Hypermedia and Direct Instruction: Do the Paradigms Fit? A Demonstration of a Learner-Centered Hypermedia Program in Classroom Observation Skills

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Objectives for the Hypermedia Program

The primary method of objectively measuring children's behavior in classroom and playgroup settings is through systematic behavior observation in which a child of concern is studied in relation to peers in the same situation (Walker & Hops, 1976). To gather data objectively and reliability, observers must undergo rigorous training and reliability testing. The training process must provide a method to learn a behavior code, practice in simulated and real settings until proficient, and measure coding reliability. Training time and protocols are extremely demanding. The usual training method involves an apprenticeship model where a "master" coder explains the procedures, demonstrates via videotapes, provides practices through videotapes and live observations, and undertakes reliability testing with tapes or live observations. The process can take 40-60 hours to bring a novice observer to the minimal acceptable level of 80% accuracy. It is not feasible to spend this amount of training time on one assessment procedure within most teacher education programs. Consequently, systematic observation procedures are rarely fully taught outside of research or clinical settings (Fitzgerald, 1995).

To become a competent observer, one must learn a behavior code and procedures, practice in simulated and real settings until proficient, meet established standards for reliability, and learn to interpret observation data. These skills take an investment in training and practice time. Typically, observers are trained through a combination of didactic instruction, work with videotapes, guided practice with a "master" coder, and "in situ" reliability checks. This training protocol is time and person intensive; it can take 40-60 hours to bring a novice observer to the minimal acceptable level of 80% accuracy. It is not feasible to spend this amount of training time on one assessment procedure within most health care training programs. As a result, full training is rarely provided health care personnel and observational data are based on subjective, informal procedures.

An alternative delivery approach for training personnel in observation skills is interactive multimedia technology. The program being demonstrated, *The Classroom Behavior Record: School Version,* is a complete training program in an observational procedure and code for educators and health care professionals (Fitzgerald, & Semrau, 1997). The purpose of the program is to provide efficient and effective training in a flexible, learner-centered, hypermedia format. The current program being demonstrated) utilizes a repurposed interactive videodisc (Semrau & Fitzgerald, 1996) with new software designed to enhance user recordkeeping and authentic practice while maintaining pedagogical effectiveness based on the stages of learning model.

Description of the *Classroom Behavior Record* Observation Procedure

CBR was developed at The University of Iowa Hospitals and Clinics by the educational staff in the Child Psychiatry Service Unit (Nichols, Robinson, & Fitzgerald, 1979). Its purpose is to provide a method of systematic observation to document children's behaviors in naturalistic settings for use in diagnosis and treatment. The original CBR code was comprised of 38 positive and negative behavior codes to provide a detailed and specific description of behavior. The coding procedure involves coding the behavior of a target child in six-second intervals, while coding the behavior of peers in the same situations on alternating six-second intervals. Thus, the data provide a comparison of the target child to his/her peers under the same situational expectations. Results provide a clinical method to evaluate treatment effects through the use of normative peer data (Walker & Hops, 1976). CBR data are used to understand youngsters' difficulties as they occur in natural settings, to establish treatment goals, and to monitor treatment effects, particularly medication. Using the prevalent, apprentice-based model of training, it typically took 40-60 hours of one-on-one training time to bring a new observer to necessary reliability levels to implement the CBR data collection procedure.

In the *Classroom Behavior Record (CBR) Observation Training Program*, video and audio scenes of children in classrooms/playgroups and instructional narrations are stored on three videodiscs. A seven-module computer program delivers instruction through text, graphics, animation, and videodisc material; provides feedback on practice activities; and controls delivery speeds.

The codes in the CBR-School Version are:

Positive Behavior Codes		Negative Behavior Codes	
AT	Attend/ On-task	**FA**	Fail to Attend/ Off-task
IM	Incidental Motor	**PL**	Play with Object
II	Instructional Interaction	**MN**	Motor/ Noise Obtrusive
PP	Positive with Peer	**DD**	Disruptive, Destructive
PT	Positive with Teacher	**NP**	Negative with Peer
CO	Comply	**NT**	Negative with Teacher
AG	Approval Received	**FC**	Fail to Comply
V1-V2	Open Positive Variables	**DG**	Disapproval Gained
		V3-V4	Open Negative Variables

Instructional Design of the CBR Training Program

Direct Instruction Model

The overall design of the training program is based on the *Stages of Learning Model* as initially described by Gagne (1974) and adapted to computer-based instruction (CBI) by Criswell, 1989. Learning is viewed as a systematic, developmental process with the learner progressing through stages of acquisition, fluency, generalization, and maintenance. Anderson (1980) describes stages in skill acquisition as being a cognitive stage to learn about the skill, an associative stage in which a learner practices the skill, and an autonomous stage in which a learner improves the skill performance.

