Research Note 85-58

(1)

AD-A160 010

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

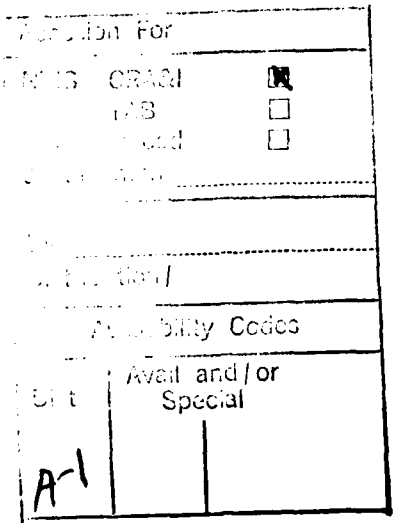
June 1985

U. S. ARMY RESEARCH INSTITUTE
FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

EDGAR M. JOHNSON
Technical Director

L. NEALE COSBY
Colonel, IN
Commander



REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: ARI Research Note 85-58	2. GOVT ACCESSION NO.: AD-A160 010
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): LEARNING STRATEGIES-A SELECTED BIBLIOGRAPHY	5. TYPE OF REPORT & PERIOD COVERED: Final Report Nov. 1984- March 1985
	6. PERFORMING ORG. REPORT NUMBER: - -
7. AUTHOR(s): Sharon Mutter	8. CONTRACT OR GRANT NUMBER(s): - -
9. PERFORMING ORGANIZATION NAME AND ADDRESS: US Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Ave., Alexandria, VA 22333-5600	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 2Q262722A791
11. CONTROLLING OFFICE NAME AND ADDRESS: US Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Ave., Alexandria, VA 22333-5600	12. REPORT DATE: June 1985
	13. NUMBER OF PAGES: 29
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): - -	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

- -

18. SUPPLEMENTARY NOTES

- -

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Learning strategies
Cognitive skills
Metacognition
Computer-based instruction
Training

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

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. Keywords:

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)

(THIS PAGE INTENTIONALLY LEFT BLANK)

LEARNING STRATEGIES-A SELECTED BIBLIOGRAPHY

I. LEARNING STRATEGIES AND COMPUTER-BASED INSTRUCTION

A. ISSUES AND RESEARCH

Blohm, P. J. (1982, June). I use the computer to ADVANCE advances in comprehension-strategy research. Paper presented at the Reading Symposium on "Factors Related to Reading Performance", Milwaukee, WI. (ERIC Document Reproduction Service No. ED 216 330)

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.

Caldwell, R. M. (1980, October). Guidelines for developing basic skills instructional materials for use with microcomputer technology. Educational Technology, 20, 7-12.

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

Derry, S. J. (1984, April). Strategy training : An incidental learning model for CAI. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

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. MDA 90-82-C-0532)
POC: Dr. Beatrice Farr
(202) 274-5538.

Hickey, A. E. (1974). Research guidelines for computer-assisted instruction. Entelek Concept Monograph. Newburyport, MA: Albert E. Hickey Associates.

Contains recommendations for CAI research guidelines derived from interviews with several leading investigators in the field: R. C. Atkinson, C. V. Bunderson, J. B. Carroll, R. M. Gagne, R. Glaser, R. E. Grubb, K. G. Hall, W. G. Harless, J. C. R. Licklider, M. D. Merrell, H. E. Mitzel, J. W. Rigney, L. M. Stolurow and P. Suppes.

McCann, P. H. (1981). Learning strategies and computer-based instruction. Computers and Education, 5, 133-140.

Reviews models and research on educational applications of computers.

Pitts, M. M., Thompson, B. & Gipe, J. (1983, April). Comprehension monitoring: Longitudinal unobtrusive measurement with computers. Paper presented at the Annual Meeting of the Eastern Communication Association, Ocean City, MD. (ERIC Document Reproduction Service No. ED 233 309)

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

Robinson, E. R. N., & Kirk, F. G. (1984). Interfacing learning strategies in computer training programs. In Human Factors Review: 1984. Santa Monica, CA: The Human Factors Society, SNC.

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

Ryba, K. A. & Chapman, J. W. (1983, August). Toward improving learning strategies and personal adjustment with computers. The Computing Teacher, pp. 48-53.

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.

Shostak, R. (Ed.). (1984). Computers in composition instruction. Eugene, OR: International Council for Computers in Education.

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.

