LEARNING STRATEGIES—A SELECTED BIBLIOGRAPHY

Sharon A. Mutter

Instructional Technology Systems Technical Area
Zita Simutis, Chief

Training Research Laboratory
Harold F. O'Neil, Jr., Director

U. S. Army
Research Institute for the Behavioral and Social Sciences

June 1985

Approved for public release; distribution unlimited.
This report has been cleared for release to the Defense Technical Information Center (DTIC). It has been given no other primary distribution and will be available to requestors only through DTIC or other reference services such as the National Technical Information Service (NTIS). The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation.
This bibliography provides an organizing framework for literature on learning strategies, and should aid the researcher in locating information on specific aspects of learning strategies research and application. It will also be useful to educators who want information on learning strategies curricula and resource materials.
Table of Contents

I. Learning Strategies and Computer-based Instruction.......................... 3
   A. Issues and Research......................................................... 3
   B. Software................................................................. 5
      1. Military........................................................................ 5
      2. Commercial.................................................................... 6
         a. Apple IIe/IBM PC..................................................... 6
         b. PLATO................................................................. 9

II. Training Learning Strategies........................................................... 9
   A. Issues............................................................................ 9
   B. Research........................................................................ 11
      1. Reading Comprehension Strategies................................ 11
      2. Mnemonic Strategies.................................................. 15
      3. Decision Making and Problem Solving Strategies............. 17
      4. Spatial Skill Strategies............................................... 17
      5. Procedural Skill Strategies.......................................... 18
   C. Techniques, Curricula, and Training Programs......................... 20
      1. Task Analysis.............................................................. 20
      2. Methods...................................................................... 20
      3. Resource Materials..................................................... 23

III. Learning Strategies Literature Reviews......................................... 24
(THIS PAGE INTENTIONALLY LEFT BLANK)
LEARNING STRATEGIES-A SELECTED BIBLIOGRAPHY

I. LEARNING STRATEGIES AND COMPUTER-BASED INSTRUCTION

A. ISSUES AND RESEARCH


Describes a CBI system for enhancing comprehension of text. Incorporated into the system are ideas of advance organizers, self-interrogation, and recovery from comprehension failure using glossing.


Provides some general guidelines for use in designing CBI for all types of instructional materials.


Describes a CBI approach to teaching learning strategies that emphasizes strategy practice. An independent (content-free) learning strategy module is given prior to content material (JSEP). Prompts to use the newly learned strategies are embedded in early segments of the course. These are gradually phased out in later segments allowing self-initiated strategy use.

Software under development (ARI Contract No. NTA 90-62-C-0532) POC: Dr. Beatrice Farr (202) 274-5538.


Reviews models and research on educational applications of computers.


Describes research on the use of microcomputers to teach comprehension monitoring strategies in reading text.


Reviews research on learning strategies and instructional strategies, and discusses the promise of AI in computer-based training programs.


Contains some practical suggestions for improving computer learning based on research in educational/psychological theory.

Salomon, G. (1972). Can we affect cognitive skills through visual media? An hypothesis and initial findings. AV Communications Review, 20, 401-422.

Suggests that visual media can be useful in enhancing imitation and internalization of mental activities such as folding, restructuring fields, and visualizing transformations.

This booklet contains a number of papers dealing with the use of computers in composition instruction. It also contains a review and evaluation of selected software developed for composition instruction.


B. SOFTWARE

1. MILITARY


Presents the results of a 3-year research program designed to create a tactical memorization training system using CAI and to explore the use of gaming techniques in the acquisition of declarative knowledge.

Software available for APPLE IIe (Some bugs remain)
POC: Dr. Richard Kern, ARI
(202) 274-5540


Describes two learning strategies modules that combine computer-assisted instruction and cooperative learning to teach summarization and networking skills (see also Dansereau, Brooks, Holley, & Collins (1983), and Dansereau, Holley, Collins, Brooks, McDonald & Larson (1980) under "Training Learning Strategies").

POC: Dr. Richard Kern, ARI
(202) 274-5540

(see previous reference under Issues and Research)


Discusses a computerized decision training system that incorporates principles of AI, decision theory, and adaptive CAI. The system focuses on electronic trouble-shooting, but can be adapted to other tasks involving decision-making skills.


