 3 hr of linear and compressed audio.

The program also uses the IBM Infowindows touch screen monitor. The touch screen eliminates the need for a keyboard. The target audience consists of highway maintenance workers generally with a high school education or less. Most of the workers are not computer oriented. The touch screen avoids an encounter with a computer keyboard. The intent is to make the student as comfortable as possible with the technology.

The program begins with a brief introduction that familiarizes the students with the methodology of the training program. The students are given a brief explanation of what an interactive videodisc is and are guided through some sample questions and responses.

After viewing the introduction, students must identify themselves by their initials (first, middle, and last) and their birth month. The unique identifier allows the program to track student responses. Software scores the students' responses to questions and reports the scores.

After the student is identified, a main menu is presented. The student can select any of the seven modules—the maintenance activities listed previously—from the menu. Each module is broken into segments. After selecting a module, the student encounters another menu, which allows the student to select a segment.

For example, in the ditch maintenance module the student would select from the following segments:

1. Introduction,
2. Ditch Maintenance Using a Motorgrader,
3. Ditch Maintenance with a Hydraulic Excavator, and
4. How Many Trucks?

The introductory segment briefly describes the purpose of and need for ditch maintenance. Segments 2 and 3 describe the details of two different methods of performing ditch maintenance. Segment 4 describes an easy way to calculate the

number of trucks required to perform the ditch maintenance. The menu also contains a selection to exit the module and return to the main menu.

Each module presents instructional material in clearly defined segments. The instruction includes the use of stillframes and motion video to illustrate maintenance procedures. After the instructional material, several questions are presented to the student. A total of 78 questions are included in the entire program, all of which are of the multiple choice or true-or-false type. Many answers are listed on a text screen, whereas others use split screen video images. The student responds to the question by touching the proper answer on the screen. If a correct response is chosen, the student receives congratulations and proceeds to the next question or segment of the module. If an incorrect response is chosen, the student receives remediation, and the correct answer is reinforced. After a review the student moves to the next question or segment of the module.

To make any selection, the student must touch the selection on the screen. The selection is then highlighted by a box. The student then must touch an enter box on the upper right-hand portion of the screen. The student may change the answer any number of times until pressing the enter box. This allows for a change of mind or for making a correction if a wrong answer is selected by mistake.

In addition, an escape box is generated by computer graphics on the lower right-hand portion of the screen. The escape box allows the student to interrupt the program at any point. The student can then exit the system and return at a later time to complete that particular module. The response-tracking program will save the student's responses to questions up to that point. The software will monitor responses to the remaining questions when the student resumes the program.

The program was designed to be used easily by the target audience. For the interactive videodisc system to be effective, highway maintenance workers must not be intimidated by its use. Every effort was made to make the program user friendly.

EQUIPMENT

As previously stated, the interactive videodisc system utilizes the IBM Infowindow touch screen monitor. An IBM PS/2 Model 30 microcomputer was selected because of its size. The EECO P-Cat 300 compressed audio decoder card is installed in the microcomputer to decode the compressed audio from the videodisc. A Pioneer LD-V6010A videodisc player is used. The IMSATT authoring system was used, and the United States Video Corporation did the system programming.

FHWA intends to send this system to various locations throughout the United States. The system is to be tested at several of the 42 RTAP technology transfer centers across the country. The technology transfer centers are jointly funded by FHWA and state highway departments. ITRE is the RTAP technology transfer center for North Carolina. Most of the centers are affiliated with universities and are established to provide technical training and assistance to local highway agencies. Many of the agencies have limited training budgets, and the technology transfer program provides quality training at a minimal cost.

For mobility the equipment is packaged in a heavy-duty shipping crate with dimensions of 27 in. x 45 in. The equipment was mounted inside the shipping crate by staff members in FHWA's electronics lab located in McLean, Virginia. The equipment is mounted on a frame in the crate that is held in position by heavy-duty shock absorbers. The monitor is mounted so that it is at a sitting student's eye level. The crate and equipment weigh approximately 200 lb. Heavy-duty wheels are mounted on the bottom for ease of movement.

All the equipment is wired to a single power strip located in the rear of the shipping crate. The equipment is packaged for use with minimum setup. Once the equipment is received, the front and back doors must be removed from the crate. A power cord from the power strip must be plugged in and the toggle switch flipped on. The system will automatically boot up. The operator can then respond to the touch screen monitor.

Initially, there was concern that the equipment might be damaged in transit. However, the equipment has been shipped several times without damage so far.

TRAINING EFFECTIVENESS

The next step is to compare the effectiveness of the interactive videodisc training with that of videotapes. Test groups will be selected in North Carolina and two other states. Half of the test group will view the videotapes in the more traditional training methodology. They will then be asked to respond to the same questions that are presented in the interactive videodisc program. The other half of the test group will work through the interactive videodisc program. The computer software will keep track of the percentage of correct answers. A direct comparison of the two groups will be analyzed.

FHWA is interested in the effectiveness of the interactive videodisc training technique. It has recently purchased several systems for in-house training use. However, there is some reservation about the effectiveness of interactive videodisc training among highway maintenance workers, who typically have a high school education or less. "Pavement Structure Repair Techniques" was designed to minimize the intimidation factor for these maintenance workers.

It is evident that FHWA recognizes the advantages of interactive videodisc, particularly for maintenance workers. The training is presented on an individual basis, and the student proceeds at his or her own pace. The student is forced to participate in the training activity. When merely viewing videotapes, students may have a tendency to daydream and miss important points in the material being presented. The interactive videodisc does not allow this to happen. In addition, when a student responds incorrectly to a question, interactive videodisc presents an immediate review and remediation. It is believed that this will cause the student to retain more knowledge.

FUTURE

The "Pavement Structure Repair Techniques" interactive videodisc program prepared by ITRE has been reviewed by

many highway maintenance engineers. The response to the program has been positive. It must now be tested with highway maintenance workers. FHWA is hopeful that the interactive videodisc will prove effective in training these employees. In the long run, proper and cost-effective highway maintenance procedures will save money and provide a longer life span for the country's roads, streets, and highways.

ACKNOWLEDGMENT

The interactive videodisc training program was developed as a part of RTAP 46A funded by FHWA. FHWA plans to use this along with other videodisc training programs. Related training information is to be available from the RTAP technology transfer centers nationally.