Orders: International Council for Computers in Education, Unversity of Oregon, 1787 Agate St. Eugene, OR 97402, (503) 686-4414, 686-4429.

B. SOFTWARE

1. MILITARY

Crawford, A. M. , & Hollan, J. D. (1983). Development of a computer-based tactical gaming system (NPRDC Special Report 83-13). San Diego, CA. Navy Personnel Research and Development Center.

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

Crook, D. E., Munro, A., Rigney, J. W., & Lutz, K. A. (1978). A computer-based text processing system for selective text-processing (Technical Report No. 88). Los Angeles, CA: University of Southern California, Behavioral Technology Laboratories.

Dansereau, D. F. (1984). Computer-based learning strategy training. In Basic Skills Resource Center: Report on the Preliminary Research Findings (ARI Research Note 85-54). Alexandria, VA: U.S. Army Research Institute.

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

Derry, S. J. (1984, April). Strategy training: An incidential learning model for CAI. Paper presented at the Annual Meeting of the American Educational Research Association New Orleans, LA.

(see previous reference under Issues and Research)

May, D. M., Crooks, W. H., & Freedy, A. (1978). Application of adaptive decision-aiding systems to computer-assisted instruction: Experimental studies (ARI Technical Report 78-A4). Alexandria, VA: US Army Research Institute. (AD A050887)

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.

McCombs, B. L. (1984). Enhancements to motivational skills training for military technical training students. In Basic Skills Resource Center: Report on the Preliminary Research Findings (ARI Research Notes 85-61 and 85-62). Alexandria, VA: US Army Research Institute.

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 paraphasing.

The Tower Puzzle

Tower of Hanoi game gives practice in problem-solving.

II. TRAINING LEARNING STRATEGIES

A. ISSUES

Bovy, R. C. (1981). Successful instructional methods: A cognitive information processing approach. ECTTJ, 29, 203-217.

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.

Cavert, C. E., & Shtogren, J. A. (1981). Evaluation of a learning strategies training program. (Final Report Delivery Order No. 0090). Ft Lee, VA. (AD A115085)

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

Dobrovolny, J. L. (1981, April). Transitioning learning strategies research into practice: Focus on the role of the technical training instructor as a learning strategies expert. Paper presented at the Annual Meeting of the American Educational Research Association, Los Angeles, CA. (ERIC Document Reporduction Service No. ED 200 778)

Gagne, R. M. (1980). Learnable aspects of problem solving. Educational Psychologist, 15, 84-92.

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

Gulick, R. M. (1979). Decision analysis as a learning strategy. In H.F. O'Neil and C. D. Spielberger (Eds.), Cognitive and Affective Learning Strategies. New York: Academic Press.

Masson, Michael E. J. (1982, April). A framework of cognitive and metacognitive determinants of reading skill. Topics in Learning and Learning Disabilities, pp 37-43.

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

McCombs, B.L. (1981). Transitioning learning strategies research into practice: Focus on the student in technical training. Paper presented at the Annual Meeting of the American Educational Research Association, Los Angeles, CA. (ERIC Document Reproduction Service No. ED 200 777)

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.

Peterson, P. L., & Swing, S. R. (1983). Problems in classroom implementation of cognitive strategy instruction. In M. Pressley and J. R. Levin (Eds.), Cognitive Strategy Research: Educational Applications. New York, N.Y.: Springer-Verlag.

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

Pressley, M., Levin, J. R., & Bryant, S. L. (1983). Memory strategy instruction during adolescence: When is explicit instruction needed? In M. Pressley and J. R. Levin (Eds.), Cognitive Strategy Research: Psychological Foundations. New York, NY: Springer-Verlag.

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

Weinstein, C. E. (1982). Learning strategies: The metacurriculum. Journal of Developmental and Remedial Education, 5, p. 6-7, 10.

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

Winn, B. (1983, April). Learning strategies and adaptive instruction. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec. (ERIC Doucment Reproduction Service No. ED 228 300)

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

B. RESEARCH

1. READING COMPREHENSION STRATEGIES

Camperell, K., & Smith, L. L. (1982, November). Improving comprehension through the use of networking. Paper presented at the Southeastern Regional Conference of the International Reading Association, Biloxi, MS. (ERIC Reproduction Service No. ED 227 459)

Describes the mapping strategy called "networking".

Cook, L. K., & Mayer, R. E. (1983). Reading strategies training for meaningful learning from prose. In M. Pressley and J. R. Levin (Eds.), Cognitive Strategy Research: Educational Applications. New York, NY: Springer-Verlag.