Describes CAI for training self-motivational skills for enhancing military technical training.

POC: Dr. Richard Kern, ARI (202) 274-5540

2. COMMERCIAL

a. APPLE IIe/IBM PC

Alien Contact

Memorization game. Player must memorize alien symbols to return to earth.

Edutek Corp.
415 Cambridge #14
Palo Alto, CA 94306
(415) 325-9965
Compunim/Sherlock

Two games of reason, one based on NIM and the other based on MASTERMIND.

Golway Computer Enterprises
350 Richard Ave.
Staten Island, N.Y. 10309
(212) 948-7288

Decision Analyst

Software includes menu selection for:
- Problem Definition
- Decision Purpose
- Establishing and Weighting Criteria
- Calculation of Criterial Values
- Defining Alternatives
- Weighting and Scoring Alternatives against Criteria
- Assessing Consequences
- Final Conclusions & Choice

Execution Software, Inc.
14 Green Pine Ave.
Barrie, Ontario L4M 4S5
Canada
(705) 722-3373

Decisionmaster

Decision aid based on weighted factor analysis, the Bayes Rule, and value theory.

Syntonic Software Corp.
10635 Richmond
Houston, TX 77042
(800) 392-2348

JANUS

Decision aid based on prioritizing pairs of alternatives.

System Simulation Ltd.
101 St. Martins Lane
London WC2
England
10 240 7821
Learning Improvement Series (4 disks)

Software teaches study and test taking skills, how to follow directions, and how to improve visual memory. Programs include Effective Study Skills, A Learning Approach, Following Written Directions, Improving Your Memory, and Strategies for Test Taking.

MCE Inc.
157 Kalamazoo Mall, Ste 250
Kalamazoo, MI 49007
(616) 345-8681

Master Match

Matching game enhances visual memory, factual knowledge, and reasoning skills for user-determined pictures, concepts, and words (authoring system included).

Computer Advanced Ideas
1442 A Walnut St.
Suite 341
Berkeley, CA 94709
(415) 526-9100

Mind Memory Improvement Course Step 1 & 2

Introductory course in techniques for improving memory. Based on a copyrighted mnemonic system.

Teach Yourself by Computer Software
2128 W. Jefferson Rd.
Pittsford, N.Y. 14534
(716) 424-5453

Reading Comprehension

An inductive skill-building program that helps to improve reading comprehension skills. Several reading levels available (4-12)

Milliken Publishing
1100 Research Blvd.
St. Louis, MO 63132
(314) 991-4220
b. PLATO

Category
Lesson to make student aware of reasoning powers.

PCP Reading Comprehension I-IV
Develops skills in information finding and paraphrasing.

The Tower Puzzle
Tower of Hanoi game gives practice in problem-solving.

II. TRAINING LEARNING STRATEGIES

A. ISSUES


Explores the idea that instructional strategies must be based on the cognitive operations involved in a learning task. Describes instructional methods that promote attention, enhance memory, and engage metacognitive processes.


Evaluates the use of a learning strategies program to enhance the acquisition of fundamental cooking skills.


Proposes that most cognitive strategies for problem solving are too task-specific and suggests that a general "executive" strategy is needed.


This framework suggests that metacognitive processes maintain control over the several interacting cognitive skills involved in reading.


Describes a four year research project investigating the application of learning strategies in the context of computer-based military technical training. Questions addressed include: how to identify strategies that will be useful in technical training, how to identify students in needs of such strategies, how to evaluate the benefit of using these strategies.


Considers several questions which must be addressed prior to implementation of a cognitive learning strategy program.

Reviews literature on learning strategy instruction during adolescence (10-22 years).


Presents the argument that a metacurriculum for learning-to-learn should be incorporated into regular course content.


Reviews research on human ability and metacognition, and discusses implications of this research for adaptive instruction.

B. RESEARCH

1. READING COMPREHENSION STRATEGIES


Describes the mapping strategy called "networking".


Describes a comprehensive reading strategies program, including its theoretical framework.

Presents the results of an investigation of whether the sequence of instruction for primary strategies (networking) and support strategies (management of concentration) produces differences in text-processing and self-report of motivational factors.


