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Reciprocal Teaching of Lecture Comprehension Skills in College Students

Norman R. Spivey[1] and Andrea Cuthbert[2]

Abstract: This study explored the effects of a reciprocal teaching intervention designed to enhance the lecture comprehension skills of college students. Forty low-verbal ability students and 40 high-verbal ability students (as measured by SAT scores) were chosen for the study and randomly assigned to experimental or control groups. The experimental groups received the reciprocal teaching intervention, whereas the control groups did not. The instructor modeled four listening comprehension activities: summarizing, self-questioning, clarifying, and predicting, and guided the students in performing the comprehension activities. Six lectures were presented to all subjects in both experimental and control groups. Lectures were followed by comprehension tests. Results showed that low-verbal ability subjects receiving the reciprocal teaching method significantly increased their lecture comprehension. These significant increases were maintained over time.

I. Introduction.

Skilled reading, attentive listening, effective studying, and other scholastic activities are complex processes that involve skill and ability. Students who do not possess these skills are at a disadvantage in any learning situation.

Listening comprehension is one of these important skills, and it must be learned if students are going to be successful in school (Senechal and LeFevre, 2002). It is an important skill that affects people's daily lives, and proficiency in listening, and listening comprehension is imperative (Petress, 1999). Students in school settings who receive the majority of their information through lectures and discussion may benefit from research identifying effective strategies that improve listening comprehension. According to Hoover and Gough (1990), listening comprehension is even necessary for reading success. They suggest that impairments in listening comprehension can also limit reading. A context where listening comprehension is of vital importance is in the college classroom. Comprehension of lectures is paramount if college students are going to be successful in the classroom. When listening comprehension skills are highly developed, they occur naturally. When they are poorly developed, they may not occur at all (Aarnoutse and van den Bos, 1998). Unfortunately, in today's colleges and universities, there are many students who lack listening comprehension skills. If such students are going to meet the expectation that they comprehend complex lecture information, they will have to be taught the necessary listening comprehension skills (Block and Pressley, 2000).

Despite the importance of listening in the classroom, the ability to comprehend what is heard has been given little attention in language arts programs. Some researchers, however, have attempted to study various instructional strategies for listening and listening comprehension.

[1]Professor of Psychology, spiveyn@bethelcollege.edu.
[2]Division Assistant, spiveyn@bethelcollege.edu, both at Bethel College, 1001 W. McKinley Ave., Mishawaka, IN 46545.

Cunningham, Cunningham, and Arthur (1981) studied listening instruction and concluded that the use of a Directed Listening Activity would aid in listening and listening comprehension. In a similar study using directed instruction to enhance listening comprehension, Donahue and Pidek (1993) tested an oral paraphrasing strategy. Results show increases in the listening comprehension skills of students with language/learning disabilities. Some researchers (Funk and Funk, 1989; Mandlebaum and Wilson, 1989; Winkle, 1991) studied listening instruction and concluded that an important factor in listening training is integration. Listening cannot be taught effectively as an isolated subject; listening activities should be included in all areas of the curriculum. Other researchers (Riggenbach, 1990; White, 1990) believe that instruction in listening must include metacognitive skills, such as monitoring listening, analyzing language data, and being conscious of language production skills. One such strategy that includes comprehension and comprehension monitoring is reciprocal teaching (Palincsar and Brown, 1984; Palincsar, 1987; Palincsar, 1991). This is a method of cooperative teaching where teacher and pupils take turns in leading a discussion about a text listened to by students. Also, students are taught four strategies—questioning, clarifying, summarizing, and predicting. According to Palincsar and Brown (1984), these four strategies serve the two important functions of comprehension fostering and comprehension monitoring. Palincsar and Brown have found this method particularly effective in the introduction of new skills and concepts. As students gain in mastery they also receive plenty of opportunity for self-directed practice with feedback from peers and teachers. This type of instruction has been successful in a variety of contexts. Because adult learners spend much of their class time listening, and some adult learners can show deficiencies in their listening comprehension, this type of intervention may be particularly effective in not only improving students' comprehension of class lectures, but also improving students' understanding of peer presentations, improving students' understanding of the content in class discussions, and improving students' basic academic conversations. Reciprocal teaching has been hailed as one of the most prominent strategy-instruction programs developed in the last few decades (Dole, Duffy, Roehler, and Pearson, 1991; Glaser, 1990; Pearson and Dole, 1987; Siegler, 1991; Stanovich and Cunningham, 1991).