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

Dansereau, D. F., Brooks, L. W. Holley, C. D., & Collins, K. W. (1983). Learning strategies training: Effects of sequencing. Journal of Experimental Education, 51, 102-108.

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.

Dansereau, D. F., Holley, C. D., Collins, K. W. Brooks, L. W., McDonald, B., & Larson, D. (1980). Validity of learning strategies/skills training (AFHRL-TR-79-84). Brooks Air Force Base, TX: Air Force Human Resources Laboratory. (AD AD085659)

Describes and evaluates a learning strategy system.

Diekhoff, G. M., Brown, P. J., & Dansereau, D. F. (1982). A prose learning strategy training program based on network and depth-of-processing models. Journal of Experimental Education, 50, 180-184.

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.

DiVesta, F. J., Schultz, C. B., & Drangel, T. R. (1973). Passage organization and imposed learning strategies in comprehension and recall of connected discourse. Memory and Cognition, 1, 471-476.

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

Jones, B.F., Monsaas, J.A., & Katims, M. (1979). Improving reading comprehension: Embedding diverse learning strategies within a mastery learning framework. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Service No. ED 170 698)

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.

Long, G., Hein, R., & Coggiola, D. (1978). Networking: A semantic-based learning strategy for improving prose comprehension. (Report No. NTID-PS-26). Rochester NY: National Technical Institute for the Deaf. (ERIC Document Reproduction Service No. ED 209 898).

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.

Petersen, C., Glover, J. A., & Ronning, R. R. (1980). An examination of three prose learning strategies on reading comprehension. The Journal of General Psychology, 102, 39-52.

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

Thomas, G. S., Aiken, E. G., & Shenrum, W. A. (1975). Further investigations of coding/rehearsal strategies during a segmented lecture format (NPRDC TR-76-15). San Diego, CA: Navy Personnel Research and Development Center. (AD A015628)

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 futher increases in recall performance.

Van Matre, N. H., Aiken, E. G., Carter, J. F., Shenrum, W. A., & Thomas, G. S. (1975). Learning from lecture: Investigations of study strategies involving note taking (NPRDC TR-76-14). San Diego, CA: Navy Personnel Research and Development Center. (AD A015285)

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.

Weinstein, C. E., Rood, M. M., Roper, C., Underwood, V. L. & Wicker, F. W. (1980). Field test of a revised form of the cognitive learning strategies training program with Army enlisted personnel (ARI Technical Report 462). Alexandria, VA: U. S. Army Research Institute for the Behavioral and Social Science. (AD A098464)

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.

Weinstein, C. E., Underwood, V. L., Rood, M.M., Conlon, C. M., Wild, M., & Kennedy, T. J. (1980). The effects of selected instructional variables on the acquisition of cognitive learning strategies. (ARI Technical Report 463). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Science. (AD A098429)

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.

Weinstein, C. E., Washington, T. P., Wicker, F. W., Duty, D. C., & Underwood, V. L. (1980). The effects of material and task variations on a brief cognitive learning strategies training program (ARI Technical Report No. 461). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A098463)

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

Weinstein, C. E., Wicker, F. W., Cubberly, W. E., Underwood, V. L., & Roney, L. K. (1980). Training versus instruction in the acquisition of cognitive learning strategies. (ARI Technical Report 460). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A098462)

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

Wittrock, M. C. & Kelly, L. R. (1984). Teaching reading comprehension to adults in basic skills courses. In Basic Skills Resource Center: Report on the Preliminary Research Finding (ARI Research Note 85-52). Alexandria, VA: U.S. Army Research Institute.

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

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

2. MNEMONIC STRATEGIES

Ainsworth, J. S. (1979). Symbol learning in Navy technical training: An evaluation of strategies and mnemonics (TAEG Report No. 66). Orlanda, FL: Training Analysis and Evaluation Group. (AD A068041)

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

Canelos, J., Taylor, W., & Altschuld, J. (1982). Networking vs. rote learning strategies in concept acquisition. ECTJ, 30, 141-149.

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

Dyer, J. C., & Meyer, P. A. (1976). Facilitation of simple concept identification through mnemonics instruction. Journal of Experimental Psychology: Human Learning and Memory, 2, 773.

