

# COMPUTER-BASED ENGLISH LANGUAGE TRAINING FOR THE ROYAL SAUDI NAVAL FORCES

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## ABSTRACT

The Defense Language Institute English Language Center (DLIELC) is responsible for the American Language Program. DLIELC training materials are used in large-group classroom and individualized language laboratory instruction. Materials may include printed texts for students and instructors, lesson audio tapes, book quizzes, performance tests, and training aids. With recent advances in training and speech recognition technologies, it is now possible to augment such materials with interactive computer-based exercises that use multimedia and voice input to teach English as a second language more effectively. Interactive training that combines audio with full-motion video, still photos, and graphic or animated visual cues has been shown to increase learner motivation by actively involving learners and providing individualized feedback and remediation.

This paper describes a program in which speech recognition technology has been combined with multimedia scenarios that simulate real-life situations and draw the learner into active use of the language. Using speech recognition allows students to improve their speaking skills by requiring them to repeat words and phrases until they are proficient. The system recognizes over 50 words and phrases. The system is currently being evaluated in Saudi Arabia.

## ABOUT THE AUTHORS

Dr. Katharine C. Golas is manager of the Instructional Systems Section at Southwest Research Institute. She began her career in Instructional Systems Development (ISD) in 1977, by using the Interservice Procedures for ISD Model to develop print-based exportable job training packages. During the past 17 years, she has directed over 75 ISD projects, including 20 interactive videodisc projects and 10 DVI® projects. She is currently directing research and development efforts using advanced multimedia training technologies. In 1992, she led a project team to redesign the Air Force ISD model and methodology. She has a Ph.D. and M.A. in Instructional Systems from Florida State University. **Address:** Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas 78238. **Telephone:** (210) 522-2094.

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Margery A. Negri has been with the Department of the Navy for 14 years. She has coordinated training programs for the Royal Saudi Naval Forces for over six years, with four years as the Specialization Schools Training Program Manager, and over two years as the Deputy of the Saudi Training Program Department at NETSAFA. She has an M.A. in Public Administration and Management.

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## BACKGROUND

The Royal Saudi Naval Forces (RSNF) use the Defense Language Institute (DLI) American Language Course (ALC) materials to teach English to all Navy personnel. The DLI course consists of classroom instruction and audio lab exercises. A prototype CBT English language training system was developed to support Book 10 of the DLI course. This language training system has also been designed with sensitivity toward some cultural factors that are unique to the client.

## TRAINING NEEDS

One of the most critical training needs today in the RSNF is the need for personnel to learn to speak English. All technical manuals and instructions given to personnel aboard ships are in English. RSNF students often come to the U.S. for advanced aviation and maintenance training. Although students usually receive an average of six years of instruction in English in grade school and high school, data indicates that the average student has a very low English comprehension level (ECL) upon entering the RSNF. Once they have completed basic training, the students go to one of several English language schools for about one year.

## DESCRIPTION OF DLIALC

The American Language Course (ALC) is taught at various RSNF schools and the Technical Institute for Naval Studies in Saudi Arabia. The ALC consists of 34 instructional modules (Books 1-34) for teaching English as a *Second or Foreign Language*, and is designed so that one book builds on the previous book to further language learning and acquisition. The average student takes approximately one year to complete the ALC. The ALC material focuses on four components of the English Language: functions, grammar, skills, and vocabulary.

## MULTIMEDIA SUPPLEMENT TO DLI COURSE

The RSNF reported to us that ALC materials do not work very well when the course is taught outside the U.S. because the students in Saudi Arabia do not have the opportunity to put what is learned in the classroom into context. For example, the content of Book 10 includes vending machines and shopping malls. When students go through the ALC at Lackland AFB in Texas, what they learn in the classroom is put into context by their everyday activities. They might use a vending machine or visit a shopping mall and actually use English in context. The few illustrations in the DLI course materials are pen-and-ink line drawings, which do not provide the realism required for the learning to be meaningful.

