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TEACHING LEARNING DISABLED JUNIOR HIGH STUDENTS TO USE VISUAL IMAGERY AS A STRATEGY FOR FACILITATING RECALL OF READING PASSAGES

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COOPERATING AGENCIES

Were it not for the cooperation of many agencies in the public and private sector, the research efforts of The University of Kansas Institute for Research in Learning Disabilities could not be conducted. The Institute has maintained an on-going dialogue with participating school districts and agencies to give focus to the research questions and issues that we address as an Institute. We see this dialogue as a means of reducing the gap between research and practice. This communication also allows us to design procedures that: (a) protect the LD adolescent or young adult, (b) disrupt the on-going program as little as possible, and (c) provide appropriate research data.

The majority of our research to this time has been conducted in public school settings in both Kansas and Missouri. School districts in Kansas which have or currently are participating in various studies include: Unified School District USD 384, Blue Valley; USD 500, Kansas City, Kansas; USD 469, Lansing; USD 497, Lawrence; USD 453, Leavenworth; USD 233, Olathe; USD 305, Salina; USD 450, Shawnee Heights; USD 512, Shawnee Mission; USD 464, Tonganoxie; USD 202, Turner; and USD 501, Topeka. Studies are also being conducted in several school districts in Missouri, including Center School District, Kansas City, Missouri; the New School for Human Education, Kansas City, Missouri; the Kansas City, Missouri School District; the Raytown, Missouri School District; and the School District of St. Joseph, St. Joseph, Missouri. Other participating districts include: Delta County, Colorado School District; Montrose County, Colorado School District; Elkhart Community Schools, Elkhart, Indiana; and Beaverton School District, Beaverton, Oregon. Many Child Service Demonstration Centers throughout the country have also contributed to our efforts.

Agencies currently participating in research in the juvenile justice system are the Overland Park, Kansas Youth Diversion Project, and the Douglas, Johnson, Leavenworth, and Sedgwick County, Kansas Juvenile Courts. Other agencies which have participated in out-of-school studies are: Penn House and Achievement Place of Lawrence, Kansas; Kansas State Industrial Reformatory, Hutchinson, Kansas; the U. S. Military; and Job Corps. Numerous employers in the public and private sector have also aided us with studies in employment.

While the agencies mentioned above allowed us to contact individuals and support our efforts, the cooperation of those individuals--LD adolescents and young adults; parents; professionals in education, the criminal justice system, the business community, and the military--have provided the valuable data for our research. This information will assist us in our research endeavors that have the potential of yielding greatest payoff for interventions with the LD adolescent and young adult.

Abstract

The present study was undertaken to find out whether the recall of prose passages could be improved in a group of learning disabled junior high students by training those students to use visual imagery when they read. Students were chosen for participation based on teacher selection and on performance on three tests from the Woodcock Reading Mastery Tests. Students in an imagery training group received 30 minutes of instruction in the use of visual imagery as a strategy for recalling what they had read. Students in a paraphrase-recall practice group received 30 minutes of practice in reading passages and telling the experimenter, in their own words, the content of those passages.

It was found that students who were trained to use visual imagery did not exhibit improved paraphrase-recall relative to the practice group. However, trends within the data suggested that further investigation of imagery training with learning disabled students should be undertaken. Also, the students as a whole recalled more content from concrete passages than from abstract passages. Similarities between this latter finding and the results of studies with non-handicapped adults were noted.

TEACHING LEARNING DISABLED JUNIOR HIGH STUDENTS TO USE VISUAL IMAGERY AS A STRATEGY FOR FACILITATING RECALL OF READING PASSAGES

Recently, considerable research has been done which suggests that among nonhandicapped persons imagery training and instructions can lead to improved recall of words, sentences and longer prose passages that have been read (Anderson, 1971, 1974; Anderson & Kulhavy, 1972; Levin & Divine-Hawkins, 1974; Paivio, 1971; Pressley, 1976; Rasco, Tennyson & Boutwell, 1975). Yet, the reasons behind this phenomenon remain poorly understood (Cramer, 1976; Lesgold, Curtis, DeGood, Golinkoff, McCormick & Shimron, 1974). Lesgold et al., borrowing an idea from Chafe (1972), suggested that images may provide a "foreground" or "context" for what comes next when reading prose passages.