These models are very helpful in determining an effective instructional design for skill-based instruction. Criswell (1989) posits that effective instruction requires a match between CBI design and learner objectives as reflected in progressive, changing performance. Effective instructional design should facilitate the mastery of learning objectives at each stage in the hierarchy. The teaching approach at each stage must change to support differing goals for the learning. The schema displayed in Figure 1 depicts the organization of the CBR training program. Design of the modules within the CBR program have differing design features to support acquisition, fluency-building, and generalization of skills in behavioral observation.

Hypermedia Design Elements

Despite an overall high level of organization and structure, the modules in the training program can be accessed in a nonlinear manner to meet different learner preferences. Movement across learning activities is easily executed by opening the different modules. To facilitate learner control within the modules, the program frequently stops and allows the learner to repeat segments, advance or restart drills, and check scores. In the tutorial modules, all subjects are listed on a pull-down menu which can be accessed at any time. Advisement for the learner is inserted into feedback on the drills which suggest levels of proficiency for each fluency drill. In early studies with this program, differences were observed in users' sequences, although most users follow the organizational pattern and embedded structure within the training program (Fitzgerald, 1995).

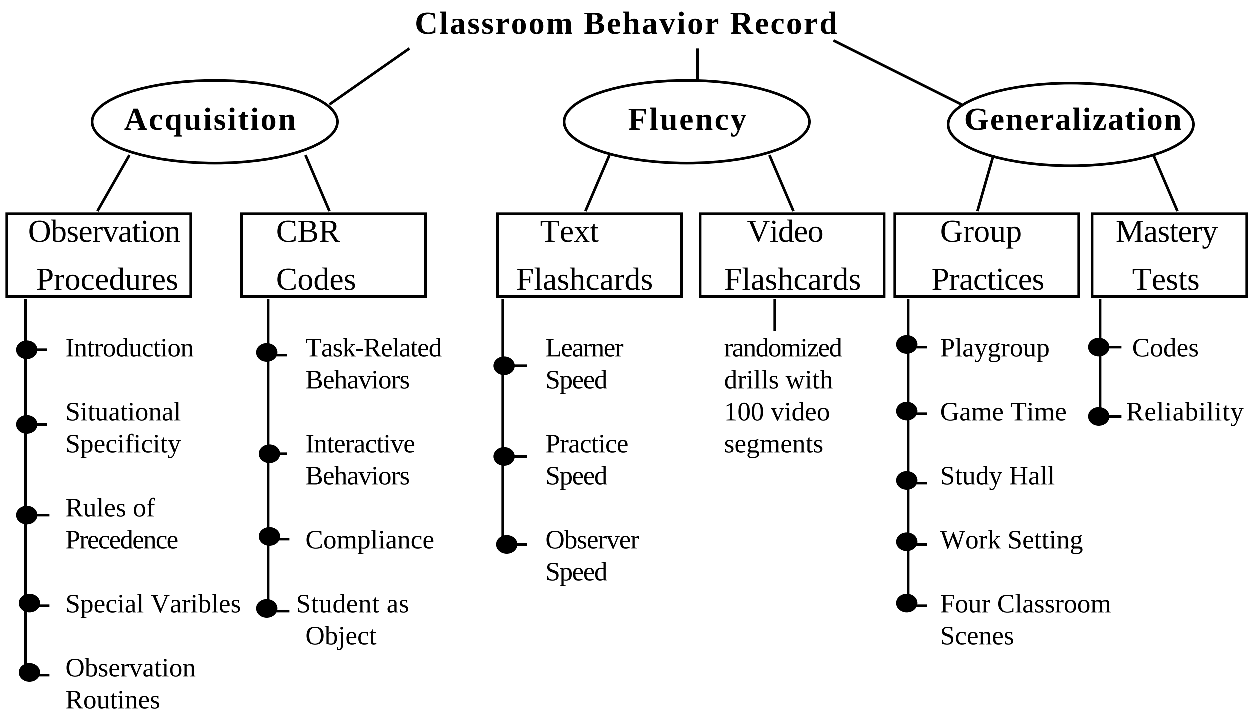

Figure 1. Matching CBR Training Modules to the Stages of Learning Model

Acquisition

The learner's instructional goal at the acquisition level is to acquire new knowledge or skills. The CBR training program includes a series of tutorials with short practices embedded within each concept or skill. The teaching hierarchy is simple to complex, based on the structure of the knowledge and skills needed in this observation system (Kelly, Orgel, & Baer, 1985). These procedural tutorials provide information through narration, screen notes, video demonstrations, and guided practice segments with feedback.

In the *Observation Procedures* module, tutorials are used to explain the importance of gathering objective observation data, studying behavior within contexts, using the open variables to define behaviors of special interest, following a hierarchy of rules for making coding decisions, and coding the child and peers' behaviors on alternating intervals. A four-minute practice is provided for the user to apply the coding rules of precedence. The practice stops at the end of each minute to allow the user to enter his/her codes and compare entries to correct answers. Another practice activity allows the user to practice the alternating interval routine with a group of four youngsters. The computer guides the user through coding one student as the target and the other three peers using the alternating interval routine. The practice stops each minute to allow the user to enter codes, see answers, and repeat if desired. See Figure 2 for an example of a tutorial screen in the *Observation Procedures* module.

In the *CBR Codes* module, the behavioral codes are taught in four groups of related behaviors: task-related behaviors, interactive behaviors, compliance, and student as object. For each code, the behavior is defined and three video examples are shown. In addition, brief practices are available within each category for practice differentiating and using the codes. When errors are made, feedback is provided to explain the critical attributes of each code. These practices are untimed since they focus on mastery of the codes, not speed of coding. Figure 3 displays the tutorial screen and practice choices available for the group of task-related behaviors.