Most studies of reciprocal teaching were conducted with children (e.g., Aarnutse, Brand-Gruwel, and Oduber, 1997; Aarnoutse, van den Bos, and Brand-Gruwel, 1998; Coley, DePinto, Craig, and Gardner, 1993; Johnson-Glenberg, 2000; and Marks et al., 1993). Investigations with college students are limited (e.g., Hart and Speece, 1998). Hart and Speece (1998) tested the effects of reciprocal teaching in fostering reading comprehension skills in community college students. Their results showed the reciprocal teaching group performed significantly better than the comparison group on tests of reading comprehension.

The purpose of this study was to explore the effects of a reciprocal teaching intervention designed to enhance the lecture comprehension skills of college students. There are four hypotheses for this study: (a) College students with lower verbal ability who receive reciprocal teaching of comprehension fostering skills will show significantly more improvement in lecture comprehension from pretest to posttest compared to students with lower verbal ability who receive no training; (b) College students with lower verbal ability who are exposed to reciprocal teaching will maintain their improvement in lecture comprehension from posttest to delayed posttest compared to students with lower verbal ability who receive no training; (c) College students with lower verbal ability who receive reciprocal teaching of comprehension fostering skills will show higher levels of improvement in lecture comprehension from pretest to posttest compared with higher verbal ability students who receive reciprocal teaching or no training. The

lower verbal ability students should have more room to improve, because these individuals tend to be deficient in strategy usage; (d) College students with lower verbal ability who receive reciprocal teaching of comprehension monitoring skills will maintain their improvement in lecture comprehension from posttest to delayed posttest compared with students with higher verbal ability who receive reciprocal teaching or no training. Because lower verbal ability students tend to be deficient in strategy usage, they should have more room to improve.

II. Methods.

A. Participants.

Participants used in the study were 80 college students, 34 males and 46 females, enrolled in two sections of introductory psychology classes (typical enrollment for each section is approximately 150 students). The two sections were similar in makeup. Both sections had approximately 85% traditional students and 15% nontraditional students. Ninety-five percent of the students in both sections were freshmen.

The investigation included students with varying verbal abilities in order to test the effectiveness of treatment conditions as a function of ability level. The 80 participants (40 low-verbal ability – LVA and 40 high-verbal ability – HVA) were randomly assigned to one of two conditions (reciprocal teaching or control). Twenty low-verbal ability students were randomly assigned to the experimental condition (LVA-E); the remaining 20 low-verbal ability students were randomly assigned to the control condition (LVA-C). Similarly, 20 of the high-verbal ability students were randomly assigned to the experimental condition (HVA-E); the remaining 20 high-verbal ability students were randomly assigned to the control condition (HVA-C). The control condition in this study was similar to that used by King (1989, 1990). The low-verbal ability experimental (LVA-E) group received all assessment tests plus the reciprocal teaching intervention. The low-verbal ability control (LVA-C) group received all assessment tests but did not receive any intervention. The high-verbal ability experimental (HVA-E) group received all assessment tests plus the reciprocal teaching intervention. The high-verbal ability control (HVA-C) group received all assessment tests but did not receive any intervention.

In order to obtain participants who differed considerably in verbal ability level, only those students whose SAT-Verbal scores fell below 420 and above 580 were asked to participate. All participants were asked to sign a form giving permission for their SAT scores to be released from the Admissions office. Ninety students with SAT verbal scores above 580 were identified and 70 students with SAT verbal scores below 420 were identified from existing records. The high-verbal ability and low-verbal ability cut-off scores used for selection in this study were the same as the high-verbal ability and low-verbal ability scores used by Baker (1985) in her study examining the differences in the standards used by college students to evaluate their comprehension. The participants were paid $10 to participate and received extra credit points in their psychology class. To help in preventing attrition, the students were told that they would not be paid nor would they receive the extra credit unless they attended all of the sessions. All students who were chosen for the present study attended all sessions. Thirty-five students chose not to volunteer for the experiment, and were allowed to write a brief review of a research article, and received the same extra credit as the students who participated in the experiment. Forty students were randomly selected from the ninety identified students with SAT verbal

scores above 580, and forty students were randomly selected from the 70 identified students with SAT verbal scores below 420.

B. Materials.

Several instruments were used to assess the effectiveness of the lecture comprehension skills intervention. The measures were as follows:

Listening Training Passages. Fifteen listening passages, averaging 800 words in length, were available in all the conditions. In the reciprocal teaching condition, students listened to each paragraph of the passage, and the instructor encouraged the dialogue necessary to instruct the students in the prediction, clarification, self-questioning, and summarizing activities. In the control condition, students listened to the passage and discussed them.