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

Edelstein, R. A. (1981, August). Effects of verbal and visual elaborations on concept learning. Paper presented at the Annual Meeting of the American Psychological Association, Los Angeles, CA. (ERIC Document Reproduction Service No. ED 221 549)

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

Kincaid, J. P., Salas, E., & Braby, R. (1980). Field test of guidelines for development of memory aids in technical training (Technical Memorandum 80-7). Orlando, FL: Training Analysis and Evaluation Group.

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

Krebs, E. W., Snowman, J., & Smith, S. H. (1981). Teaching old dogs new tricks: Facilitating prose learning through mnemonic training. Journal of Instructional Psychology, 5, 33-39.

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

Levin, J. R., Shriberg, L. K., & Berry, J. K. (1983). A concrete strategy for remembering abstract prose. American Educational Research Journal, 20, 277-290.

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

Lutz, K. A., & Rigney, J. W. (1977). The effects of student-generated elaboration during acquisition of concepts in science (Technical Report No. 82). Los Angeles, CA: University of Southern California, Behavioral Technology Laboratories. (AD A047088)

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

Marston, P. T., & Young, R. K. (1974). Multiple serial list learning with two mnemonic techniques. (ERIC Document Reproduction Service No. ED 118 609)

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

Mayer, T. E. (1980). Elaboration techniques that increase the meaningfulness of technical text: An experimental test of the learning strategies hypothesis. Journal of Educational Psychology, 72, 770-784.

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

Paris, S. G., Newman, R. S., & McVey, K. A. (1982). Learning the functional significance of mnemonic actions: A microgenetic study of strategy acquisition. Journal of Experimental Child Psychology, 34, 490-509.

This study examined two methods to teach learning strategies. Elaboration on the usefulness and approriateness 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.

Weinstein, C. E. (1977, April). Cognitive elaboration learning strategies. Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY. (ERIC Document Reproduction Service No. ED 144 953)

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

Weinstein, C. E. (1982). Training students to use elaboration learning strategies. Contemporary Educational Psychology, 7, 301-311.

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

Goodman, B., Fischhoff, B., Lichtenstein, S. & Slovic, P. (1978). The training of decision makers (ARI Technical Report 78-B3). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD-A077990)

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

4. SPATIAL SKILLS STRATEGIES

Cochran, K. F., & Wheatley, G. H. (1982). Cognitive strategies in spatial performance. Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY. (ERIC Document Repoduction Service No. ED 219 430)

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

Cross. K. D., Rugge, S.M., & Thorndyke, P. W. (1982). Cognitive processes in interpreting the contour-line portrayal of terrain relief. (Contract No. N00014-80-C-0508). Washington D.C.: Office of Naval Research. (AD A126403)

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

Hanley, G. L. & Levine, M. (1982, April). Chunking cognitive maps: The symmetry of the resulting representation and its effect on interference. Paper presented at the Annual Meeting of the Eastern Psychological Association, Baltimore, MD. (ERIC Document Reproduction Service No. ED 222 837)

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

5. PROCEDURAL SKILLS STRATEGIES

Kottas, B. L., & Bessemer, D. W., (1979). Evaluation of gunnery simulators visual display and several strategies for learning targets. (ARI Technical Report 427). Ft. Knox: U.S. Army Research Institute. (AD A086459)

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.

Schorr, F.L. (1982) Comprehending procedural instructions: The influence of metacognitive strategies. Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY. (ERIC Document Reproduction Service No. ED 214 130)

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.

Schorr, F. L., & Glock, M. D. (1983). Comprehending procedural instruction: The influence of comprehension monitoring strategies and instructional materials. (Technical Report No. 10). New York: Cornell University, Department of Education.

Singer, R. N., & Anshel, M. H. (1980). The modular approach (with strategies) to learning motor skills (ARI Technical Report 444). Alexandria, VA: U.S. Army Research Institute. (AD A089793)

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

Singer, R. N., Korienek, G., & Ridsdale, S. (1980). The influence of learning strategies on the acquisition, retention, and transfer of procedural tasks. Bulletin of the Psychonomic Society, 16, 97-100.

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 tranfer.

Singer, R. N., Ridsdale, S., & Korienek, G. G. (1979). Achievement in a serial positioning task and the role of learner strategies (ARI Technical Report 430). Alexandria, VA: U.S. Army Research Institute. (AD A082749)

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

Singer, R. N., Ridsdale, S., & Korienek, G. G. (1979). The influence of learning strategies in the acquisition, retention, and transfer of a visual tracking task. (ARI Technical Report 402). Alexandria, VA: U. S. Army Research Institute. (AD A081994)

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

Carlisle, K. E. (1982, December). The learning strategy technique of task analysis. NSPI Journal, pp. 9-11, 41.