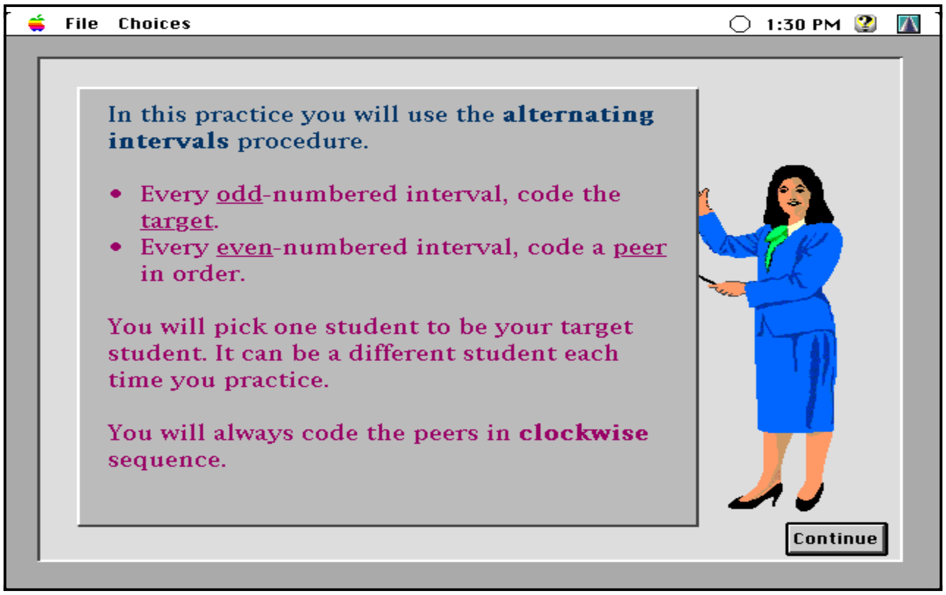

Figure 2. Tutorial Screen for the Observation Routine Practice

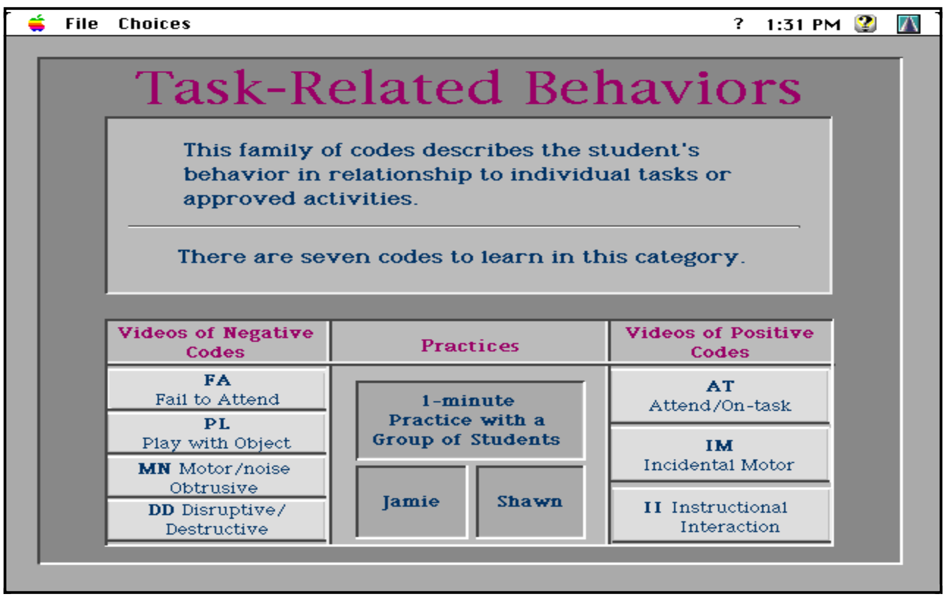

Figure 3. Tutorial Screen for Learning Task-Related Behavior Codes

Fluency

Following acquisition, the goal of instruction is for the learner to use the knowledge and skills in a fluent manner (Criswell, 1989). New information should become automatic so it can be re-called without undue cognitive processing. The CBR training program includes two components for building fluency.

In the *Text Flashcard* module, brief descriptions of behavior are displayed in text on the screen. The format for the text flashcard is displayed in Figure 4. There are approximately 100 text flashcards which are presented in random order at three controlled speeds, allowing a limited time to read the description and enter the user's code into the