Research (Al-Juhani, 1991) indicates that computer-based training and videotapes are excellent instructional delivery systems for teaching English as a second language because information can be put into visual context. A full-motion video scenario with audio dialogue can be used as an advance organizer for the student. It ties the objective language elements for each lesson together. By observing these elements used together in an appropriate context, the student should gain a deeper understanding of the elements that he has already learned in the classroom and audio lab.

## DESCRIPTION OF TARGET AUDIENCE

The RSNF students in the target audience are between 17 and 31 years old and most have a high-school education. They are not computer-literate. They learn best through memorization and repetition, and tend to be literal, behaviorally-oriented learners. Their motivation is fairly high when they start the English language program but they become bored quickly. The average English comprehension level (ECL) for students entering Book 10 is 30-35 percent.

## CULTURAL CONSIDERATIONS

Based on feedback received from the RSNF, the following key cultural issues have been recognized in the CBT:

- There are no women in the CBT.
- There are no churches in the backgrounds, or crosses, bars, nightclubs, or any public place that allows dancing or dispensing of alcohol.
- There are no blatant attempts at humor or *mention of the King*.

## STRATEGIES

### General Instructional Strategy

Knowledge engineering techniques were applied during an initial study of the clients' training needs. The conclusion of this initial study was that scenario-based training techniques would be most effective in meeting the clients' cultural, cognitive, and affective requirements. Scenario-based training was accomplished by framing the lesson contents with a continuing story with characters who are present throughout the story. One of the characters is American and the other, more central character is a visitor in the United States from Saudi Arabia. The digital video story shows vocabulary and grammar from Book 10 used in everyday context. The scenarios and stories are presented on a computer screen using compressed digital video and audio. Other course material and text are presented on the same computer. The system is interactive and the student can use a mouse or touch screen to enter information. All exposition, text, instruction, and performance evaluation and testing are done through the same computer system. The students use a headset and microphone to interact through speech recognition hardware and digital audio record and playback. The speech interface gives students practice in vocabulary and pronunciation. At selected points within a lesson, video close-ups of a native speaker's mouth during speech are displayed. The student can use the video to correct the position of his own mouth parts, then speak and compare his pronunciation to that of the native speaker.

### Interactive Design Strategies

Over 30 interactive instructional strategies were designed for the program. For example, one strategy employed video vignettes with "cliffhangers." Each of

the four lessons in the program ends with an event where the two characters are in trouble. In Lesson 1, they lock their keys in the car and in Lesson 2, they lose each other at a shopping mall. In Lesson 3, they have a flat tire and in Lesson 4 the person they go to the airport to meet is delayed. Since the program is integrated with the classroom instruction (i.e., the student receives Lesson 1 in the classroom, then goes to the CBT for Lesson 1), the idea behind the cliffhangers is to motivate the student to complete the CBT lessons so they can see what happens to the characters.

Another strategy uses dialog practices where the student "speaks for" one of the characters in the video and then can replay his own speech or hear the character repeat the phrase. Games are also developed where students watch a video segment and then select the subject, verb, and object of the verb by speaking directly to the computer. Another strategy is a game where the student takes orders for snacks from three of his classmates. The student then selects the appropriate items from a vending machine and gives each item to the person who asked for it. If he gives the correct item to the classmate, the classmate says "thanks." If he tries to give a classmate something he did not request, the classmate says "I did not order that!" Another strategy shows two events happening in a certain order and asks the student to identify the correct adverb clause of time for one of the events. Word order is practiced by showing the student a photograph or video sequence and asking him to select a sentence that describes the action in the correct order. Another exercise shows a family tree and asks the student to identify how the individuals in the family are related by speaking directly to the computer.

