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ABSTRACT

A study analyzed the relative effectiveness of three teaching strategies for enhancing vocabulary and reading comprehension. Sixty-eight students in three fourth-grade classrooms in a suburban southwestern public school were presented with a vocabulary lesson on weather from the reading text according to one of the following strategies: (1) basal discussion technique (schema theory); (2) discussion through hierarchical presentation of key terms and semantic webbing (hierarchical presentation theory); or (3) discussion through hierarchical presentation of key terms and pictorial webbing (dual coding theory). Following the vocabulary lesson, students read the target passage from their texts silently. After the reading was completed, students were given the multiple choice measure of comprehension from the teacher's edition of the textbook. The same measure was administered one week later. Results indicated that students in the classroom instructed with semantic webbing performed significantly better, especially on the delayed recall measure. Memory between low and high achieving students varied differentially according to instructional strategy. Combining pictorial and written stimuli appeared to interfere with retention, especially among low achievers. (Nine tables of data are included; 19 references are attached.) (SR)

Semantic Webbing, Semantic-Pictorial Webbing and Standard Basal Teaching Techniques: A Comparison of Three Strategies to Enhance Learning & Memory of a Reading Comprehension Task in the Fourth Grade Classroom

by
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Running Head: SEMANTIC WEBBING

ABSTRACT

Research supports three theoretical approaches which may facilitate learning and memory. The first, schema theory, implies learning occurs when information is related to already-existing knowledge structures. The second, hierarchical presentation theory, suggests information provided in a systematic, logical manner enhances understanding and recall. The third, dual-coding theory, recommends that encouraging the processing of information both pictorially and semantically results in deeper knowledge and enhanced memory. This study compared class and student performance on immediate comprehension and delayed recall measures after instruction based on one of these theories was received. Students in suburban southwestern public school fourth grade classrooms were presented with a lesson on weather from the reading text according to one of the following formats: 1) basal discussion technique (schema theory); 2) discussion through hierarchical presentation of key terms and semantic webbing (hierarchical presentation theory) or 3) discussion through hierarchical presentation of key terms and pictorial webbing(dual coding theory). Students in the classroom instructed with semantic webbing performed significantly better. Further analysis revealed this was especially true on the delayed recall measure. Memory between low and high achieving students varied differentially according to instructional strategy. These findings have implications for both developmental and physiological aspects of the organization of memory. They also suggest effective instructional designs.

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Background

Viewing the development of knowledge in children as a constructivistic interaction between the child and the environment is an idea that goes back at least to Piaget's emphasis on the processes of accommodation and assimilation (Piaget, 1929). These means of adaptation of the organism to the environment can, in turn, be traced to Herbart and other philosophers of the eighteenth and nineteenth centuries. Part of this interactive explanation has recently been "resurrected" by cognitive scientists in the form of schema theory. Schema theory (Pearson & Spiro, 1982; Anderson, J. 1976; Anderson, R. 1977) suggests that learning is a constructionistic process in which each new piece of information, as assimilated or accommodated to, expands and refines the existing knowledge base already in memory, interacting to enhance understanding. Both prior knowledge and memory become important variables in learning. Schema theory, and the volumes of research currently available in support of it, suggest that for learning to occur, new information must be relevant to already-existing information.

Long, Hein & Coggiola (1978) found that utilizing semantic mapping as an instructional strategy increased delayed recall among deaf students. Sinatra, Stahl-Gemake & Berg (1983) found hierarchically or logically arranged semantic webs were effective instructional tools for use with learning-disabled populations. Other recent research has verified the long-established notion that hierarchical presentation of information seems to facilitate learning, at least among adolescents. When information or vocabulary are presented in a systematic way, for example by moving from the specific to the general, this information appears to be more easily encoded in an organized manner which facilitates retrieval and enhances understanding (Grinder, et al, 1992; Horton, et al, 1992; McCarthy-Tucker, 1992). Thus, one feature of a successful instructional strategy seems to be its ability to effectively relate new information to the prior knowledge base of students and a second feature seems to be a systematic, hierarchical introduction of information, vocabulary and/or concepts.