computer keyboard. The correct code is given and explained if the user enters an incorrect code or if time runs out before the code is entered. A running score is provided the user along with suggested levels of achievement for increasing the practice speed. The goal is to obtain fluency at the six-second speed needed for actual behavior coding with the CBR procedure. Rapid responding to these flashcards builds automaticity in remembering the codes.

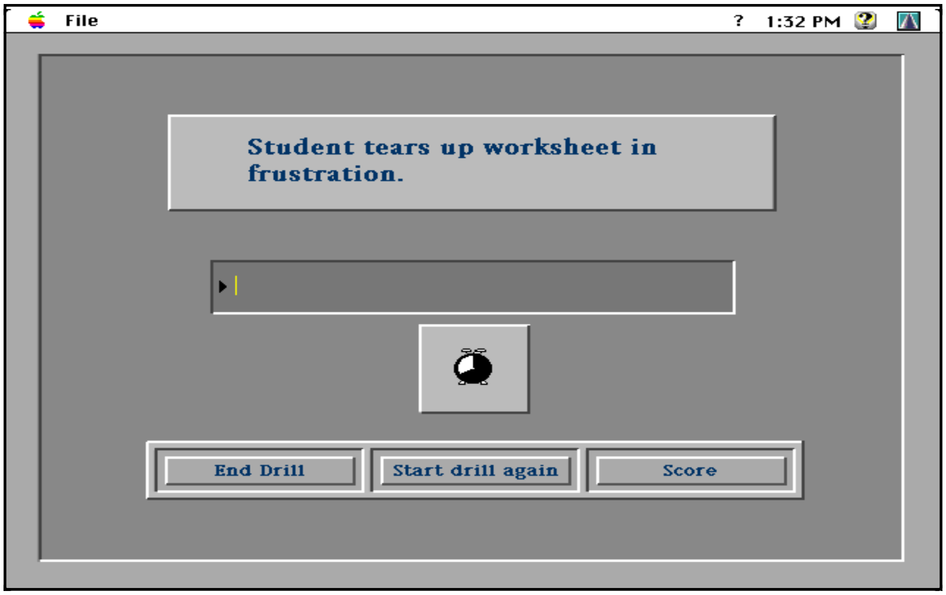

Figure 4. Text Flashcard Drill Card

The second fluency-building module, *Video Flashcards*, provides a more realistic coding simulation because it uses actual video scenes of children. In addition to continuing to build speed and accuracy, the fidelity of the practice is increased in this phase of instruction (Alessi, 1983). The format for the video flashcard is displayed in Figure 5.