Recent investigations by Levin and his associates have suggested the facilitative effects of imagery in prose learning are not universal. Levin (1973) found that students must be able to decode individual words and understand their meaning if imagery instructions are to be effective. Levin, Divine-Hawkins, Kerst and Guttmann (1974) found that ability to profit from imagery instructions in a prose reading task depended on students' ability to learn lists of paired-associates pictures. Finally, according to Paivio's dual-coding model, imagery coding should be particularly facilitative of concrete as opposed to abstract passages.

Based on clinical and classroom experience, many special educators have reported memory deficiencies among learning disabled (LD) children and youth (e.g., Myers & Hammill, 1976; Wilcox, 1970). Other writers have noted that the investigation of strategies whereby handicapped students process information remains a research priority (e.g., Gallagher, 1975). To date, however, no studies have assessed imagery strategies among identified groups of LD students.

The primary purpose of the present study was to investigate whether it is possible to train LD junior high school students to use visual imagery to improve the recall of prose passages they have read. The following secondary questions were also of interest. First, is performance related to individual differences in ability to learn from pictures and to the concreteness or imagery evoking value of reading passages? Second, does imagery training transfer to performance on a standardized test of reading comprehension?

Method

Subjects

Seven certified LD teachers utilized a checklist for learning disabilities to screen from among the students they served those that: (a) were of average ability or above, (b) could recognize and understand individual words at the third reader level, and (c) had a disability in reading comprehension severe enough, by itself, to interfere with learning. In addition, only those students who obtained a posterior probability of being LD of .85 or higher were chosen (cf., Wissink, Kass, & Ferrell, 1975). Of the 72 completed checklists, 51 were retained on the basis of meeting the .85 criterion. Next, students were retained for study only if written parental permission for participation was obtained.

Finally, remaining students were administered selected subtests from Form A of the Woodcock Reading Mastery Tests (Woodcock, 1973) until 30 LD students were identified who: (a) obtained a Reading Grade Score of 3.0 or higher on the Word Identification and Word Comprehension Tests of the Woodcock, and (b) obtained a Reading Grade Score which was at least one year below actual grade placement on the Passage Comprehension Test of the Woodcock. Among the students tested only four failed to meet these latter criteria.

Among the 30 students identified, 23 were males, and 7 were females. The mean age of the students was 169.5 months (SD = 10.7 months), the mean IQ was

92.2 (SD = 8.97). The mean standard score for the Passage Comprehension Test of the Woodcock was 40.6 (SD = 3.68), which represents an approximate reading grade score of 4.4. Seventeen students attended three urban schools. Thirteen students attended four rural schools.

Materials

Paired-Associates Test. A 24-pair list of pictures was developed for use as a paired-associates test. The pictures were black and white line drawings of common objects and animals. Each pair of pictures was mounted on an index card (.1016m X .1524m). The cards were flashed by hand by the experimenter at the rate of one every four seconds. Also, each subject was given a response page which contained a list of words corresponding to the sitmulus pictures in each picture pair. The student was asked to say the name of the response picture. The investigator wrote down the student's responses.

Paraphrase-Recall Tests. Passages from books C and D of Reading for Concepts (Liddle, 1970) were used in the construction of the paraphrase-recall tests. These passages covered content in such areas as science and social studies and were 150 to 200 words in length. The readibility levels of the passages ranged between 2.9 and 4.2.

Fifty nonhandicapped seventh and eighth graders rated sentences from each of twenty passages on the basis of how easy it was to evoke an image for each sentence. The mean ratings for each passage were computed and the two highest rated and two lowest rated passages were selected for use in the paraphrase-recall tests.