Since information which cannot be retained, retrieved and appropriately applied cannot be considered to have been "learned," memory also needs to be considered. Paivio (1971) suggests that human memory consists of a dual-coding process. Verbal information and pictorial information are processed and stored differently within neural networks. Other researchers define dually-coded memory traces as semantic vs. imagistic, or sequential vs. simultaneous. It has been suggested that, if information is processed in both modes, both storage and retrieval may be enhanced. Some research (Kulhavy, R. W. & Schwartz, N. H., 1980; Abel, R., 1982) have explored the effects of presenting information to learners both verbally and pictorially in order to explore whether utilizing both modes enhances learning and memory. They found that this method seems to enhance learning and memory for subjects from grades six through college. Thus, a teaching strategy which incorporates dual-coding features by utilizing both verba' and graphically or pictorially depicted information should be most effective.

One consideration to keep in mind regarding dual processing, however, is that neurological research and research from the area of special education suggests the ability to process, encode and retrieve information may be context-specific. Encoding specificity effects memory, at least to some degree, for most individuals. For example, information which is introduced in a verbal or semantic context may be easiest to retrieve in a verbal or semantic context. Information introduced in a graphic or pictorial context may be best retrieved in a graphic or pictorial context. Information introduced through both pictorial and semantic means may be easiest to retrieve when both are present at time of retrieval.

Improving reading comprehension of students is an important concern for teachers (Heimlich & Pittelman, 1986.) A measurement problem, however, is that in our present schools, both curriculums and assessment instruments are primarily text-based. Thus, information which is encoded graphically rather than semantically may not be as easily accessible for students when traditional types of assessment are used. Students may "know more than we know they know" if there is a mismatch between the type of encoding encouraged by the teaching strategy used and the manner in which the learning is assessed. The ability to co-ordinate, process and retrieve information encoded imagistically and then translate that information to a verbal mode may not be a mental process which is equally available to all students. Substantial individual differences in the ability to coordinate and translate information from spatial to verbal modes may exist. The ability or inability to "shift modes" in learning and memory from verbal to pictorial frames could vary partly as a function of developmental level and partly as a result of the structure of the brain itself as modified by genetic and environmental variables. All of these considerations should be kept in mind when seeking to design, utilize and measure effective strategies for improving student reading comprehension in the classroom.

Research

This study analyzes the relative effectiveness of three teaching strategies for enhancing vocabulary and reading comprehension among fourth grade students in a suburban elementary school. Strategies utilized are: 1) a basal-reading method (text-based strategy which attempts to tap prior knowledge); 2) a semantic webbing method (hierarchically-presented and text-based strategy which attempts to tap prior knowledge), and 3) a pictorially-depicted webbing method (hierarchically-presented and picture-based which attempts to tap prior knowledge). This study seeks to determine which method seems most effective for enhancing reading comprehension.

Subjects and setting: 68 students in three fourth grade classrooms of a suburban elementary school were subjects. Gender, ethnic backgrounds, SES and achievement levels as measured by the

Iowa Test of Basic Skills were compared among classes. No differences were present on any of these dimensions. Research was conducted during the lesson time normally scheduled, on a schoolwide basis, for reading. All instruction and data collection occurred in the subjects' classrooms and was conducted by the experimenter. The experimenter was a resource teacher at the school where the study was conducted. She had not previously instructed any of the subjects in the study.

Method and design: The independent variable was the type of instructional strategy used. The first strategy tapped prior knowledge of vocabulary. The second strategy tapped prior knowledge and introduced vocabulary and concepts in a hierarchically-ordered, categorical manner. The third strategy included both of the previous features, and also allowed for pictorial representations to facilitate dual coding. The dependant variable was student scores on a multiple-choice test to measure comprehension of the concepts in the passage, taken from the teacher's edition of the textbook from which the passage used as the content base of the lesson was derived.

A passage on weather taken from the fourth grade reading text used in the school served as the content base for each lesson. Students were first assessed for prior knowledge by writing definitions to a list of vocabulary words. Vocabulary words from previous lessons were included with vocabulary words from the target lesson. Order of word presentation was randomized. Any student who attained a score of more than 50% correct on target vocabulary words had scores excluded from final data analysis.

Three separate scripted lessons were used--one for each instructional strategy. One script was taken directly from the teacher's edition of the text and included discussion questions and vocabulary exercises. The questions attempted to draw on prior knowledge of the learners. Students then read the target passage silently. After the reading was completed, students were given the multiple choice measure of comprehension from the teacher's edition of the textbook. The same measure, with question order randomized, was again administered to the class one week later to assess retention.