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

2. METHODS

Bean, T. W. (1979, April). Guiding comprehension in the learning assistance setting. Paper presented at the Twelth Annual Western College Reading Association Conference, Honolulu, HI. (ERIC Document Reproduction Service No. ED 177 517)

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

Bellezza, F. S. (1983). Mnemonic device instruction with adults. In M. Pressley & J. Levin (Eds.), Cognitive Strategy Research: Psychological Foundations. New York, N.Y.: Springer-Verlag.

Beyth-Marom, R., Dekel, S., Gombo, R., & Saked, M. (1984). Thinking Under Uncertainty: An Elementary Approach. Hillsdale, NJ: Lawrence Earlbaum Associates.

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.

Brown, A. L., Campione, J. C., & Day, J. D. (1980, November). Learning to learn: On training students to learn from texts. Invited address given at the Annual Meeting of the American Educational Research Association, Boston, MA. (ERIC Document Reproduction Service No. ED 203 297).

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.

Dansereau, D. F., Collins, K. W. , McDonald, B., Diekhoff, G., Garland, J., Holley, C., Evans, S. H., Irons, D., Long, G., Walker, C., Hilton, T., Lehman, D., Helemanu, M., Ellis, A. M., & Fenker, R. M. (1978). Systematic training program for enhancing learning strategies and skills: Further development (AFHRL-TR-78-63). Brooks Air Force Base, TX: Air Force Human Resources Laboratory. (AD A061014)

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

Dansereau, D. F., Long, G. L., McDonald, B. A. Actkinson, T. R., Ellis, A. M., Collins, K., Williams, S., & Evans, S. H. (1975). Effective learning strategy training program: Development and Assessment. (AFHRL-TR-75-41). Brooks Air Force Base, TX: Air Force Human Resources Laboratory. (AD A014722)

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.

Diekhoff, G. M. (1982, September). How to teach how to learn. Training/HRD, pp. 36-40.

Discusses ways to pretrain for successful learning.

Flower, L. S., & Hayes, J. R. (1977). Problem-solving strategies and the writing process. College English, 39, 449-461.

Describes an heuristic strategy for analytical writing.

Giordana, G. (1982). Mnemonic techniques that improve reading comprehension. The Clearinghouse, 58, 164-166.

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

Hunter, J., Jones, L., Vincent, H., & Carmichael, J. W. (1982). Project SOAR: Teaching cognitive skills in a pre-college program. Journal of Learning Skills, 1, 24-26.

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

Kendall, J. R., & Mason, J. M. (1982). Metacognition from the historical context of teaching reading (Technical Report No. 263). Cambridge, MA: Bolt, Beranek and Neuman, Inc. (ERIC Document Reproduction Service No. ED 220 821)

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

Norman, D. (1977). Teaching learning strategies (Contract No. NOO14-76-0628). Washington, D.C.: Advanced Research Project Agency. (ERIC Document Reproduction Service No. ED 151 677)

Describes a course to help student improve their learning skills.

Paulson, P. L. (1980, October). Two methods for making the steps of the SQ3R more concrete. Paper presented at the Annual Meeting of the College Reading Association, Baltimore, MD. (ERIC Document Reproduction Service No. ED 195 958)

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

Treat, N. J., Poon, L. W., Fozard, J. L., & Popkin, S. J. (1978). Toward applying cognitive skill training to memory problems. Experimental Aging Research, 4, 305-319.

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

Whimbey, A., & Lochhead, J. (1979). Problem Solving and Comprehension: A Short Course in Analytic Reasoning. Philadelphia, PA: Franklin Institute Press.

Wilcox, W. C., & Wilson, B. G. (1979, January). How to study: The neglected basic. Paper presented at Brigham Young University Midyear Conference, Provo, UT.

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

3. RESOURCE MATERIALS

Brown, J. L. (1983, June). On teaching thinking skills in the elementary and middle school. Phi Delta Kappan, 709-714.

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

Dansereau, D. F., Long, G. L., McDonald, B.A., & Actkinson, T. R. (1975). Learning strategies inventory development and assessment. (AFHRL TR-75-40). Brooks Air Force Base, TX: Air Force Human Resources Laboratory. (AD A014721)

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

Hayes, J. R. (1981). The Complete Problem Solver. Philadelphia, PA: The Franklin Institute Press.