During the paraphrase-recall tests, students were asked to read passages and then to recall, without regard to exact wording, as much of the content of the passage as they could. The measure of recall was based on the number of test propositions recalled relative to the number possible. The propositions

were included in the checklist according to criteria described by Lesgold et al. (1974).

Procedures

The entire experiment was conducted such that each student was exposed to three 40-minute experimental sessions.

Session 1. During the first session students were given the three selected tests from the Woodcock. If they reached criteria on these tests, they were given the paired-associates tests. The investigator presented a three-pair practice list and then asked the student to remember the response words for each of the three pairs.

Following the presentation of the three-pair practice list, students were presented with the 24-pair test list on three consecutive trials. After each exposure of the test list, the student was shown the test page and asked to say as many of the names of the response pictures as possible. Responses were written down by the experimenter. One and one-half minutes were allowed for the response activity.

Pearson r's were computed between the total correct scores for each trail. The results were as follows: r (trials 1 and 2) = .84, r (trials 1 and 3) = .67, r (trials 2 and 3) = .88.

On the basis of the total correct responses across the three trials, students were divided into three groups of 10 students each. These groups represented high, middle, and low performance on the paired-associates test. Then five students from each paired-associates level were randomly selected and assigned to an imagery training group. The other five students in each level were assigned to a paraphrase-recall practice group.

Session 2. After approximately 10 days, the second 40-minute session was held with each student. During this session, the student was pretested on the

paraphrase-recall tests. Then, the student was exposed either to 20 minutes of training in the use of imagery or to 20 minutes of practice with the paraphrase-recall task. Paraphrase-recall test passages were given both as pretests during Session 2 and as posttests during Session 3.

A given student could receive any one of the four paraphrase-recall passages first. If a student received a high-imagery passage first during a given testing session, then that student was subsequently presented with a low-imagery passage during that same session and visa versa.

Students were instructed to read and study each passage silently until the experimenter said "stop" and to read carefully rather than fast. Students were given three minutes to read the passages. Very rarely did a student fail to read a passage completely during the alloted time period. Following reading, two minutes were allowed for paraphrase-recall.

After being given the paraphrase-recall pretest, subjects in the imagery-training group were given 20 minutes of training that was divided into five steps. First, students were introduced to the idea that by making a "picture in your head" one could better remember what one had read. The student was asked to describe images of their own room at home. Then, the experimenter and student read selected sentences silently together. The student was then asked to describe images that he or she had constructed for these sentences.

Second, students were told that images should represent as much of the content of a sentence as possible. The student was shown sentences and pictures which represented the content of the sentences. For each picture the student and experimenter discussed the extent to which the content was represented in the picture.

Third, the student was told, "For some sentences it is easy to create an image and for some it is difficult." The student was presented with sentences

and asked to discuss with the experimenter the extent to which it was easy or difficult to create an image for each sentence.

Fourth, the student was presented with short paragraphs from Reading for Concepts Books C and D and asked to try to make an image after coming to the end of each sentence. Fifth, the student was asked to read a paragraph, to make an image for each sentence, and to describe the content of the paragraph in their own words. The experimenter pointed out that the three sentences in the paragraph could be linked together with a single image.

Students in the practice group were asked to read all of the sentences and paragraphs that the training group read in exactly the same order as these sentences and paragraphs were presented to the training group. For each sentence or paragraph, they were required to read and then describe in their own words the content of the passages. For many of the shorter sentences the students simply repeated back each sentence verbatim.

If, during the 20 minutes, students finished the content presented to the training group, they continued reading other selections from Reading for Concepts and telling about what they had read.

Session 3. After approximately 10 days, the third and final experimental session was held. During the first 10 minutes of this session, students in the training group reviewed and practiced using imagery in the context of paraphrase-recall tasks. Students in the practice group were asked to read whole passages and then describe in their own words the content of the passages.

Then each subject was posttested on the paraphrase-recall test during which the imagery-trained students were cued (through more extensive instructions) to use imagery. Finally, all subjects were posttested on the Passage Comprehension Test of the Woodcock, Form B.