The second script utilized semantic webbing. Students were asked to write the word "weather" on a piece of paper, then list other words which reminded them of weather by category. An example was given on the chalkboard. After five minutes, the instructor randomly called on five students to read their categories of words. These student-generated words were listed on the chalkboard and then arranged hierarchically, with input from the class. Students were each told to generate a web of the words presented. An example was given on the board. Students then developed their own webs. These were collected. Students were then instructed to read the passage. The post-tests were given in the manner previously described. The third script was identical to the second, except that students were instructed to draw pictures for webs, rather than use words. The class example also included pictures.

Statistical analyses included a 3 (basal, semantic web or pictorial/ semantic web) by 2 (immediate and delayed recall scores) MANOVA. Scores were also analyzed separately for high achievers (above 50th percentile of class ITBS reading scores) and low achievers(below 50th percentile of class ITBS reading scores). T-tests compared immediate and delayed recall scores resulting from each strategy for each achievement group. Stepwise regression analysis, using the Pivotal Condensation Method (Tatsouka, 1971) was used to eliminate age and gender as factors contributing to scores.

Results: All three instructional groups had equivalent mean scores on the prior knowledge assessment. No significant differences in performance were evident among groups according to instructional strategy on the immediate comprehension measure. On the delayed comprehension test, more variation was evident. The semantic-mapping group performed best, with a mean of 13.4 and an SD of 2.4. The group instructed by the traditional basal technique had a mean score of 11.9 and SD of 3. The semantic-pictorial group had the lowest mean, 10.8, and the highest SD, 3.3. This data is summarized in Table 1.

Median scores across all groups and tests were near mean scores, indicating a normal distribution was present. Range of scores was greatest for the semantic-pictorial mapping group on the delayed comprehension test and least for the semantic mapping group on the delayed comprehension test. The minimum score was identical in all three groups on the comprehension measure, but showed variation on the delayed measure. The lowest score in the semantic-pictorial group fell from 6 to 4. The lowest score in the semantic webbing group rose from 6 to 9. The minimum score in the basal group fell from 6 to 5. Maximum scores showed less variation. In the semantic-pictorial group, the maximum score (18) remained the same on both immediate and delayed measures. In the basal group, the maximum score fell from 18 on the immediate comprehension measure to 17 on the delayed comprehension measure. In the semantic webbing group, the maximum score rose from 17 on the immediate comprehension measure to 19 on the delayed comprehension measure. Data is summarized in Table 2.

--------------------insert tables 1 and 2 about here--------------

Examining student scores individually to note the comprehension and delayed comprehension scores of those instructed by the traditional, basal strategy revealed that 70% of the students evidenced a decrease in scores between immediate and delayed measures. 10% showed no change while 20% showed an increase. Among students instructed by the semantic-pictorial technique, 66% showed a decrease in scores between measures, 14% showed no change and 20% showed an increase. Among students instructed according to a hierarchical semantic webbing strategy, only 40% showed decreases in score between measures. 10% showed no change and 50% evidenced increased scores. This data is summarized by instructional group according to age, gender, ITBS standard scores and pre-test score for each subject in tables 3, 4 & 5.

--------------------insert tables 3, 4 and 5 about here--------------

Table 6 is a correlation matrix of examined variables. Grade equivalency and standard scores derived from ITBS data correlated moderately to comprehension and delayed comprehension scores on the measures employed in this study. Pretest scores showed a slight correlation to comprehension scores, delayed comprehension scores, ITBS standard scores and ITBS grade equivalency, with values at .32, .37, .33 and .31 respectively. No significant correlations appear between either gender or age in months and achievement or comprehension scores on the measures used.

-----------------------insert table 6 about here--------------------

Analysis of variance was carried out utilizing the general linear model (Woodward, Bonett & Brecht, 1986; Lindeman, Merenda & Gold, 1980). Since the design could be conceptualized in two distinct ways (three treatment groups, each receiving a distinct type of instruction or a control group model, with one group receiving "traditional" instruction while the others received variant forms of hierarchical webbing instruction) and this conceptualization determines the mathematical formulae utilized, two separate MANOVAS were performed. The probability scores derived from each are compared. Both show that Instructional Group was a significant factor for both comprehension and delayed comprehension scores. The probability of the variation in scores between the two webbing groups occurring by chance alone, with the basal group serving as control, was .008. The probability of the difference occurring in a three-group model was .02. These findings (summarized in Table 7) show significant differences in performance on comprehension measures of a fourth grade basal reading passage as a function of type of instruction received.

