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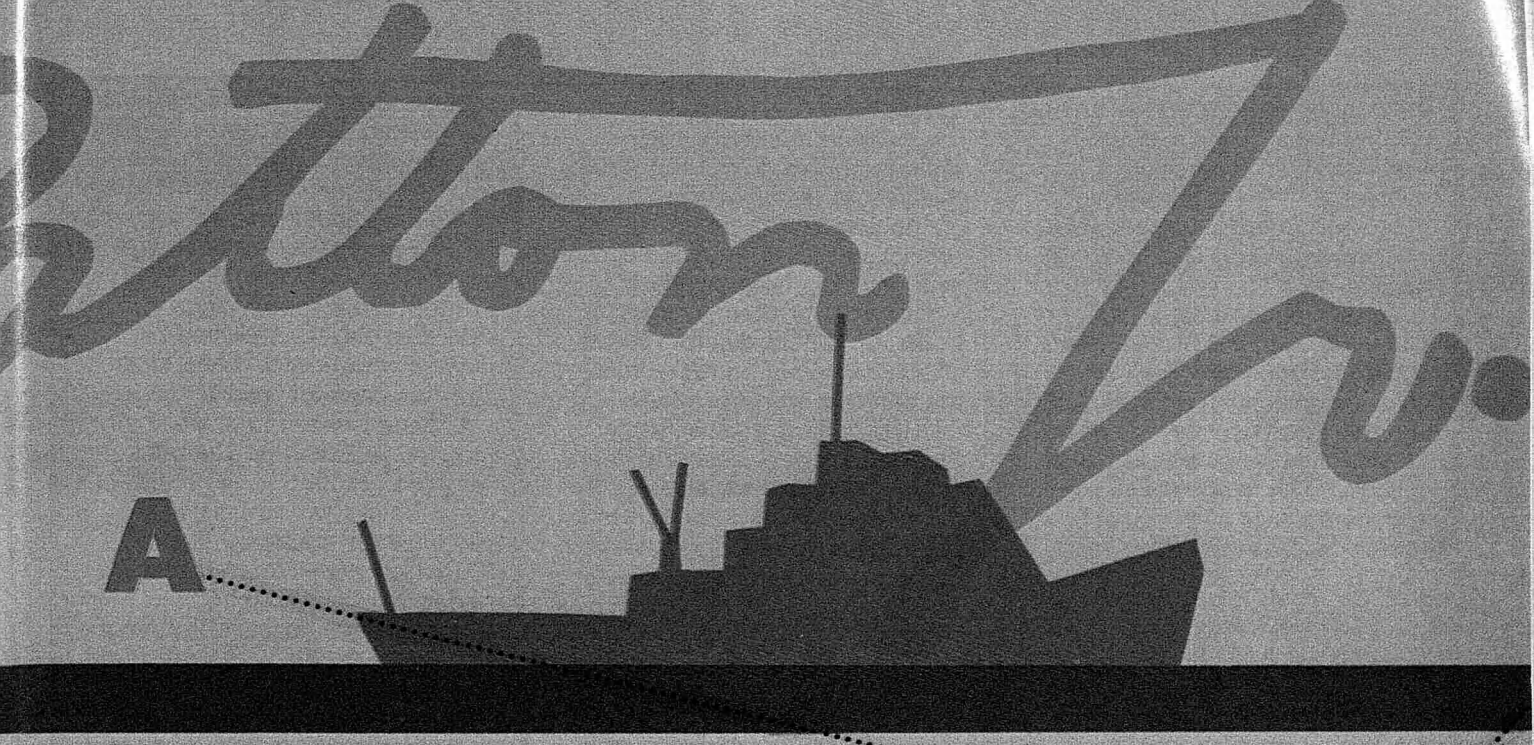

TEACHING BASIC SKILLS WITH COMPUTER GAMES

By SHARON BROWNFIELD and GRETCHEN VIK

A 1979 Ford Foundation report found that 60 million native-born Americans were functionally illiterate. When 60 million potential members of the labor force can't read classified ads, instruction manuals, package labels or file labels, American industry should have an interest in helping to solve the problem.

Like industry, the military has been increasingly concerned about recruits' lack of basic skills. The issue was given national exposure by columnist Jack Anderson in February 1982, when he noted that almost 40 percent of the Army's junior enlisted personnel read below the 5.5 grade level, which means that they are functionally illiterate by United Nations standards. At the same time, like industrial machinery and processes,

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military operations and weaponry are becoming more technically sophisticated. They require operators who can master complex skills quickly and, therefore, trainees who have command of basic skills.