The passages were chosen from the following current college psychology texts: *Theories of Human Learning* (Lefrancois, 2000); *Social Psychology* (Aronson, Wilson, and Akert, 1997); *Life-span Development* (Santrock, 1999); and *Abnormal Psychology and Modern Life* (Carson, Butcher, and Mineka, 1996). The passages were expository and represented a wide range of topics. The passages were selected after ensuring that they conformed to college level according to the Fry Readability Formula (Fry, 1977).

Pretest, Practice, Posttest, and Delayed Posttest Lectures. The students in all four groups (experimental and control) were asked to listen to and watch six videotaped course lectures from a General Psychology course. The lectures took place in the regular classroom under normal class conditions. The lectures were conducted by an associate professor with 14 years teaching experience in introductory psychology classes. The lectures were video-taped to allow each section of the introductory psychology classes to observe and listen to the exact same lecture. The duration for each lecture was one-half hour. Each lecture was followed by a comprehension test to gather lecture comprehension data. The first lecture was followed by a comprehension pretest to gather baseline data. The next three lectures, given during the intervention phase, were followed by comprehension tests to gather ongoing data on the reciprocal teaching versus control conditions. The fifth lecture was followed by a comprehension test to gather lecture comprehension data for posttest. The sixth lecture was followed by a comprehension test to gather lecture comprehension data for the delayed posttest. The criteria for selection of these lecture presentations were that they were unrelated to material covered in other classes to avoid effects of prior knowledge at testing, and that they represented a pure lecture format (no discussion groups, activity groups, movies, etc.).

The lectures followed the order of topics in *Essentials of Psychology: Exploration and Application* (Coon, 2000), which was the textbook used for the course. However, the material covered in the lectures was supplemental and did not come directly from Coon's text (to avoid effects of prior reading of material in the text). The lectures covered the following regular course topics: the control of pain, observational learning, creativity, birth order, mental health, and motivational cycle. Each lecture followed a logical outline form with main topics supported by details and examples. The goal of the lecture was to organize the information and present it in a step-by-step fashion, allowing for easy assimilation into existing knowledge schemes. To insure that listening was the only method used by the students to take in the information, no terms were written on the board.

Pretest, Practice, Posttest and Delayed Posttest Lecture Comprehension Tests. Following each lecture, a written test was administered to evaluate participants' comprehension of the content of the lecture. The written tests covered only material presented in the lecture and

consisted of 14 questions, 10 multiple-choice (five text explicit and five text implicit) and four short-answer essay (two text explicit and two text implicit). To aid in classifying the questions as text explicit or text implicit, Pearson and Johnson's (1978) taxonomy was used. The multiple-choice questions were each worth one point and the short-answer questions were each worth two and a half points, making the entire test worth 20 points. The entire Pretest Lecture Comprehension Test is found in Appendix A.

Two independent raters (both taught written communications classes) were asked to use Pearson and Johnson's (1978) taxonomy to classify the 10 multiple-choice questions and the four essay questions for each lecture. Using Pearson and Johnson's taxonomy, the raters classified each question as either text implicit or text explicit. Using the lecture as an indicator of content covered, the two independent raters, neither knowing the identity of the student nor the conditions of the experiment, scored the multiple-choice questions and the open-ended questions on each of the six tests. A scoring key of the expected answers for each multiple-choice question and each essay question was prepared for the two raters. The key contained the answers to each question, and the amount of credit allotted to each question. For each essay question, each of the participants' answers were compared to the ideal answer in the scoring key and a given number of points were assigned in terms of the adequacy of the answer. To clarify the coding scheme used for the essay questions, the following is an example of an essay question used in the present study. Two participants' answers are also provided, one receiving full credit and one receiving partial credit.

Question: Kagan noted two contrasting styles of thinking exhibited by children. Name and describe each style.

Answer (full credit, 2.5 points): Impulsive thinkers: tend to look at problems in a global way and offer quick responses. Reflective thinkers: concentrate on the details of the problem and are more deliberate (slower) in offering responses.

Answer (partial credit, 1.0 points): Impulsive: Come up with first answer they think of. Responsive: Respond with an answer.