No significant differences among groups appeared on the pre-test or on the immediate comprehension measures when examined by T-tests. The greatest significance (see Table 8) appeared in a comparison of means between the semantic-pictorial webbing group and the hierarchical semantic webbing group on the delayed comprehension measure. The Independent Samples T-Test (Hayes, 1981) between these two groups resulted in a value of p=.0073. Scores of the subjects instructed through semantic-pictorial webbing were significantly lower than scores of subjects in the semantic webbing group. Scoring patterns for each group were then further analyzed (see Table 9) according to student achievement level.

---------------insert tables 7, 8 and 9 about here-------------------

Discussion: Including pictures as well as words appeared to interfere with or inhibit delayed comprehension as measured by a semantic assessment tool, whereas developing hierarchical, categorical and/or logical relationships through words seemed to enhance it. A memory interference phenomenon seems potentially evident. When subjects were divided into "low" and "high" achievers, according to whether standard score on the reading comprehension portion of the ITBS was above or below the group mean. (X=121), in the group utilizing semantic-pictorial mapping, high achievers showed little score difference between the initial and delayed comprehension measures. Low achievers, however, lost an average of more than two points. The range of scores between the two tests increased for low achievers, but decreased for high achievers. In the semantic webbing group, the mean score for both low and high achievers increased by two points. The range of scores decreased, especially among low achievers. In the basal group, little difference occurred between the two tests; low achievers gained one point overall while high achievers lost one point overall. The range of scores for low achievers increased markedly, however, while it diminished somewhat for high achievers. This suggests that retrieval may occur somewhat differently for low and high achievers. Low achievers may be more susceptible to interference and less able to organize information independently. Introducing material in a hierarchically organized way, in the same medium which will be used to measure retention, was most effective for these students. Because studies with older students and adults have found that combining pictorial and semantic cues is more effective (Kulhavy, R. W. & Schwarz, N.H., 1980; Abel, 1982), some evidence of a developmental trajectory for memory organization is suggested.

Perhaps the "low achievers" are simply developing organizational structures for memory at a different rate than "high achievers."

This analysis suggests that varying effects on memory exerted by different instructional strategies may be an important variable in determining student scores. Memory among high achievers appears to be more stable and thus less effected by instructional strategy than among low achievers. Combining verbal and pictorial information, then measuring retention only in a verbal mode, appears to have the greatest negative effect among low achievers. Hierarchical ordering of verbal information, later measured for recall through verbal means, seems to best enhance memory for all students in the classroom. Traditional basal techniques seem to have the least--or, rather, the most unstable--effect on memory.

Statistical analyses of the data from this study reveal significant differences in subject scores on measures of reading comprehension do appear to be attributable to instructional method. Hierarchically-ordered presentation of a semantic web appears to be a superior strategy for increasing comprehension, with differences more apparent on delayed than on immediate recall measures. This may indicate that memory in children, rather than understanding of material, is most impacted by the differences in instructional methodologies. Low and high achievers appear to react in a slightly different manner to various strategies, but both groups fare best when instructed through semantic webbing.

Conclusion: This study supports findings that semantic mapping increases delayed recall. It also supports findings that hierarchically or logically arranged semantic webs are effective instructional tools. The study contradicts the hypothesis that combining pictorial and written stimuli deepens comprehension and strengthens memory, at least for elementary school students. Combining the two actually appeared to interfere with retention as measured on a traditional classroom instrument, especially among low achievers. Among low-achieving students in this study, both basal and semantic web instruction resulted in a mean increase of score on a comprehension measure administered after one week, while semantic-pictorial instruction resulted in a decrease.

Implications for future research

Perhaps as Kosslyn (1976) and others have suggested, the brain does process verbal and pictorial information in qualitatively different ways, and this processing is less well-coordinated in lower-achieving students and at earlier developmental levels. This developmental component may explain the contradictory results between this study and others which have suggested that combining verbal and pictorial cues actually enhances comprehension and memory (Abel, 1984).

The study clearly indicates that semantic mapping is a superior strategy for increasing comprehension. Since this strategy develops a categorical, hierarchical organizational structure using words, this reiterates Thorndike's observation that the ability to understand relationships among words is crucial to comprehension (Thorndike, 1917). The feature of the semantic map or web that appears to most increase comprehension is the manner in which it logically organizes new information for the reader, utilizing words as the medium. Instructional techniques which do this are the types of techniques teachers should find, develop and use in the classroom.