### Speech Recognition Strategies

Speech recognition (SR) technology is an interface technology that makes it possible for a computer user to issue commands and instructions to a computer using spoken words alone instead of a keyboard, mouse, or other interface device. Speech recognition (sometimes miscalled "voice recognition") is possible because of advances in digital signal processing (DSP), computer programming, and psycholinguistics. SR depends on the fact that speech utterances have distinct and characteristic acoustic properties. Psycholinguistic research has shown how the human ear and brain process acoustic sounds and many of these processes can be performed by DSP chips hosted on a small personal computer. Many different

recognition algorithms have been developed for DSP chips and board sets.

The system selected to support the speech recognition strategy on the CBT was VoiceTools from Dragon Systems, Inc. The following criteria were used to select this SR hardware:

1. Speaker independence
2. Isolated speech (up to 4 seconds long)
3. Recognition accuracy
4. Vocabulary size/customizability (110,000-word vocabulary)
5. Windows compatibility
6. C-language drivers
7. Single-board commercial off-the-shelf product
8. Compatibility with Action Media II, other system boards, and controllers

The English language CBT uses speech recognition subject to the following general principles:

1. The total vocabulary is limited to 300 utterances or less.
2. A maximum of seven utterances from the vocabulary are compared to one another at any time.
3. The speech recognition system is speaker-independent and trained to recognize new speakers with Saudi accents.
4. Users are provided with escape pathways in the event of recognition failure. Human factors considerations led us to the conclusion that no more than three exchanges involving the same word must take place. The programming logic will recognize the constraints and provide for escapes.
5. SR use **never** interferes with or degrades student learning or instruction. SR is used only where it is appropriate and effective.

The English language CBT employs SR technology in two ways:

1. Phonemic stress drills on a subset of Book 10 vocabulary words and phrases.
2. Selection of correct answers to various exercises.

Phonemic stress drills were chosen because of a recommendation from experts in teaching English to non-native speakers. English is a stressed language and many failures of understanding are the result of

incorrect syllabic stress. Moreover, stress patterns can easily be detected by isolated-speech, speaker-independent systems. The number of utterances that must be compared at any one time is a simple permutation of the number of syllables in the utterance and can therefore be constrained.

SR is used in approximately half of the instructional strategies, as described previously.

### **Feedback and Student Data Collection Strategies**

If the student gets a correct answer the first time, he is given positive feedback that he was right. If the student makes a mistake on the first attempt, he is told to try again. If the student is wrong twice in a row, he is given the correct answer. The system provides feedback which is generally very positive. The student is never told directly that he is wrong. He is told either to try again, or is given the correct answer. We chose this method of providing feedback to avoid discouraging the student in any way.

The CBT keeps track of student data as follows. For the exercises, data is collected on each input the student has made. We know on which try (first or second) the student was correct or whether the student did not get the correct answer at all. A percentage score is tabulated for each section, and a total score is tabulated for the entire program. A posttest at the end of the program covers the key learning objectives of the CBT supplement. The test contains a selection of interactive exercises and data is collected to show how the student performed on each exercise.

### **CBT SYSTEM SPECIFICATIONS**

The system provides approximately 5 hours of interactive instruction and consists of 30 minutes of full-motion video (all-digital format); 70 minutes of audio, 210 still photographs, and 82 graphics.

Table 1 shows the hardware and software system for the CBT Saudi Language Program.

### **REPORT OF EVALUATION DATA**

#### **Instructional Effectiveness**

The CBT supplement was evaluated first at Lackland AFB in San Antonio, Texas, and later in Saudi Arabia.