After all the questions on the test had been graded, the points for the multiple-choice question were added together with the points for the essay questions, and a composite score was computed. The scores on the multiple-choice questions and essay questions were analyzed separately, and were found to be significantly correlated, $r(79) = 0.61$, $p < 0.05$. Therefore, a composite score was used in the present study. The internal consistency of each test was examined using the Kuder-Richardson Formula 20 (*KR*-20). The internal consistency of the multiple-choice portion of the six lecture comprehension tests ranged from 0.70 to 0.77. Interrater reliabilities on the tests were also examined. Agreement between the raters was 85 percent. On the lecture comprehension tests, the range of actual scores was: HVA-E, 15-20; LVA-E, 12-18; HVA-C, 15-20; LVA-C, 8-16.

C. Procedure.

The steps in the procedure for the control and experimental conditions were as follows:

Low Verbal Ability Control Group. Twenty low verbal ability students (LVA-C) were assigned to four groups; each group consisted of five students who worked with an instructor. The instructor was a senior undergraduate student majoring in Psychology. The instructor was trained by the experimenter to give summaries, lead discussions, and answer questions. Each group listened to a training passage, then the instructor summarized the passage for the students,

led a discussion about the passage, and answered any questions that the students had about the passage. This type of control condition was similar to that used by King (1989, 1990) in assessing comprehension of lecture material. This control condition provided activities for the students which allowed for the control groups to be treated similarly to the experimental groups (they met with an instructor, they discussed the listening passages, they met for the same amount of time each day, etc.). The only difference was that students in the control condition did not receive the reciprocal teaching intervention. These control students also listened to lectures and answered pretest, practice, posttest and delayed posttest lecture comprehension tests.

High Verbal Ability Control Group. Twenty high verbal ability students (HVA-C) received no intervention but listened to the training passages and discussed the information in the passages. The students also listened to lectures and answered pretest, practice, posttest and delayed posttest lecture comprehension tests. Procedures used with Control Group 2 were identical in all respects to procedures used with Control Group 1.

Low Verbal Ability Experimental Group. Twenty low verbal ability students (LVA-E) were assigned to four groups; each group consisted of five students who worked with a reciprocal teaching instructor in the experimental condition. Each group listened to a training passage, then the instructor directed the dialogues and instructed the students in the use of the four strategies. The instructors received three training sessions (Palincsar and Brown, 1984).

High Verbal Ability Experimental Group. Twenty high verbal ability students (HVA-E) were assigned to four groups; each group consisted of five students who worked with a reciprocal teaching instructor. The students received the same tests and intervention as the students in the low verbal ability experimental group, and the procedures used with the high verbal ability experimental group were identical in all respects to procedures used with the low verbal ability experimental group.

For the control groups and experimental groups, there were four phases to the study: (a) pretest, consisting of a lecture and a comprehension test; (b) treatment, consisting of 15 days of training--half an hour per day using the reciprocal teaching format for the experimental group or the discussion format for the control group, plus three lectures and three comprehension tests; (c) posttest, consisting of a lecture and comprehension test at the termination of the training phase; (d) delayed posttest, consisting of a lecture and comprehension test eight weeks after termination of the posttest phase. The students were apprised of their progress on the lecture comprehension tests. They were shown graphs depicting the percentage correct for each lecture comprehension test.

Reciprocal Teaching. A procedure developed by Palincsar and Brown (1984), reciprocal teaching, was used in the present intervention study. A reciprocal teaching instructor, grouped with either five low verbal ability college students (LVA-E), or five high verbal ability college students (HVA-E), first presented an overview of four strategies designed to enhance comprehension and comprehension monitoring: summarizing, questioning, clarifying and predicting. For the remainder of the intervention phase, the instructor and students listened to tape recorded passages and entered into dialogues pertaining to the passages to which they listened. The instructor and students took turns leading the group, and the instructor gradually shifted responsibility to the students as they gained expertise. The main objective of the four comprehension strategies was for students to understand the passages and remember them. All of the activities were embedded in as natural a dialogue as possible, with students and instructor giving feedback to each other within the context of actually listening to the passages. The students were encouraged to summarize the content of what they heard and then ask a question

about the main idea of the passage. Students were also encouraged to ask questions for clarification if anything in the passage was not understandable, as well as to make predictions about future events from the content of the listening passage.