Since the findings presented here contradict studies which claim combining words and pictures is a strategy superior to using only words, further research is necessary to discover why. Are elements in the hardware of the brain responsible? Is a coordination between spatial and verbal modes necessary to benefit from a dual-approach strategy? Is this coordination of sequential and simultaneous processing developmentally based, environmentally based or physiologically determined? Is it present in sixth graders but not fourth graders? Can it be taught or enhanced through specific methods? Is it genetically tied? A veritable labyrinth of future research topics are suggested here.

Of course, no absolute conclusions may be drawn about the most effective form of instruction (or anything else in life!) from this study. It does, however, add to data which supports hierarchically-ordered semantic presentation of material as an effective instructional strategy for teaching, especially when that which has been taught is tested with semantic measures. It also reminds us just how little we truly know about cognitive development, learning and memory and "casts the lantern light" down a few more tunnels for future exploration.

	Immediate	Delayed
Semantic Mapping Group		
mean	12	13.4
standard deviation	3.4	2.4
Semantic Pictorial Group		
mean	12.2	10.8
standard deviation	3	3.3
Basal Group		
mean	12.8	11.9
standard deviation	3.3	2.9

Table 1:Comparison of means and standard deviations of Semantic Mapping, Semantic-Pictorial Mapping and Basal Control Groups on immediate and delayed comprehension measures.

	Median		Minimum		Maximum		Range	
	Immediate	Delayed	Immediate	Delayed	Immediate	Delayed	Immediate	Delayed
Semantic Group	11	13.5	6	9	17	19	11	10
Semantic Pictorial Group	12	10	6	4	18	18	12	14
Basal Group	13	12	6	5	18	17	12	12

Table 2 Comparison of median scores and range of scores for Semantic Mapping, Semantic Pictorial and Basal Instructional Groups.

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Control Group

Ss	Age(yr./mo.)	Sex	ITBS Score	Pretest	T_1	T_2
1.	10/0	M	120	0	10	9
2.	10/9	M	122	1	6	12
3.	10/6	M	106	2	12	11
4.	10/1	F	150	2	15	14
5.	9/10	F	122	1	10	10
6.	11/3	M	106	1	16	5
7.	10/4	M	126	2	11	15
8.	10/4	F	137	3	15	13
9.	10/4	F	124	2	14	13
10.	10/0	F	147	5	18	17
11.	10/6	M	116	4	11	13
12.	9/10	F	102	0	13	9
13.	10/7	M	142	5	17	11
14.	10/0	M	119	2	7	13
15.	10/0	F	142	1	13	12
16.	10/2	F	116	1	9	7
17.	10/4	M	124	9	13	12
18.	10/8	M	135	1	14	10
19.	10/0	F	142	1	17	15
20.	9/11	M	133	3	16	16

Table 3: Individual scores of subjects from basal instruction group.

Semantic Mapping Group

Ss	Age(yr./mo.)	Sex	ITBS Score	Pretest	T_1	T_2
1.	10/0	F	137	1	10	15
2.	10/7	M	111	0	8	9
3.	10/6	M	144	2	16	17
4.	9/6	F	111	2	13	11
5.	10/0	F	121	1	8	13
6.	9/11	F	117	4	16	14
7.	10/0	M	129	5	14	19
8.	10/1	F	117	5	11	13
9.	10/7	M	140	2	15	14
10.	9/9	M	116	1	9	13
11.	9/9	M	140	1	11	14
12.	9/9	M	147	1	14	14
13.	10/9	F	114	3	10	13
14.	10/2	M	123	3	8	13
15.	10/4	F	110	2	8	9
16.	9/11	F	129	2	11	11
17.	10/6	M	114	1	16	11
18.	10/0	F	123	1	17	15
19.	10/0	M	116	1	6	14
20.	10/0	M	156	2	17	12

Table 4: Individual scores of subjects from semantic mapping group.