All paraphrase-recall test responses were transcribed from the tapes. First, one scorer scored all of the passages, then 40 passages were randomly selected and independently scored by the second scorer. A Pearson product-moment correlation coefficient was computed between the two sets of scores. The value of this correlation was $r = .98$.

Finally, the transcribed tapes were analyzed, using Mann-Whitney tests, to insure that any differences that might have occurred between the training and practice groups were not due to differences either in: (a) the number of times the experimenter responded to a statement made by the student, or (b) the number of times the trainer provided positive verbal reinforcement to the student. No significant differences between the groups were found along these dimensions.

Results

Results for the paraphrase-recall test and the Passage Comprehension Test of the Woodcock were analyzed separately. Means, adjusted means, and standard deviations for both the paraphrase-recall and Woodcock data are presented in Table 1.

Insert Table 1 about here

The design for the paraphrase-recall scores was a three (high, medium, and low paired-associates) X two (training and practice) X two (high-imagery and low-imagery passages) factorial design with repeated measures on the last factor. The dependent variables were paraphrase-recall posttest scores. These scores were adjusted by covariance procedures for paraphrase-recall pretest scores and intelligence quotients (as gleaned from school records).

The analysis of variance revealed only one significant main effect: a significant difference between adjusted posttest means for high- and low-imagery passages, $F(1, 23) = 50.88$, $p < .001$. All other main effects and interactions associated with this design were non-significant.

The design associated with the Woodcock Passage Comprehension scores was a three (high, medium, and low paired-associates) X two (training and practice) factorial design. The dependent measure was the Passage Comprehension Test of the Woodcock, Form B, administered as a posttest. Covariates were pretest Passage Comprehension scores and IQ scores. None of the main effects or interactions associated with performance on the Passage Comprehension Test were found to be significant.

Discussion

The primary research question in this study was the following: Would LD adolescents who were trained to use imagery demonstrate improved recall of prose passages they had read? In the case of the present experiment, the trained students as a whole did not exhibit such improved recall. This may have been due to such factors as small sample size as well as the limited training (30 minutes) given to a group of students with a chronic history of learning problems.

It should be noted, however, that the high-paired associates training group had the highest adjusted posttest means for both the low-imagery paraphrase-recall test and for the Passage Comprehension Test. In addition, for this group, the adjusted posttest mean on the high-imagery paraphrase-recall test (35.42) was nearly equivalent to the highest adjusted mean (35.47) which was obtained by the middle paired-associates practice group.

The above finding, of course, may be due merely to the operation of chance. There are some tentative implications that may be drawn, however. First, the results would be difficult to explain in terms of Paivio's (1971) dual-coding model. That model would predict a relatively higher mean for the high paired-associates training group on the high-imagery posttest.

Second, the LD students as a whole recalled more material from the high-imagery than from the low-imagery passages, the imagery-evoking values of sentences in these passages having been previously determined by a group of non-

handicapped age peers. Normal adults, likewise, recall concrete material more easily than abstract, both when that material is words in isolation (see Paivio, 1971, p. 200) or words in passages (Yuille & Paivio, 1969). The facilitative effect of imagery-concreteness may be similar for both LD and nonhandicapped groups and this similarity should be further investigated. Also, the findings lend support to the frequently heard directive that LD students should be provided with concrete referents for the concepts they are to comprehend and remember.

Third, the directionality of the results suggest that both the paired-associates dimension and a transfer task should be retained in subsequent studies.

The construction of visual images is presumably one of a number of strategies that the mature learner applies when it is appropriate. The present study did not demonstrate that LD adolescents can be taught to apply this strategy to improve their recall of reading passages. Nevertheless, future research may reveal those conditions under which LD students can apply such a strategy successfully. The teaching of an imagery strategy could then be incorporated directly into a curriculum for the secondary LD student.

References

Anderson, R. C. Encoding processes in the storage and retrieval of sentences. Journal of Experimental Psychology, 1971, 91, 338-341.