After listening to a training passage, the following dialogue occurred between instructor (I) and student (S) early in the training program of the present study (first week). Part of the passage the students listened to was as follows:

> The traditional view of abnormal psychology has been based on the assumption that a fixed set of mental disorders exists, whose obvious manifestations cut across cultures. This psychiatric tradition dates back to Emil Kraepelin, who felt that depression, sociopathic behavior, and especially schizophrenia were universal disorders that appeared in all cultures and societies. Early research supported the belief that these disorders occurred worldwide, had similar processes, and were more similar than dissimilar. Such cultural universality has led to the belief that a disorder such as depression would be similar in origin, process, and manifestation in Asian, Black, Hispanic, or White clients. As a result, no modifications in diagnosis and treatment need to be made. Western concepts of normality and abnormality could be considered universal and equally applicable across cultures (Sue, Sue, and Sue, 1994, p. 9).

I: Can anyone summarize this passage?
S: Abnormal behaviors are the same around the world?
I: Good job. And how were these abnormal behaviors similar?
S: They occurred the same way everywhere?
I: O.K. You're right. But, the disorders were also similar in other ways, like their origin.
S: And their processes?
I: Right! Anything else?
S: I can't remember.
I: O.K. Let me try to do a summary for you. The most important thing about this passage is that according to some researchers, abnormal behavior is the same from one culture to the next. The disorders have the same origin, processes, and manifestation no matter what culture they appear in.

After listening to another training passage, the following dialogue occurred between instructor (I) and student (S) later in the training program of the present study (third week). Part of the passage the students listened to was as follows:

> Why do people overuse drugs? The answer to this question is complicated by the number of different kinds of drugs that are used and the number of factors that interact to account for the use of any drug. An explanation of drug abuse must take into account several general observations. First, in the 1960s and 1970s some researchers had hoped that they could identify a cluster of personality traits that could account for addiction to substances. However, simple attempts to find a common pattern of personality traits that underlie addiction have failed. It is highly unlikely that addiction is caused by a single personality type (Sue, Sue, and Sue, 1994, p. 281).

I: Can you summarize the paragraph?
S: Sure. At first researchers thought that drug abuse was connected to the personality. Like a personality trait for drug use. But then they didn't find any personality traits connected to drug use. Drug addiction probably isn't caused by personality traits.
I: Excellent Job. Now predict what you think will come next in the passage.
S: Another explanation for why people abuse drugs. Maybe something to do with peer pressure or other types of pressure like stress.
I: You're right. The third paragraph deals with that!

In the treatment phase, the instructor introduced the passage with a brief discussion. Since the passage was new to the students, the title was called to their attention and they were asked to predict the content of the passage based on the title. The instructor then indicated which group member would teach the first segment of the passage (usually one paragraph); the instructor or one of the five students. The instructor led the first few dialogues to model the appropriate techniques for utilizing the four comprehension strategies. After listening to the segment, the leader (student or instructor) for that segment asked a question like those that might be on a test of the material. The question was generated on the spot based on the material presented in the segment. The instructor or student leader then summarized the segment, discussed and clarified any difficulties, and finally made a prediction about future content. The reciprocal teaching instructor provided the guidance necessary for the students to complete the preceding activities by using a number of techniques: prompting (asked a question to generate dialogue), instructing (corrected student if something was stated incorrectly, gave information when it was needed) and modifying the activity (had student summarize if they were having trouble formulating a question). Throughout the daily reciprocal teaching intervention, segment to segment and paragraph to paragraph, the students were told that these activities were strategies that would help them understand better as they listened, and that they should try to use the strategies every day.

III. Results.

To assess effects of the reciprocal teaching strategy on the two verbal ability groups over time, a 2 (verbal ability) x 2 (treatment group) x 6 (time) repeated measures Analysis of Variance was conducted on the participants' scores on the six lecture comprehension tests.

The main effect of group was significant, F (1,76) = 35.65, $p < 0.01$. The groups receiving reciprocal teaching scored higher (M=l6.57, SD=1.l8) on the lecture comprehension tests as compared to the control group receiving no reciprocal teaching (M=15.14, SD=l.56). The main effect of verbal ability was also significant, F (1,76) 252.53, $p < 0.01$. The higher verbal ability group scored higher (M=17.64, SD=1.22) than the lower verbal ability group (M=14.30, SD=2.50). These effects were qualified in that the group x verbal ability interaction was significant, F (1,76) = 32.70, $p < 0.0$l. Table 1 presents the lecture comprehension scores of the experimental group and the control group as a function of verbal ability. In order to simplify the interpretations of interactions, a test of simple main effects indicated that high verbal ability students outperformed low verbal ability students on the lecture comprehension tests in the experimental condition, F (1,76) = 4.03, $p < 0.05$, as well as in the control condition, F (1,76) = 38.12, $p < 0.0$l, however, the differences between the two ability groups were largest in the control condition.