TS

Ss	Age(yr./mo.)	Sex	ITBS Score	Pretest	T_1	T_2
1.	10/6	M	133	5	16	13
2.	10/10	F	92	2	8	7
3.	10/9	F	114	1	12	8
4.	10/2	M	123	1	13	10
5.	10/6	M	82	1	8	7
6.	9/11	F	137	4	18	18
7.	9/9	F	118	2	6	6
8.	9/11	F	117	2	12	8
9.	10/11	F	11[illegible]	3	11	10
10.	10/3	M	118	0	14	10
11.	10/9	F	122	2	12	14
12.	9/11	M	129	5	14	14
13.	11/2	M	116	2	6	9
14.	11/2	F	111	0	11	9
15.	10/3	F	119	2	15	14
16.	9/9	M	117	2	13	17
17.	10/5	M	117	3	12	7
18.	9/8	F	140	5	17	11
19.	10/0	M	109	2	15	4
20.	10/6	M	117	2	10	10
21.	9/2	F	109	2	12	10
22.	9/11	F	122	4	11	13
23.	10/2	M	123	3	9	12
24.	10/2	M	133	2	16	14
25.	10/4	F	133	1	11	12
26.	9/11	M	116	2	15	13
27.	12/2	M	109	1	13	9
28.	10/4	M	133	4	14	15

Table 5:- Individual scores of subjects from semantic pictorial mapping group

Correlation Matrix

	v1	v2	v3	v4	v5	v6	v7	v8	v9
v1	1.00	.05	-.29	.01	-.04	.07	-.01	.02	0.00
v2	.05	1.00	-.25	.32	.37	.33	-.12	.31	.25
v3	-.29	-.25	1.00	-.14	-.27	-.11	.03	-.16	-.17
v4	.01	.32	-.14	1.00	.35	.42	.07	.50	.35
v5	-.04	.37	-.27	.35	1.00	.51	.16	.60	.56
v6	.07	.33	-.11	.42	.51	1.00	.08	.90	.65
v7	-.01	-.12	.03	.07	.16	.08	1.00	.20	.22
v8	.02	.31	-.16	.50	.60	.90	.20	1.00	.77
v9	0.00	.25	-.17	.35	.56	.65	.22	.77	1.00

Number of cases: 68

Number of missing cases: 0

v1 = Sex (1=M; 2=F)

v2 = Pretest Score

v3 = Age

v4 = Comprehension Score

v5 = Delayed Comprehension Score

v6 = ITBS Reading Standard Score

v7 = Instructional Group

v8 = ITBS Grade Equivalency

v9 = Achievement Rating (1=low; 2=High)

Table 6: Correlations between factors establishing age and gender are not effecting scores on tests within any group.

Results of ANOVA Using Instructional Group as a Between-Factor and Scores on Comprehension and Recall Tests as a repeated Measure within-Factor, Including Calculations for Random Effects Considering Two Experimental Groups and a Control Group

SSH	DF	MSH	SSE	DF	MSE	F	DF	P
45.036	1	45.036	395.7	65	6.087	7.4	1,65	.0083

Results of ANOVA Using 3 Treatment Groups as Between-Factors and Scores on Comprehension TEsts and Recall Tests as Repeated Measure Within-Factors, Including Random Effects Calculations

SSH	DF	MSH	SSE	DF	MSE	F	DF	P
48.789	2	24.395	395.7	65	6.087	4	2,65	.0223

Table 7: MANOVA results comparing scores of instructional groups.

	Immediate	Delayed
Semantic Mapping vs. Semantic Pictorial	.75	.01
Semantic Mapping vs. Basal	.44	.09
Semantic Pictorial vs. Basal	.55	.29

Table 8: Results of the probability of the differences in scores occurring by chance according to Independent Samples T-Tests. The semantic mapping group and the semantic pictorial group scores on the delayed recall measure are significant at the .01 level.

I= Immediate Comprehension Test D= Delayed Comprehension Test

	Mean		Median		Minimum		Maximum		Range	
	I	D	I	D	I	D	I	D	I	D
Semantic Mapping Low Achievers	11	13	11	13	6	9	16	14	10	5
Semantic Mapping High Achievers	13	15	14	14	8	11	17	19	9	8
Semantic Pictorial Low Achievers	11	9	12	9	6	4	15	17	9	13
Semantic Pictorial High Achievers	14	13	14	14	8	11	17	19	9	8
Basal Low Achievers	10	11	10	11	10	7	11	16	1	9
Basal High Achievers	14	13	14	13	6	10	18	17	12	7

Table 9: Comparisons of performance of low and high achievers on immediate and delayed recall tests according to instruction received.

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