Table 1. CBT System Specifications

|                        |  |
|------------------------|--|
| <p><b>Hardware</b></p> | <p>CompuAdd 486DX/66 with 20 MB of RAM<br/>         Quantum 1010is 1.2 Gigabyte SCSI hard disk drive w/controller (Adaptec 1540B)<br/>         Microtouch 20" touchscreen monitor (Mitsubishi)<br/>         Diamond Viper Vesa Local Bus VGA card w/2 Meg RAM<br/>         Logitech MouseMan (3-button)<br/>         Teac Dual floppy disk drive (3 1/2" and 5 1/4")<br/>         Intel Actionmedia II Digital Video Accelerator<br/>         1/8" male stereo to 1/8" male stereo cable<br/>         Pro Audio Spectrum 16-bit audio card<br/>         Altec Lansing Speakers, AC 550 (pair)<br/>         IBM M-Audio capture and playback adapter (comes w/VoiceTools)<br/>         Shure SM-10 microphone headset (comes w/Voice Tools)<br/>         Shure SM-11 microphone and 6-foot adapter cable (female XLR to male stereo)<br/>         Toshiba double-speed CD ROM drive (optional)<br/>         4mm DAT tape backup unit (optional)</p> |
| <p><b>Software</b></p> | <p>DOS 6.0<br/>         Windows 3.1<br/>         Dragon Systems, Inc. VoiceTools (user version)<br/>         Novaback Backup and Restore Software version 1.01 (optional)</p>  |

One Saudi Arabian student enrolled in the DLI American Language Course at Lackland AFB completed the CBT supplement in 4½ hours. The student was enlisted in the Royal Saudi Air Force and had just completed Book 10, receiving a score of 72% on the Book 10 quiz.

General comments based on student performance:

1. The student really enjoyed the video story of Saad and Tom. He asked a lot of questions about Saad and wanted to know where the story was filmed. He enjoyed the reference to buying better coffee for Hassan and the use of the term "Inshallah."
2. The student used the mouse and touchscreen about the same amount of time. He tended to use the touchscreen whenever there was a graphic, and the mouse when text appeared.
3. The student's attention span was very short. He did not seem bothered at all about the pauses on the program when the computer was searching for a video sequence. He seemed to enjoy having the short wait while the computer was bringing up the information.
4. The student had no trouble with the user interface. Once he had completed Lesson 1, he seemed comfortable with the NEXT button, and he knew to click on the microphone icon before he spoke to the computer for voice recognition and the tape recorder icon to record his voice. The only real problem was that he kept saying the voice

recognition words only one time (instead of twice).  
 5. The student was enthusiastic when he pronounced a word correctly and the computer said "GREAT!" He really wanted to get the answers correct.

The system is currently in Saudi Arabia undergoing a formal evaluation. The purpose of the In-Kingdom evaluation of the CBT supplement to ALC Book 10 is to answer the following questions:

1. What effect does the CBT supplement have on learning the American language? Does the data indicate an **immediate** increase in student ability to speak and understand the American language at the Book 10 level?
2. Does the CBT supplement reduce training time?
3. Does the CBT supplement have an effect on the enthusiasm of the students toward learning the American language? Are the students more motivated to continue with the American Language Course because of the introduction of the CBT?
4. Are some of the instructional design strategies used in the CBT more effective than others at teaching Book 10 content? Instructional strategies include dialog and dialog practices, simulation exercises, speech recognition exercises, grammatical drills, voice record and playback exercises, and the full-motion video "story" of Saad and Tom.
5. What is the instructor's reaction to the use of CBT in English language training?

## SUMMARY

A common mistake with many CBT development efforts is that people use the computer to teach things that are best taught using other instructional delivery methods such as print materials (textbook) or classroom instructor-led. The Book 10 CBT supplement does not require the student to **read** a great deal of text off the machine (better achieved with the student text) or **write** a lot. The target audience has minimal word processing and keyboard use skills. The CBT design capitalizes on what the computer does best:

1. Present realistic scenarios through multimedia so the student can learn to speak English in a real-world context.
2. Expose the student to the use of grammatical structures and idioms within a narrative context.
3. Allow the student to recite words and phrases out loud and be able to immediately replay his lines and hear how he did in comparison to the expert.
4. Let the student practice pronunciation and get corrective feedback.
5. Let the student **hear** the correct pronunciation of words and phrases as many times as he needs to.

Data should be available in late 1994 to determine effectiveness of the CBT.

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