To help employees, Dow Chemical, General Motors and Philip Morris, along with more than 20 other major companies, sponsor reading improvement programs at work and in public schools.[1] The military also supports a number of remedial programs. Because Congress mandated in 1977 that all the on-duty educational programs of the services be specifically related to job performance, basic training in reading, math and language must now be taught in job context, rather than as part of a general education curriculum. The premise of the change is that training and successful job performance are based on possession of certain basic skills.[2]

In the past, some of these educational programs have used traditional classroom and print-based approaches. However, the constraints of remote sites, irregular work schedules and personnel shortages make training in a traditional classroom setting very difficult. The Army, a leader in the use of technology for education and training, hired the Center for Instructional Development and Evaluation (CIDE) at the University of Maryland University College to design an instructional system that would provide individualized, self-paced literacy lessons.

The Army specifically requested that the instruction:

- provide information in military contexts by using Army manuals as lesson sources;
- motivate soldiers whose previous educational experience had generally been negative;
- develop problem-solving skills that would require the use of the functional literacy skills the students were learning.

CIDE took up the challenge. Through analysis of needs, interviews and Army manuals, a core of basic skills that soldiers need to perform their assigned tasks was identified. These were reference skills, reading expository text, following directions, graphic analysis, completing forms, mathematical concepts and computation and problem solving. These skills were then arranged in a learning hierarchy so that lessons could be structured to build on what students had previously learned.

The hardware system

The structure of the instructional system was based on both research on the characteristics of adult learners and the potential of new technology. Research indicates that adults are used to autonomy and prefer self-directed learning. And the fact that the student is able to choose when, what and how much to learn about a topic at one sitting is one of the greatest advantages of computer-assisted instruction (CAI).

Because the project for the Army was a research and development effort, CIDE was able to experiment with the design of a system that could take advantage of the latest technology and, in some cases, direct technological development. In the first year, the project made extensive use of computer-based instruction and supplemental use of the videodisc component. The system consisted of a Cromemco microcomputer with a 64K memory supported by two 8-inch floppy disc drives, a 21-inch intercolor terminal with eight colors, a Centronics printer, and a DiscoVision videodisc player. A second monitor was needed when videodisc was used for instruction.

Although this system was received favorably at the pilot sites in Germany, it had limitations. Using two screens was awkward for students. The limited memory required that students be responsible for changing discs during the course of instruction.

A major goal for the second and third years, therefore, was to make the system's operation as simple as possible to the user. This goal was achieved by designing a hardware system with a single integrated screen for video, computer text and graphics; a 10-megabyte harddisc storage; and a touch-sensitive screen.

The integration of the video and computer signal on a single screen allowed for more creative use of the videodisc to support instruction as well as to motivate. This new system configuration offered the developers a wide range of instructional strategies—video images (still and motion), computer graphic overlaps, masking of video images and audio, with or without video—in addition to the wide range of options available through traditional CAI.

Table 1.
Gagne's Instructional Events

1. Gaining attention.
2. Informing learner of lesson objective.
3. Stimulating recall of prior learning.
4. Presenting stimuli with distinctive features.
5. Guiding learning.
6. Eliciting performance.
7. Providing feedback.
8. Assessing performance.
9. Enhancing retention and learning transfer.

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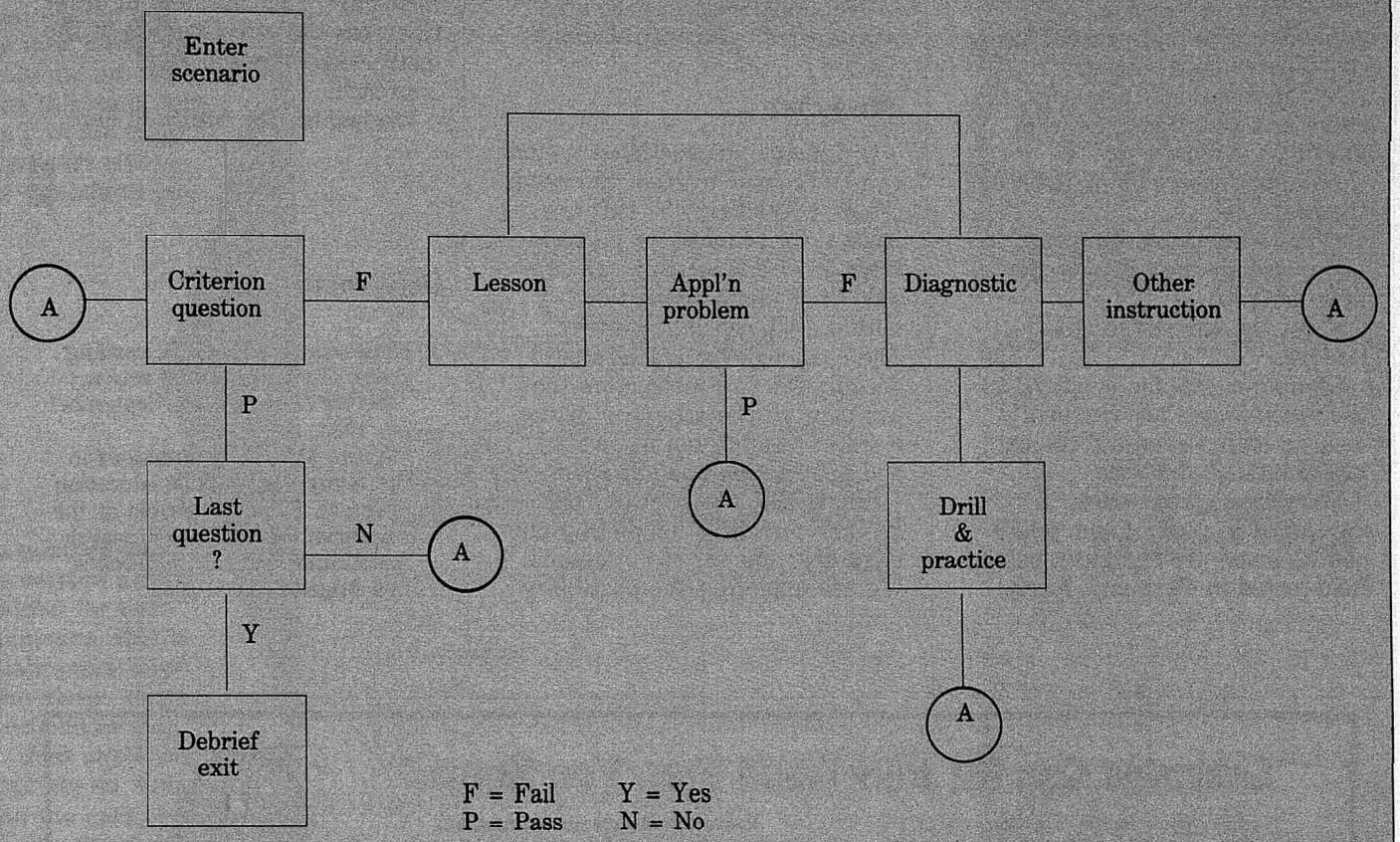
Figure 1.
Flow Chart