Table 1. ***Mean and Standard Deviation Scores for Lecture Comprehension as a Function of Group and Verbal Ability.***

	High Verbal		Low Verbal	
	M	*SD*	*M*	*SD*
Reciprocal Teaching Group	17.68	1.98	15.94	1.99
Control Group	17.53	2.05	13.31	2.44

The effect of time was significant, F (5,380) = 16.97, $p < 0.01$. A Newman-Keuls test of multiple comparisons revealed significant differences ($p < 0.05$) between means (Test #1 *M*=14.83 < Test #6 *M*=15.92 < Test #2 *M*=16.03 = Test #3 *M*=l6.03 < Test #4 *M*=16.20 < Test #5 *M*=16.56) indicating that students increased their scores on the lecture comprehension tasks from Test #1 through Test #5, then achieved lower scores on the delayed Test #6, perhaps because there were practice effects. This effect was qualified in that the group x time interaction was significant, F (5,380) - 9.36, $p < 0.0$l. Table 2 presents the lecture comprehension scores of the experimental group and the control group as a function of time.

Table 2. ***Mean and Standard Deviation Scores for Lecture Comprehension as a Function of Group and Time.***

		Reciprocal Teaching		Control	
		M	*SD*	*M*	*SD*
Test1	(Pretest)	14.87	1.89	15.07	2.38
Test 2		16.69	1.63	15.60	2.20
Test 3		17.05	1.79	15.35	2.40
Test 4		17.13	2.20	15.35	2.33
Test 5	(Post test)	17.72	2.26	15.85	2.20
Test 6	(Delayed Post test)	16.95	2.14	15.30	1.98

A test of simple main effects indicated that the group the subject belonged to (reciprocal teaching or control) significantly affected test performance over time. Significant increases in comprehension were found in the reciprocal teaching condition, F (1,380) 19.33, $p < 0.01$. A Newman-Keuls test of multiple comparison revealed that significant differences ($p < 0.05$) between means existed (Test #1 *M*=14.87 < Test #2 *M*=16.69 < Test #6 *M*=16.95 < Test #3 *M*=17.05 < Test #4 *M*=17.l3 < Test #5 *M*=l7.72) indicating that students in the reciprocal teaching condition increased their scores on the lecture comprehension tasks from test #1 through Test #5 and then achieved lower scores on the delayed Test #6, implying that the intervention led to a sizable impact, which was only partially maintained over time. No significant differences were found in the control condition, $p > 0.05$.

A group x verbal ability x time interaction was also significant, F (5,380) = 11.11, $p < 0.01$. The means and standard deviations related to lecture comprehension as a function of group (experimental vs. control), verbal ability and time (tests 1 - 6) are found in Table 3.

Table 3. ***Mean and Standard Deviation Scores for Lecture Comprehension as a Function of Group, Verbal Ability, and Time.***

		Reciprocal Teaching Group			
		High Verbal		Low Verbal	
		M	*SD*	*M*	*SD*
Test1	(Pretest)	16.90	2.17	12.90	1.62
Test 2		17.80	1.22	16.45	2.03
Test 3		18.10	1.65	16.20	1.94
Test 4		17.70	2.30	16.40	2.11
Test 5	(Post test)	18.00	2.36	17.40	2.17
Test 6	(Delayed Post test)	17.60	2.20	16.30	2.08
		Control Group			
		High Verbal		Low Verbal	
		M	*SD*	*M*	*SD*
Test 1	(Pretest)	16.70	2.01	13.45	2.75
Test 2		17.50	2.06	13.70	2.35
Test 3		17.70	2.14	13.00	2.67
Test 4		17.50	2.11	13.20	2.55
Test 5	(Post test)	18.30	1.91	13.40	2.49
Test 6	(Delayed post test)	17.50	2.10	13.10	1.86

A Newman-Keuls test of multiple comparison ($p < 0.05$) indicated that there were significant differences between high verbal ability students and low verbal ability students in both the experimental, and control conditions during the first lecture comprehension test. However, for the experimental condition, tests two through six showed no significant differences between high and low verbal ability students in the experimental condition. This indicated that the low verbal ability students who received the reciprocal teaching intervention improved their scores to the level of the high verbal ability students, and this improvement remained stable from posttest to delayed posttest. The data also indicated that the high verbal ability students who received the reciprocal teaching intervention did not significantly increase their lecture comprehension scores. For the control groups, significant differences between the high verbal ability students and low verbal ability students continued throughout the six testing situations. This indicated that low verbal ability students who did not receive a reciprocal teaching intervention continued to perform poorly on the listening comprehension task, and those high verbal ability students not receiving a reciprocal teaching intervention continued to perform at a high level on all six tests.