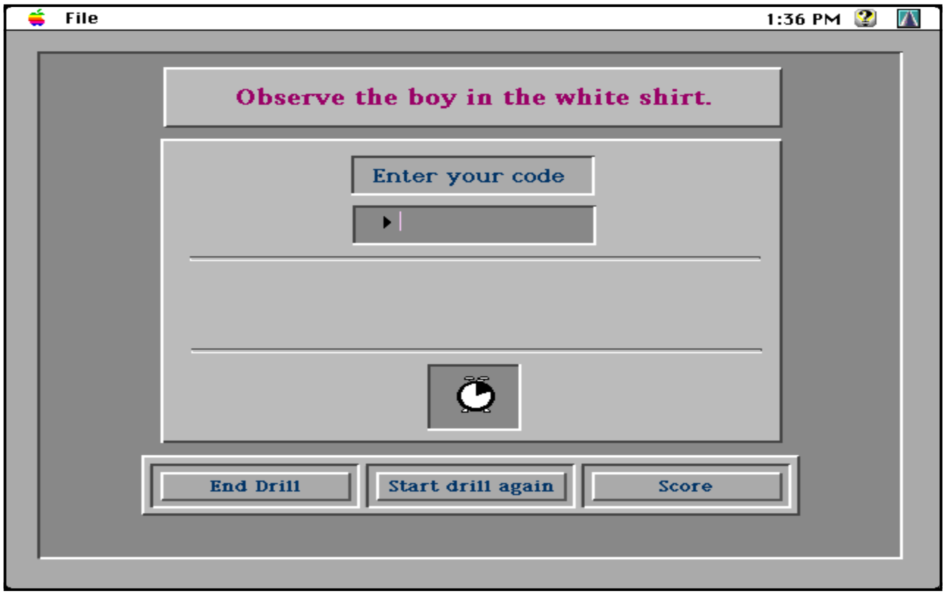

Figure 5. Video Flashcard Drill Card

The flashcard module has 100 brief video clips displaying classroom behaviors which are displayed in random order. The user is allowed 3 seconds to enter his/her code following the video segment. The correct code is given and explained if the user enters an incorrect code or if time runs out before the code is entered. A running score is provided the user along with a suggested level of achievement to have mastered the fluency module of the training. Through these video flashcards, users increase their ability to rapidly interpret and code behaviors visually observed in youngsters in a wide variety of situations

Generalization and Maintenance

Goals at the generalization stage are for the learner to apply knowledge or skills in the way they will be used "in situ" and to practice to mastery. The practice situations must be similar to those used during instruction but offer mixed practice with new, realistic scenarios (Kelly et al., 1985). Classroom and playgroup scenes are included to provide extensive practice for the learner which simulate the job of an observer in psychiatric and educational settings.

There are a total of eight scenes in the *Group Practices* module providing practice opportunities with a total of 18 different youngsters varying from ages 5 to 15. The scenes show youngsters in play group and classroom situations. These practices follow the actual CBR procedures: the user alternately codes the target student and peers with a continuous six-second interval and marks his/her codes on a paper/pencil recording form. Each segment runs for 10 intervals (1 minute) and then pauses to allow the user to enter his/her codes and compare codes to those of the master coder to discern differences and compute reliability based on the 10 intervals. The user may choose to repeat each minute for review or continue forward. Figure 6 displays the format for data entry. In this example, Mark is the target child and BJ and Ky are peers.