The instruction

To go with this sophisticated hardware system, CIDE needed to develop highly engaging and effective instruction. Capitalizing on the target audience's interest in video games, CIDE invented a game-like scenario to entice and motivate soliders who needed to improve their basic skills.

From this came STARS—the Space Time Army Reconnaissance System. As members of an elite time travel force, soldiers travel through time and space to exciting new worlds where they must apply their functional literacy skills to accomplish their missions. One mission was to get General Patton to sign a requisition, proving that the time machine worked; another was to recover a Chaparral missile carrier and perform maintenance activities while moving it from one location to another. Soldiers earn time-warp energy units as they progress through the lessons and win game-playing time by acquiring these units.

The instructional flow of a lesson appears in Figure 1. Assessment questions are built in as part of the game activities. Failure to pass a question drops the student into a lesson which is structured according to Gagne's CAI model (outlined in Table 1).

Various instructional strategies are used at each point in Gagne's model. At some points, several steps in the model, such as gaining students' attention (step 1) and informing the student of the objective of the lesson (step 2), are combined. When the skill being taught is very basic, no recall (step 3) is included in the lesson. Usually, the purpose of the lesson is communicated to students through audio, computer text, motion sequences and/or stills. Whenever possible, the basic skill being taught is set in a military context and tied to specific MOS job-related tasks. The application problem used in assessing performance has the student apply the skills in a specifically military setting.

Throughout the lessons video and audio from the videodisc are used for instruction and motivation.

For instructional purposes, the videodisc is used to:

- present stimuli with distinctive features, e.g., a close-up of a legend on a map to highlight symbols for graphic analysis;
- guide learning, e.g., a motion sequence in which the students must report what was seen;
- elicit performance, e.g., a series of drawings out of sequence that must be reordered

according to directions;

- provide feedback, e.g., audio that indicates right or wrong answers and the need for further study;
- enhance retention, e.g., game-like drill and practice using coordinates on a map grid.

For motivational purposes, the audio and visual images from videodisc are used to:

- support the gaming aspect of the scenario;
- provide encouragement;
- direct the students to the next activity;
- set the context for the lessons.

Computer graphic overlays on the video image are frequently used to help students focus on key points.

Sixty-five lessons were developed as part of last year's contract and are currently being field-tested in Germany. Early evaluation results from the previous year show that the lessons can actively involve students for up to 20 hours of intensive instruction and that the instructional system performs with over 90 percent reliability.

The future

A dynamic instructional system can be created to meet the needs of adult learners who lack the basic skills required to perform their jobs. This system can provide basic skills instruction within a job-relevant context. The challenge for trainers is to design effective instruction that can capture the attention of the learners, keep them motivated and provide job transferability.

What's the future for CIDE? We are currently completing our third disc and set of 65 lessons. We are exploring the possibility of strengthening the gaming aspect of the scenario and the link between basic skills and military tasks. We are also looking carefully at the evaluation information from the field in order to assess the effectiveness of the instructional system and approach.

We believe the future is here.

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