IV. Discussion.

A. Lecture Comprehension.

The purpose of this study was to investigate the effects of a reciprocal teaching intervention on lecture comprehension. The findings yielded support for Palincsar and Brown's (1984) research on the effects of reciprocal teaching. Those low verbal ability college students who experienced the reciprocal teaching intervention improved their listening comprehension scores from pretest to posttest to delayed posttest compared to low verbal ability students who received no training. It appears that the experience of the reciprocal teaching intervention increased low verbal ability students' ability to understand information presented orally. This understanding was reflected in their increased comprehension scores. The scores improved rapidly, showing improvement by the end of the first week of treatment. The improved lecture comprehension was also reflected in the stability of scores from posttest to delayed posttest. Those low verbal ability students in the control condition (not receiving a reciprocal teaching intervention) continued to perform poorly from pretest to delayed posttest.

Another possible explanation for the sudden improvement of the low verbal ability students in the reciprocal teaching groups is accountability. The students in the reciprocal teaching groups were held accountable for leading the groups. The students felt it was important to lead the group with competence and to gain the respect of their fellow group members. The students appeared to take this responsibility very seriously. The feelings of accountability may have caused students to work harder in the groups, thus improving their lecture comprehension scores. Reinforcement may also have contributed to the improved scores of the low verbal ability students in the reciprocal teaching groups. The students appeared to respond well to the feedback and reinforcement they received in their groups. They looked forward to interacting with the group and felt that the group had a positive influence on them personally. The reinforcement the students received in the group may have motivated them to improve their performance on the lecture comprehension tests.

Another explanation for the increased lecture comprehension scores of the low verbal ability students in the reciprocal teaching groups may have been the communication that took place between students in all of the groups. It was possible that students talked to each other and compared their experiences. Those in the reciprocal teaching groups received more attention (dialogue within the group, responsibility of leading the group, etc.) than students in the control conditions. This knowledge of group differences (they were receiving special attention) may have caused students in the reciprocal teaching group to try harder to please the instructor. An instructor effect may be another explanation for the improved lecture comprehension scores of the low verbal ability students in the reciprocal teaching group. The reciprocal teaching instructor for the low verbal ability students may have been more effective or enthusiastic than teachers in the other conditions. The instructor for the low verbal ability students was excited about the position and was motivated to do well. The instructor's enthusiasm may have positively affected the low verbal ability students and caused them to perform at a higher level than they would have with a less enthusiastic teacher.

High verbal ability students in both the reciprocal teaching group and the control group continued to perform at high levels from pretest to posttest to delayed posttest. This would indicate that the reciprocal teaching intervention did not significantly affect the lecture comprehension scores of students already high in verbal ability. Lower verbal ability students

had more room to improve and the reciprocal teaching intervention did in fact improve their scores. Higher verbal ability students did not have as much room to improve because they were already scoring at higher levels in their lecture comprehension. The lack of improvement in scores could be due to a ceiling effect. The lack of improvement could also be because the passages needed to be more difficult. The range of scores for the HVA experimental group was 15-20, meaning the lowest score was 15 points out of a possible 20 points, and the highest score was 20 points out of a possible 20 points. This would suggest that there was little room for improvement and if the questions were more difficult, or if the passages were more difficult, the range may have been wider.

B. Implications.

A major implication of this study is that a reciprocal teaching intervention does appear to be successful in fostering listening comprehension abilities in low verbal ability college students. The reciprocal teaching intervention provided a model of what expert listeners do when they are trying to understand and remember information. The intervention allowed students to observe the comprehension fostering activities in which they were expected to engage. The intervention also provided appropriate feedback for the student. The instructor was able to gauge the students' abilities and provide information to increase their level of competency. Through the interactions with the instructor and the other students, low verbal ability students were able to increase their listening comprehension abilities, and to maintain those increases over time.

C. Suggestions for Further Research.

The reciprocal teaching intervention appeared successful in fostering lecture comprehension. However, more research is necessary to identify the specific components responsible for the improvement in lecture comprehension. Also, more research is necessary to understand the effects of a reciprocal teaching intervention on high verbal ability students. The difficulty of the comprehension tasks and testing procedures need to be investigated for high verbal ability students. It is also important to investigate if higher verbal ability students are already using similar comprehension strategies. It would seem important to investigate variations or changes in this type of teaching intervention and assess what effects they would have on a more average or above average population.