Anderson, R. C. Substance recall of sentences. Quarterly Journal of Experimental Psychology, 1974, 26, 530-541.

Anderson, R. C., & Kulhavy, R. W. Imagery and prose learning. Journal of Educational Psychology, 1972, 63, 242-243.

Chafe, W. L. Discourse structure and human knowledge. In J. B. Carroll & R. O. Freedle (Eds.), Language comprehension and the acquisition of knowledge. Washington, D. C.: Winston, 1972.

Cramer, E. H. Pictures in your head: A discussion of relationships among mental imagery, reading comprehension, and reading attitudes, 1976 (ERIC Document Reproduction Service No. ED 122 263).

Gallagher, J. J. (Ed.) The application of child development research to exceptional children. Reston, Va.: The Council for Exceptional Children, 1975.

Lesgold, A. M., Curtis, M. E., DeGood, H., Golinkoff, R. M., McCormick, C., & Shimron, J. The role of mental imagery in text comprehension: Preliminary studies. Pittsburgh, Pa.: University of Pittsburgh Learning and Development Center, 1974. (ERIC Document Reproduction Service No. ED 094 317).

Levin, J. R. Inducing comprehension in poor readers: A test of a recent model. Journal of Educational Psychology, 1973, 65, 19-24.

Levin, J. R., & Divine-Hawkins, P. Visual imagery as a prose learning process. Journal of Reading Behavior, 1974, 6, 23-30.

Levin, J. R., Divine-Hawkins, P., Kerst, S., & Guttmann, J. Individual differences in learning from pictures and words: The development and application of an instrument. Journal of Educational Psychology, 1974, 66, 296-303.

Liddle, W. (Ed.). Reading for concepts. St. Louis, Mo.: McGraw-Hill, 1970.

Myers, P. I. & Hammill, D. D. Methods for learning disorders (2nd ed.). New York: John Wiley, 1976.

Paivio, A. Imagery and verbal processes. New York: Holt, Rinehart, & Winston, 1971.

Pressley, G. M. Mental imagery helps eight-year-olds remember what they read. Journal of Educational Psychology, 1976, 68, 355-359.

Rasco, R. W., Tennyson, R. D., & Boutwell, R. C. Imagery instructions and drawings in learning prose. Journal of Educational Psychology, 1975, 67, 188-192.

Wilcox, E. Identifying characteristics of the neurologically handicapped adolescent. In L. E. Anderson (Ed.), Helping the adolescent with the hidden handicap. Belmont, Calif.: Academic Therapy, 1970.

Wissink, J. F., Kass, C. E., & Ferrell, W. R. A Bayesian approach to the identification of children with learning disabilities. Journal of Learning Disabilities, 1975, 8, 158-166.

Woodcock, R. W. Woodcock reading mastery tests. Circle Pines, Minnesota: American Guidance Service, 1973.

Yuille, J. C., & Paivio, A. Abstractness and recall of connected discourse. Journal of Experimental Psychology, 1969, 82, 467-471.

Table 1

Means, Adjusted Means, and Standard Deviations for the Paraphrase-Recall Posttests and the Passage Comprehension Test from the Woodcock, Form B

Group	Low-Imagery			High-Imagery			Woodcock		
	M[a]		SD	M[a]		SD	M[a]		SD
Training									
Low	12.00	(11.90)	9.82	31.80	(32.67)	12.64	41.41	(41.24)	3.44
Middle	14.40	(13.85)	6.50	31.20	(31.90)	15.30	39.00	(39.97)	3.87
High	31.80	(30.33)	16.33	35.40	(35.42)	10.76	45.00	(42.83)	3.54
Practice									
Low	14.00	(12.89)	9.97	27.40	(27.51)	10.31	39.40	(39.94)	3.58
Middle	19.80	(18.89)	6.38	33.60	(35.47)	5.13	41.20	(41.12)	3.96
High	13.80	(13.17)	11.73	31.00	(32.20)	11.49	40.20	(41.11)	6.91

[a]The numbers in parentheses are means adjusted using analysis of covariance.