Describes and evaluates a learning strategy system.


A learning strategies program called NAIT (Node Acquisition and Integration Technique) is shown to enhance prose learning. NAIT helps in the selection and definition of key concepts, consideration of examples and applications of concepts, and in identifying relationships between concepts. Methods are described.


This study compared the effects of name and attribute clustering strategies in comprehension and recall of textual materials.


Describes a field test of a learning strategies reading program in which training for learning strategies was embedded within a reading mastery learning framework. Results indicated that this method improved reading comprehension.

Describes research which investigated the use of a networking strategy to improve prose comprehension in deaf students. Results indicated that the strategy had a larger effect on long term retention than on short term retention and that better performance was obtained when networks were written rather than held in memory.


Describes an experiment conducted to examine the impact of comprehension, questions, objectives, and advance organizers on retention.


Results of this study suggest that note-taking during lecture interferes with learning, that recall can be improved by dividing the lecture into short segments, and that strategies such as mental review and answering questions produce further increases in recall performance.


Investigated the influence of taking notes during lecture on learning. Results suggested that note taking by itself interfered with learning, but that review of notes more than made up for this interference.

Describes a field test of the Cognitive Learning Strategies Training Program. Results showed no difference between groups given this program and those given no learning strategies instruction. Appendix contains program for training.


Strategy instruction that focused on the processes involved in creating effective learning strategies produced better performance for reading comprehension and retrieval than instruction which focused on a description of the strategy itself (product-oriented). Moreover, practice using strategies was shown to be beneficial.


Describes a study which demonstrated that the type of training that produces optimal performance depends upon difficulty of study materials and type of test.


Describes a study which demonstrated that training for learning strategies which includes practice and feedback produces optimal retrieval performance.

Describes a study to investigate generative reading strategies for low ability adults.

POC: Dr. Richard Kern, ARI
(202) 274-5540

2. MNEMONIC STRATEGIES


Compared four methods of presentation for instructional materials and the effectiveness of mnemonic strategies in learning Morse Code.


Networking produced better performance than rote learning for concept acquisition and spatial learning tasks.


Subjects given a mnemonic strategy performed better on a difficult concept identification task than those given no strategy.


Visual mnemonic elaboration produced better higher-order comprehension than visual schematic and visual metaphor elaborations.

Describes an investigation of embedded mnemonic aids for rote learning of Navy training materials.


Mnemonic training involving visual imagery and the method of loci substantially increased recall for prose.


A keyword strategy with illustrations increased retention of social studies text materials.


Experimenter-supplied interactive graphics produced better acquisition learning than student-supplied paraphrasing, drawing illustrations or thinking of verbal analogies.


Investigation of retention following use of the method of loci and the pegword mnemonics with high and low imagery word lists.


Elaboration resulted in better transfer and higher recall of conceptual idea units than did control processing (reading only).

This study examined two methods to teach learning strategies. Elaboration on the usefulness and appropriateness of the strategies produced better recall, clustering, strategic study behavior, and metamemory about strategies than did a simple presentation of the strategies along with instructions to use them.


Describes procedures which can be used to train cognitive skills and research designed to investigate the covert processes involved in these skills.


A training program to develop the use of a generalized elaboration learning strategy improved free recall, paired associate learning, reading comprehension, and serial learning.

3. DECISION-MAKING AND PROBLEM-SOLVING STRATEGIES


Reviews current training programs for decision-making and discusses important research questions.

4. SPATIAL SKILLS STRATEGIES


Discusses the correlation between performance on a test of spatial skills and self-report of the use of spatial learning strategies.

Discusses a study which investigated the cognitive processes underlying contour-map interpretation and describes a problem-solving strategy to facilitate performance on this task.


Study to determine whether students could accurately integrate spatial information (two cognitive maps) following an interfering task.

5. PROCEDURAL SKILLS STRATEGIES


Two strategies for judging target speed, estimating actual speed or categorizing target speed as fast, medium, or slow were studied. The categorization strategy was the most effective for maximizing expected hit probabilities.


Examined comprehension monitoring strategies used by adults when following instructions for a procedural task. The method of presentation for instructions was either by illustration, by text, or by both illustration and text. Results indicated that individuals use different metacognitive strategies in performing procedural tasks and that this may be affected by mode of presentation of task instructions.