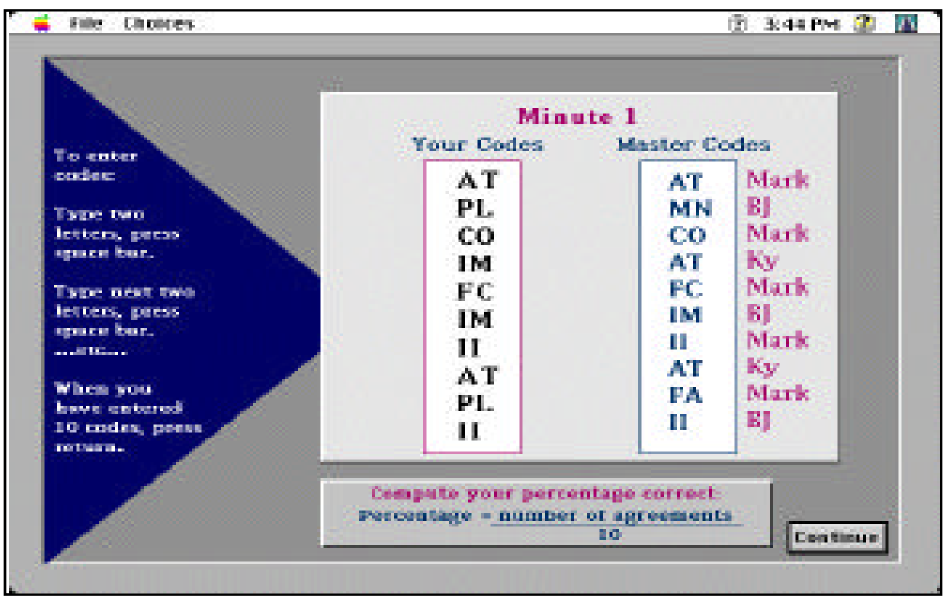

Figure 6. Data Entry Screen for Classroom Application

The CBR program includes two methods for testing mastery of coding and reliability. In the *Codes Test* module, 30 video flashcards are displayed for six-seconds each and the user marks the code on a paper/pencil recording sheet. This test is designed to test accuracy in coding and allows the user adequate time to think and enter his/her codes into the computer. Approximately half the video segments are new to the user as they were withheld from prior practice. Results are provided the user following the test.

The second testing module, *Reliability Tests*, operates the same as the *GroupPractices*. Four youngsters are displayed in the video and each may be selected as the target child; thus, four reliability tests can be run in this module to check mastery and maintenance over time. The test is five minutes long (50 intervals) and the user codes target and peers on alternating intervals, marking the codes on a paper/pencil coding sheet. When the test is completed, the user enters his/her codes into the computer program and receives a reliability score.

Validation of Training Effectiveness

The CBR training program has been implemented with 40 graduate students enrolled in special education courses at a mid-Atlantic university. These students were enrolled either in teacher certification programs in learning and behavioral disorders or in the doctoral program in special education. Data were collected over a three-year time period utilizing multiple instructors.

The data reported below are the outcome scores for each user on his/her first attempt on the outcome tests. Users were not certified for using the code and procedure in actual educational or clinical practice until the certification criteria were met. Certification requirements were met by one of two score combinations: 72% on codes test and 80% on reliability test, or 80% on codes test and 78% on reliability test. With extended practice, all but two users met criteria to be certified in CBR for actual use with children.

Usage Time. The average length of program engagement time for users to pass reliability testing equalled 15.68 hours. The range extended from 5.18 hours to 36 hours of practice time. These data do not include preparation time students may have spent memorizing codes off-line.

Learning Patterns. Averaging across all 40 users, approximately 30% of on-line training time was spent in the acquisition stage of learning the code; 25% of on-line training time was spent in the fluency-building stage of learning; and 45% of on-line training time was spent in the generalization stage with simulated practice.

Outcomes on the Codes Test. The codes test measures knowledge of the codes. The mean score for the users equalled 76.9% (s.d. = 8.875) on their first attempt on the test.

Outcomes on the Reliability Test. The reliability test measures both speed and accuracy in coding. The mean score for the users equalled 80.125% (s.d. = 6.086) on their first attempt on the test.

Importance of the Demonstration

The CBR hypermedia program has proven to be extremely robust as an efficient and effective format for teaching classroom observation skills. Comparing learning time to prior records, training time has been reduced from 40-60 hours to 16 hours. It is noteworthy that these training results were achieved with minimal direct training from an instructor sitting side-by-side with a novice observer for extensive practice using videotapes or live classrooms. Few studies have been reported in the literature regarding hypermedia learning environments which both 1) anchor design elements in a theory of learning and 2) provide validation of learning outcomes. In perusing instructional design and technology-oriented journals, it is apparent that the most prevalent design framework for hypermedia is an open-ended learning environment which allows learner exploration and knowledge construction. The design features used to operationalize the model are unique, blending the "old" direct instruction software format with "new" hypermedia instructional approaches. The information provided in the demonstration is widely generalizable, anchored in scholarship, and validated through user studies.

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