Further research should also be conducted investigating the effects of a reciprocal teaching intervention on the comprehension abilities of adults at different ages. Assessing age differences in adults' abilities to comprehend auditory information is important. It is also important to assess the effectiveness of a reciprocal teaching intervention for subjects across the adult life-span. Given the high proportion of older "nontraditional" students enrolling in colleges and universities (Aslanian and Brickell, 1980), research addressing this issue is critical.

It is also important to investigate the effects of a reciprocal teaching intervention on comprehension abilities of students in an average college classroom. If this training procedure is to be practical, it must be tested in a normal, average classroom. Because some students at the college level struggle with their understanding of information, and reciprocal teaching could increase their comprehension abilities, it is necessary to investigate the strengths or weaknesses of this intervention in the college classroom with college teachers. Further research should also be conducted to assess if peers (other college students) could take on the role of teachers in the

reciprocal teaching procedure. The question of whether peer tutoring could effectively promote comprehension skills needs to be investigated.

D. Conclusions.

The message of programs such as reciprocal teaching is that knowledge of the learning process and the conditions that affect it should be a major part of the curriculum in elementary schools, secondary schools, and colleges. Reciprocal teaching is a highly effective method for teaching metacognitive reading and listening skills. As students master these metacognitive reading and listening skills, their reading comprehension and listening comprehension improve. It seems that instructional strategies focusing on these skills should be implemented in the classroom.

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Appendix A.

Pretest Lecture Comprehension Test.

LECTURE TEST #1

I.D. number _____
Please answer the following multiple-choice questions.

1. From two to eight weeks after fertilization, all organs are created and the placenta becomes functional. Which stage of prenatal development is being described here?

a. germinal
b. embryonic
c. fetal
d. zygote

2. Concern about the health of the fetus would be greatest if the mother had rubella (German measles) during which of the following weeks of pregnancy?

a. 5^{th} week
b. 10^{th} week
c. 15^{th} week
d. 20^{th} week

3. The end of the fetal period is signaled by:

a. implantation of the fetus on the uterine wall.
b. birth.
c. the differentiation of the blastula.
d. the start of ossification.

4. Which of the following statements concerning consumption of alcohol by women during pregnancy is true?

a. Any amount of alcohol is potentially harmful to the developing child.
b. Consumption during the first eight weeks is relatively harmless due to the small size of the fetus.
c. Damage occurs only during the embryonic stage.
d. Consumption of small amounts of alcohol can actually be beneficial to fetal health.

5. If a baby is born with Down Syndrome, the most likely cause is:

a. disease during pregnancy.
b. drug use during pregnancy.
c. a combination of stress and poor nutrition during pregnancy.
d. maternal age.

6. One of the substages of the fetal period is:

a. the differentiation stage.
b. the structural development stage.
c. the cognitive development stage.
d. the critical development stage.

7. Which childbirth technique has been called “birth without violence”?

a. A traditional birth.
b. The Leboyer method.
c. The Lamaze method.
d. Natural childbirth.

8. Which is NOT an aspect of the Lamaze method of childbirth?

a. The mother is taught a method of breathing and muscular control to minimize pain.
b. The use of a “coach” to give support to the mother during delivery of the child.
c. The use of anesthetics to remove all pain felt by the mother during delivery of the child.
d. Birth is treated as a celebration of life and not a medical procedure.

9. A pregnancy is most sensitive to teratogens during:

a. the germinal period.
b. the fetal period.
c. the embryonic period.
d. conception.

10. Melissa, who has active genital herpes, had her baby delivered by Caesarean section. This form of delivery was used because:

a. genital herpes deteriorates the birth canal.
b. it ensures fast treatment for the infant who is also infected.
c. it prevents transmission of the disease to the infant during birth.
d. factors unrelated to the herpes were in place.

Please answer the following short-answer essay questions.

1. Describe a physical characteristic of a mother during pregnancy which can lead to increased chances of spontaneous abortion, or miscarriage.

2. Describe the effects of the Rubella virus if it invades during the first two months of pregnancy.

3. Maria is pregnant and has experienced severe and prolonged anxiety during her pregnancy. How will this anxiety affect Maria during her pregnancy?

Joan is pregnant and has been smoking throughout her pregnancy. What effects might Joan’s smoking have on the fetus?