Learning strategies such as imagery, directed attention, temporal anticipation, verbalization, and paraphrasing aided acquisition of juggling skills.


Investigated the effect of imagery, chunking, verbalization, or informed choice (of previous strategies) on initial learning and transfer of a motor task. Informed choice facilitated acquisition, whereas imagery enhanced transfer.


Imagery and chunking strategies led to more accurate performance in acquisition and transfer of a serial motor task.


Tracking tasks may benefit from learning strategies such as temporal anticipation (rhymic strategy) of target location, but experience is also necessary.
C. TECHNIQUES, CURRICULA, AND TRAINING PROGRAMS

1. TASK ANALYSIS


Discusses the steps involved in doing a task analysis from the viewpoint of the types of learning strategies used in task performance.

2. METHODS


Describes two techniques for guiding comprehension: the guided writing procedure and small group brainstorming for enhancing technical vocabulary.


Reviews systematic biases in decision-making and discusses how these biases may be avoided. Provides exercises designed to help readers to improve decision-making skills.


Discusses training designed to increase student understanding of the significance of learning strategies, and gives four points to consider when designing training to induce effective learning.

Evaluates a learning strategies training program using an executive strategy (MURDER), networking, and peer learning. Descriptions and procedures for all strategies are given.


Describes a training program for text comprehension and retrieval using three strategies (paraphrasing, question-answering, visual imagery). Results showed that the program produced better long-term retention of materials than a control treatment. Techniques are described.


Discusses ways to pretrain for successful learning.


Describes an heuristic strategy for analytical writing.


Describes several mnemonic techniques such as the method of loci, absurd pictures, narratives, rhymes, acronyms, acrostics, numerical acrostics, graphic illustrations, and spontaneous associations.

Describes a six-week program to teach comprehension and analytical skills based on the work of Whimbey and Lochhead (see reference below).


Discusses some techniques to induce self-monitoring for comprehension of text.


Describes a course to help student improve their learning skills.


Index cards and audio tape can enhance "average" college students' use of the SQ3R method for studying.


Describes four elements of a training program to enhance cognitive skills (elderly population).


Describes the basic principles underlying memory, comprehension, and problem-solving strategies, and provides details of the most common of these strategies.

3. RESOURCE MATERIALS


A video program called "Think About" helps students to reason and solve problems more systematically. Contains listing of resource materials for teaching learning strategies.


Describes a learning strategies inventory which can be used to assess learning strategy inadequacies and as a basis for developing strategy training.


Textbook for a course on problem solving.
Sections include: Problem Solving Theory & Practice
Memory and Knowledge Acquisition
Decision-making
Creativity and Invention


POC: Dr. Richard Kern, ARI
(202) 274-5540

Nine scales measure the ability to use learning strategies. These scales include: Study Flexibility, Imagery, Application, Creative Elaboration, Relationships, Understanding, Sign Language and Reinforcement, Ease of Studying, and Selection/Retention.


Workbook for learning the SQ4R method of enhancing reading comprehension and retention.

"THINK ABOUT"

(see Brown, J. L. (1983) reference above)

Agency for Instructional Television
Box A
Bloomington, IN 47402
(800) 457-4509

HM Study Skill Group

Workbook for learning note-taking, test-taking and study habit skills.

David Marshak
National Association of Secondary School Principals
1904 Association Dr.
Reston, VA 22091

III. LEARNING STRATEGIES LITERATURE REVIEWS


Discusses mnemonic systems as "cognitive cueing devices". Includes a framework for classifying and describing several types of mnemonics.

Describes the method of loci and pegword mnemonic system and provides a componential analysis of the necessary elements of such systems.


Discusses a model of cognitive monitoring.


Describes some mnemonic devices and recent application of these devices in advertising and second language learning.


Explores the idea that cognitive strategies are activations of schemata.


Presents a synthesis of research in cognition and neuroscience with the goal of deriving techniques for enhancing acquisition, retention, and retrieval of factual and performance-based information.

Proposes a model of reading behavior based on procedural semantics. Reading strategies are discussed in relation to this model.