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

Jones, B. F., Tinzman, M., & Cox, B. E. (1984). Content-driven comprehension instruction and assessment: A model for Army training literature (Contract No. MDA-903-82-C-0169). Alexandria, VA: US Army Research Institute.

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

Long, G., Conklin, D., & Garrison, W. (1978). The development of a cognitive process-based learning strategies questionnaire (Report No. NTID-PS-23). Rochester, N.Y.: National Technical Institute for the Deaf. (ERIC Document Reproduction Service No. ED 209 896)

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.

Smith, D. E. P. (1961). Learning to Learn. New York: Harcourt, Brace, and Jovanovich.

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

Bellezza, F. S. (1981). Mnemonic devices: Classification, characteristics, and criteria. Review of Educational Research, 51, 247-275.

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

Bower, G. H. (1970). Analysis of a mnemonic device. American Scientist, 58, 496-510.

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

Calfee, R. C. (1974). Memory and cognitive skills in reading acquisition. In D. D. Duane and M. B. Rawson (Eds.), Reading Perception and Language: Papers from the World Congress on Dyslexia. Baltimore, MD: York Press.

Cook, L.K. & Mayer, R.E. (1983). Reading strategies training for meaningful learning from prose. In M. Pressley and J.R. Levin (Eds.), Cognitive Strategy Research: Educational Applications. New York, NY: Springer-Verlag.

Dansereau, D. F., Long, G. L., Actkinson, T. R., & McDonald, B. (1974). Learning strategies: A review and synthesis of the current literature (AFHRL-TR-74-70). Brooks Air Force Base, TX: Air Force Human Resources Laboratory. (AD A007722)

Duchastel, P. C. (1983). The use of summaries in studying texts. Educational Technology, 23, 36-41.

Flavell, J. H. (1979). Metacognition and cognitive monitoring. American Psychologist, 34, 906-911.

Discusses a model of cognitive monitoring.

Griffith, D. (1979). A review of the literature on memory enhancement: The potential and relevance of mnemotechnics for military training (ARI Technical Report 436). Alexandria, VA: US Army Research Institute. (AD A086407).

Levin, J.R. (1981). Pictures as prose learning devices. (Theoretical Paper No. 93). Madison, WN: Wisconsin Center for Educational Research, The University of Wisconsin. (ERIC Document Reproduction Service No. ED 221 549)

Morris, P. E. (1979). Strategies for learning and recall. In M. M. Gruneberg and P. E. Morris (Eds.), Applied Problems in Memory. New York: Academic Press.

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

Munro, A., & Rigney, J. W. (1977). A schema theory account of some cognitive processes in complex learning (Technical Report No. 81). Los Angeles, CA: University of Southern California, Behavioral Technology Laboratory. (AD A043592)

Explores the idea that cognitive strategies are activations of schemata.

O'Neil, H. F. (Ed.). (1978). Learning Strategies. New York: Academic Press.

O'Neil, H. F., & Spielberger, C. D. (Eds.). (1979). Cognitive and Affective Learning Strategies. New York: Academic Press.

Pressley, M. (1983). Making meaningful materials easier to learn: Lessons from cognitive strategy research. In M. Pressley and J.R. Levin (Eds.), Cognitive Strategy Research: Educational Applications. New York, NY: Springer-Verlag.

Pressley, M., & Levin, J. R. (Eds.). (1983). Cognitive Strategy Research: Educational Applications. New York, NY: Springer-Verlag.

Pressley, M., & Levin, J. R. (Eds.). (1983). Cognitive Strategy Research: Psychological Foundations. New York, NY: Springer-Verlag.

Rigney, J. W. (1976). On cognitive strategies for facilitating acquisition, retention, and retrieval in training and education (Technical Report No. 78). Los Angeles, CA: University of Southern California, (AD A027153).

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.

Rigney, J. W., & Munro, A. (1977). On cognitive strategies for processing text (Technical Report No. 80). Los Angeles, CA: University of Southern California, Behavioral Technology Laboratories. (AD A039377)

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

Rigney, J. W., & Munro, A. (1981). Learning strategies. In H. F. O'Neil. (Ed.), Computer-Based Instruction: A State of the Art Assessment. New York: Academic Press.

Schoenfield, A. H. (1982, March). Beyond the purely cognitive: Metacognition and social cognition as driving forces in intellectual performance. Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY.