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A Remedial Reading Program At the College Freshman Level

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A REMEDIAL READING PROGRAM
AT THE COLLEGE FRESHMAN LEVEL

by
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A Thesis Submitted in Partial Fulfillment
of the Requirements for the
Degree of
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VITA

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>I. REVIEW OF RELATED LITERATURE</td>
<td>6</td>
</tr>
<tr>
<td>II. THE EXPERIMENT</td>
<td>23</td>
</tr>
<tr>
<td>III. RESULTS OF THE EXPERIMENT</td>
<td>41</td>
</tr>
<tr>
<td>IV. SUMMARY AND CONCLUSION</td>
<td>50</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>52</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table | Page
--- | ---
I. MEAN PERCENTILE RANK ACHIEVED BY EXPERIMENTAL AND CONTROL GROUPS ON INITIAL TEST AND RETEST, PRELIMINARY EXPERIMENT | 42
II. MEAN PERCENTILE RANK ACHIEVED BY EXPERIMENTAL AND CONTROL GROUPS ON INITIAL TEST AND RETEST, MAIN EXPERIMENT | 46
III. DIFFERENCE BETWEEN MEAN SUBTEST STANDARD SCORES ON INITIAL TEST AND RETEST, MAIN EXPERIMENT | 48
INTRODUCTION

Problems relating to reading in all its various aspects have excited a great deal of interest. There is an extensive literature concerning the nature of reading, the measurement of reading ability, the diagnosis of factors contributing to reading disabilities, and the improvement of reading ability at all age levels. This very interest in the problem of reading, however, quite probably stems from the situation hinted at by Bennett when he comments that "a glance at the typical magazine sales stand or a little observation of the reading habits of adults will cause one to wonder whether the great majority of the population of literate America knows how to read in any but a limited sense." (2:1)

The nature of reading, as a total process or activity, is an important question to which no universally accepted answer has been given. Some authors, in their discussion of reading problems and in their experimental investigations, imply that reading is simply a process in which the student moves his eyes across successive lines of print, interprets what he perceives and stores it in his memory. Too frequently, however, the importance of the interpretative phase of the process is minimized or even ignored. Reading thus becomes a mere receptive and retentive process. According to Buswell, "reading is simply a process of interpreting a certain kind of visual experience in which conventional symbols on a printed page are substituted for the common objects in the
environment." (7:144)

This concept of reading we must reject because it is not sufficiently inclusive. Moore indicates a more satisfactory interpretation when he states that perception, whether of objects or words, "consists essentially in the assimilation of a sensory presentation to the intellectual categories of past experience..."¹ According to this conception, reading is a complex process involving the perception and the active intellectual interpretation of the printed symbols. The student, therefore, must not only perceive words; he must think as he reads.

Johnson makes the following pertinent observation concerning this type of reading: "It involves not only the simple understanding of meaning; it involves the recognition of relationships; it includes the ability to see implications and to draw inferences; it requires interpretations and critical evaluations; it calls for intelligent application to immediate problems." (25:82)

Reading, therefore, should not be thought of as involving simply the perception, comprehension and retention of items of knowledge. Rather, it is a complex activity which calls into play all those intellectual abilities and habits which educational institutions strive to inculcate and develop in their students. In other words, reading is one of the utmost importance to the student of and by itself as one of the highest forms of intellectual activity. In this concept of reading, the acquisition of items of knowledge from the printed page is a secondary importance.

The widespread interest and the extensive literature mentioned above only reflects the importance of reading to the individual, both as a student and as a member of society. Many writers, perhaps over-emphasizing the obvious, have elaborated upon the essential role played by reading in enabling the student to survive and progress academically. "Although efficient reading does not guarantee high academic performance, controlled studies indicate that it does influence total academic achievement to a significant degree." (177) It is commonly pointed out in this connection that by far the majority of high school and college courses demand that the student be able to read and to read well. The student who cannot read at a satisfactory rate, or who does not adequately comprehend what he reads, is poorly equipped to withstand the intellectual rigors of high school and college. If such a student does survive, his efficiency is greatly impaired and he is unable to reap to the fullest his educational harvest.

The ability to read well, however, is important not only to students. It is important to the business man, the professional man, the housewife, the laborer, the farmer. With characteristically American emphasis on pragmatic values, various writers have been quick to point out that the business man can advance his own interests if he is capable of reading widely and intelligently; that the professional man can hardly aspire to competence in his chosen field unless he reads himself full of his subject; that the housewife who reads rapidly and with understanding can acquire information which will enable her to make a more efficient and pleasant home; that the laborer and the farmer can hope to advance themselves to a great extent by reading farm and labor bulletins.
A less obvious, but more fundamental value of reading is to be found in its relation to the democratic form of government. It almost has become a platitude that such government is predicated, at least in theory, upon an alert and informed citizenry. But these citizens frequently acquire their information, their viewpoints, their conceptions and prejudices from books, newspapers and magazines. If individual men are to have the necessary information, if they are to be aware of their political rights and obligations, if they are to develop an adequate social consciousness, if they are to be citizens who can direct and inspire their elected representatives, then they must be men who are capable of reading widely, rapidly, and with keen comprehension. The increasing emphasis given to this aspect of reading is well expressed by Strang:

In addition to the psychology and philosophy of reading a sociology of reading has appeared on the educational horizon. Sociology considers the question "How much reading and what kind of reading are required of good citizens in the world today?" The amount and quality of reading an individual does has been suggested to an excellent index of his social competence...Thus the reading of high school and college students becomes an indication of the effectiveness of education for social responsibilities. Reading for intelligent citizenship in a democratic society is becoming the theme song of many articles and yearbooks...At present we are in the stage of being aware of these problems and of seeking somewhat incoherently for their solution. (h3:10)

In view, therefore, of the importance of reading in this age of the printed word, it has become increasingly clear that educational institutions, from grade schools to colleges, should attempt to teach reading skills, to diagnose factors responsible for reading disabilities and, by
various remedial measures, to improve those who have become poor or indifferent readers.

A constantly growing literature on these aspects of the subject testifies to the amount of work being done. Methods and techniques for teaching reading in the grades have been developed and refined. With the introduction of tests and other devices, diagnosis of various factors contributing to reading disability has become more accurate and positive. In the field of remedial instruction, however, although much work has been done, and while the results in many cases have been favorable, the issue as to the value and effectiveness of various remedial efforts on the college level remains undecided.

It was in an attempt to contribute some significant factual data to the solution of this problem that a remedial reading project, the report of which constitutes this thesis, was undertaken. The following pages, then, contain an account of the remedial reading program which was offered, under conditions of experimental control, to Freshmen students in the College of Arts and Sciences of Loyola University, Chicago, during the academic years 1940-1941 and 1941-1942.
CHAPTER I

SURVEY OF RELATED LITERATURE

Although the literature relative to the art of reading is quite extensive, comparatively few contributions in this field are reports of remedial programs on the college level. Many of these studies are concerned with the problem of reading as it presents itself in the primary grades. Others are directed to an analysis of the reading process in an effort to detect the psychobiological elements of which it is composed. Various diagnostic techniques, both group and individual, are given a prominent place in the literature. Many reports are concerned with special topics, such as the relation between speed and comprehension, visual factors contributing to reading disability, eye movements and the perceptual aspects of reading. The so-called clinical or individual method of diagnosing and treating reading defects is apparently growing in popularity, judging from the number of reports which have been submitted concerning this approach. Studies of the efficacy of group remedial instruction, however, are neither numerous nor convincing, particularly on the college level.

It is also to be noted that most of the studies reported in the literature differ from the present study in one or more of the following respects: (1) Many of the studies involved the use of complicated or expensive devices such as eye movement cameras, projectors to throw upward-moving reading material on a screen, various forms of tachistoscopes and
other instruments. (2) All of the studies differed significantly from the present report in the amount of time devoted to remedial instruction, including the number of minutes per class, the number of weeks during which the remedial courses were offered. (3) In none of the remedial programs described in the literature were the same reading materials used for practice purposes. (4) Very little correspondence has been noted between this and other studies with respect to the content of the lectures which accompanied the practice sessions. (5) A rather disconcerting fact soon becomes apparent to anyone reviewing this literature: many of the studies concerning the efficacy of remedial instruction fail to establish adequate controls, or, indeed, any controls at all, thus depriving the results of whatever significance they might have; Zeleny (50) reports that of twelve studies reviewed by her only six reported any form of control whatever. (6) Some of the reports do not give evidence of satisfactory statistical analysis; again Zeleny complains of consistent failure to interpret results in terms of accepted statistical measures. (7) Finally, some of the reports indicated that students in the remedial reading courses were motivated by being informed that an academic grade would be assigned to each of them in accord with his improvement or lack of improvement in reading. Although there are other points of difference between the present project and similar studies reported in the literature, these points appear to be the most significant.

Among the earlier efforts to determine the efficacy of group remedial instruction on the college level, is the study reported by C. W. Stone (42). The subjects in this study were students, apparently over 400 in number, of Junior, Senior or Graduate standing, comprising five
classes at the University of Illinois and ten classes at the State College of Washington. For purposes of control, two classes in educational method at the University of Illinois were selected. During the experiment no special mention of the topic of silent reading was made to these students. Two other classes, taking courses in introductory education, were selected as partial-practice controls. The attention of these students was called only indirectly to the problem of silent reading. In none of these classes were reading test scores reported to the students, nor was their attention in any way directed to the improvement of reading ability. The Monroe and the Stone reading tests were used to determine the ability level of the students both before and after remedial instruction. The practice or experimental classes were submitted to intensive remedial instruction, with special emphasis on motivation and the reading of practice exercises in class. This remedial course was conducted for a period of two months or more, but the author does not mention the length of the class period nor the number of classes per week. He reports, however, that the two control classes manifested an average gain in rate of reading of 32%; the two classes constituting the partial-practice groups showed rate increases, respectively, of 21% and 37%; the four practice classes which comprised the experimental group showed gains of 36%, 48%, 84% and 108% in rate. With respect to comprehension, the control group gained 21%; the partial practice groups gained 37% and 44%; while the experimental groups manifested gains of 36%, 53%, 70% and 74% in comprehension as measured by the Stone and also the Monroe reading tests. No other data are presented and no further statistical analysis is made. The author concludes that the silent reading ability of college students may be improved to a marked
An experimental study relative to the improvement of comprehension among children in the elementary grades is reported by R. P. Carroll (8). The subjects in this experiment were children in 7th and 8th grade, and the remedial efforts were directed to the improvement of their ability to read directions. Employing the technique of individually equated pairs, Carroll divided the subjects into an experimental or practice group and a control group. On the basis of figures which need not be cited here, he concluded that subjects in the experimental group showed a significant increase in their ability to understand and respond correctly to directions, while students in the control group, who had received no instruction in this regard, showed no such improvement. The inference drawn by Carroll from this experiment is that specific training relative to a specific reading skill is efficacious.

An investigation into the results secured by drill in silent reading among college freshmen is reported by R. P. Carroll and C. C. Jacobs (9). Twenty-eight freshmen students were selected at Syracuse University, where the incidence of failures during the first year had produced concern over the study habits and reading ability of entering students. The reading material, both for the initial and the final tests and for the practice exercises, was drawn from text books used in freshman courses botany, English, history and zoology. The tests and the practice material took the form of paragraphs, followed by questions. Eight pages, each page containing about two such paragraphs followed by five or more questions, constituted the original test, on which the highest raw score possible was 80 correct responses. The final test followed the same pattern, but it
was longer to provide additional material for those students who had made great improvement. A time limit of twenty minutes was imposed. Twenty-eight teachers and graduate students in the summer session took both the initial and the final test, thus constituting, according to the authors, a control group. The experimental group drilled daily for ten minutes, using four pages of practice material. The experimental group showed a mean gain of 36.18 points, or a gain of 73.3%; the control group gained 12.82 points, or 28%. The authors conclude that the drill group made 2.8 times as much gain as the control group, or 280% of the amount. No other statistical interpretation of the results is reported.

L. C. Pressey and S. L. Pressey (35) report that favorable results were obtained from a remedial reading course given to 422 freshmen who were in the lowest quartile on a standardized reading test. The remedial classes met once each week for seven weeks. The first and second weeks were devoted to the mechanics of reading, especially eye movements and vocalization; in the third class, instruction was provided in paragraph reading; during the fourth class, a second test of reading was administered and 115 students, who had risen to the 45th percentile or above, were excused; the fifth class was given over to drill in reading phrases, using tachistoscopic projections on a screen; during the sixth period the students were instructed in the reading and interpreting of graphs; the seventh and final period was devoted to another form of the reading test. Although no mention is made of a control group, the authors report an average increase of 27 percentile points, and conclude that the remedial instruction was beneficial. It is to be noted, however, that no additional data is provided which might shed light on the statistical significance of these results.
Directing training specifically to eye fixations and span of recognition, Ring and Bentley (37) report favorable results with five adult subjects. Each individual's rate of reading, in terms of the number of fixations per unit of time, his span of recognition and the average number of fixations per line were determined in advance of the training period. Articles in *Fortune* magazine were utilized for practice purposes. Vertical fixation lines were ruled down the printed columns, beginning with the normal or average number of fixations for each subject. This material was read during a fifteen-minute practice period in the morning and again for fifteen minutes in the afternoon, for two days. Then one fixation line was removed, the space between the vertical lines being kept equal; the subjects practiced again for fifteen minutes, morning and afternoon, for one week, at the end of which time another fixation line was dropped. At the end of almost two weeks, the results were computed, again in terms of rate, span of recognition and number of fixations per line. Figures which need not be included here led the authors to conclude that such training is effective, as the rate of reading increased and the average number of fixations per line decreased. No controls are reported and no further statistical analysis was attempted.

Thompson (45) reports a successful experiment in group remedial reading at the University of Nebraska Teacher's College. Whipple's High School and College Reading Test, Forms A and B, was used for purposes of testing and retesting. Remedial treatment was recommended on the basis of individual diagnosis. After an unspecified number of practice sessions, however, the author reports that comparison of the means of the test and retest scores indicated that no significant change had taken place. A
further comparison was then made by selecting a control group which was equated with the experimental group in terms of two variables: (1) intelligence, as measured by the Ohio State University Intelligence Examination, and (2) reading ability, as measured by the Whipple Reading Test. Figures given by the author indicate that the remedial group showed a gain of 28.7%, while the control group lost 4.4%. The author concludes that the remedial reading course, of which no description is given, resulted in a significant improvement of reading ability within a short time.

An experiment in remedial reading, conducted at the University of Southern California, is reported by Berry (3). An analysis of the content of college English courses, of the material in college textbooks, and of the structure and content of several reading tests led to the conclusion that there are at least nine specific reading skills which students should master. Two comparable forms of a silent reading examination were then constructed, designed to draw upon these abilities. Printed material, both for didactic and practice purposes, was prepared. Over 400 students were selected from three sections of the required Freshman English course, the author thus hoping to secure a representative sample of students with respect to English ability. Two experimental groups, totalling 204 students, were formed, while the remaining 220 students constituted two control groups. One experimental and one control group took one form of the reading test for the original measurement and the alternate form for the retest; this procedure was inverted for the other experimental and control group. The printed didactic and practice material was given to the experimental group; they received no other instruction or motivation in reading. The practice sessions extended over one calendar month, but the author does not state whether the students met as a group for practice or worked
on an individual basis, nor does she indicate the length or frequency of the practice periods. In any event, "statistically significant improvement was noted in the experimental groups over the control groups in each of the six following abilities: accompanying one's reading with appropriate visual imagery, knowing or inferring the meaning of difficult or unusual words, noting restrictive modifications, disregarding whatever is irrelevant, accepting the writer's point of view without bias or prejudice, and skimming to get a bird's-eye view of the subject matter. Lesser gains, not amounting to full statistical significance, yet nevertheless gains, were noted in each of the other abilities studied, namely, selecting data for use in answering questions, isolating the essential parts of an idea, and determining the topic of a selection." (3:827) The improvement of the control group was negligible, amounting only to a 2% gain in mean score. The experimental group, however, manifested an average gain of slightly more than 25%. The author's conclusions are quite optimistic.

Parr (33) conducted a remedial reading program at the University of Iowa's College of Education during the 1928 - 1929 academic year. First, the Iowa Silent Reading Tests were administered to 169 Juniors and Seniors who were enrolled in a course in educational psychology. The standing of these students on the reading test was then compared with their achievement in the course as measured by the final grade. Of those students scoring 150 or less on the reading test, 33% received a grade lower than "C"; of those scoring between 151 and 200 on the reading test, only 13% were lower than "C". In the second semester, an "Educational Psychology Reading Test", devised by the author, was administered and 20 students from the lowest quartile were given remedial instruction. These pupils
met with the writer once each week for a two hour laboratory period over an interval of 15 weeks. The students drilled in various phases of silent reading and received instructions in how to study more effectively. The author states that as a control group he selected those students in the educational psychology course whose reading score exempted them from remedial instruction. No mention is made of the equation of these two groups. From gross scores given by the writer, it becomes apparent that in rate the experimental group gained 38.5%, and the control group gained 20.7%, while in comprehension the experimental group gained 29.5% on the author's test and 35.2% on the Iowa Silent Reading Tests, and the control group gained 15.4% on the author's test and 12.4% on the Iowa Reading Test. No effort is made, however, to determine statistical significance relative to these results. The author concludes, on the basis of data not included in this report, that students in the experimental group made greater achievements in the educational psychology course, and also manifested greater gains in general scholarship than the students in the control group. It is the expressed conclusion of the author, therefore, that remedial instruction in reading can prove beneficial.

A remedial reading course, inaugurated in the autumn of 1929 on the Freshman - Sophomore level at Nebraska Wesleyan University, proved quite successful according to Deal (10). Nine remedial classes were formed, while three others were utilized for purposes of control. The basis upon which these groups were selected is not mentioned. The experimental groups met once a week for at least one hour, and the course extended over one semester. Using the test - retest technique, the author reports a difference of 9.65 points between the mean score on the initial test and
the mean score on the final test. This difference was 6.4 times as great as the probable error of the difference, and is therefore considered by the author to be highly significant. There was no increase manifested by the control group, which attained practically the same mean score on both the initial and the final test. The author concludes that "the study shows students are able to increase their reading comprehension as much as one hundred percent in short training periods over a few weeks."

(10:272)

Moore (31) reports the results of a training program in reading at Mt. Holyoke College. A reading test, consisting of seven parts, was devised in two alternate forms, between which a correlation of .96 was established. Form A of this test was administered to the Freshmen students, and those scoring in the lowest quartile were invited to take a six-week course in efficient studying and reading. The remedial class met once a week, although the length of this period is not indicated. The usual topics were discussed in lecture form, and the students were given exercises in finding central meanings, increasing speed, building up words, comparing the meanings of similar proverbs. The students were requested to select two books for practice reading outside of class, and each student conferred once a week for about forty minutes with a senior. No control of any kind is reported. The figures reported by the author indicate that in terms of median score a gain of 58.7% was made. No attempt to determine the degree of significance of these figures is indicated, but the author concludes that the remedial instruction was effective to a marked extent.

An effort to improve reading rate among college freshmen is reported
Practice material was prepared, consisting of short phrases, rather widely separated, in the hope of reducing eye fixations and regressive movements, and in hope of widening the span of recognition. Throughout the experiment, these phrases were gradually increased in length, while increasing amounts of normal reading material were interspersed between exercises. The author does not indicate how many days and hours per week were devoted to such exercises. At the end of ten weeks, however, testing indicated that an increase of 58% in rate had occurred, together with a 62% reduction in the duration of fixations and a 67% reduction in the number of fixations. No controls are reported. The author concludes that the increase in speed of reading was due primarily to enlargement of the reading span.

As a minor part of an exhaustive study on the reading ability of adults, Buswell (7) reports that records were secured on 25 subjects who attended at least 10 out of 15 class meetings over a period of three weeks. The nature of the remedial measures undertaken in these classes is not set forth. However, the author reports an average increase of 15.3% on a specially constructed reading test, together with a gain of 13.3% in paragraph comprehension and a 4.2% gain in the number of words read per minute. No controls are reported. The author expresses the conviction that reading, contrary to a rather widespread opinion, is not an elementary school subject in which growth is completed at the level of sixth or eighth grade. On the contrary, he reports, on the basis of findings which cannot be summarized here, that maturation of the reading process continues long after the elementary grades. He implies that differentiation and refinement of the process can be expected on the college level, particu-
larly when students are motivated and directed by an adequate remedial reading program.

An investigation to determine the effectiveness of remedial reading instruction on the Freshman college level is reported by Smith (40). The subjects were 21 N.Y.A. students who were selected on the basis of their percentile standing on the Psychological Examination of the American Council on Education. In an effort to secure a representative group of Freshmen, selections were scattered from the 3rd to the 99th percentile. It is expressly stated that the remedial group was selected not on the basis of reading ability, but on the basis of general intelligence as measured by the A.C.E. Psychological Examination. Both the Iowa Silent Reading Tests and the Minnesota Reading Examination were administered to these 21 students. Thereafter, for a period of eight months, they were requested to devote three hours of their own time each week to private practice, and one hour to group instruction. Various instructions and exercises were provided both for private practice and for the group work. After eight weeks, Form B of both reading tests was administered. The results were expressed in terms of mean scores on the Iowa Silent Reading Tests, and indicate that the experimental group gained more than the control group on all of the subtests. These results are not expressed in terms of percent of gain, nor is any statement made concerning their statistical significance. However, the author is convinced that remedial reading instruction on the college level is worth while.

A remedial reading program at Armour Institute of Technology in Chicago is reported by Orcutt (32). Four classes of 35 members each were selected on the basis of a reading test. Two of these classes were
composed of students ranking in the highest quartile, and two were composed of students in the lowest. The experimental and the control groups each consisted of two classes, one composed of high-ranking and the other of low-ranking students. The remedial groups met twice each week for fifty minutes over a period of ten weeks. The classes were devoted mainly to lectures and discussion concerning the nature of reading and its improvement; little outside work was requested. Unidentified reading tests were administered at the end of each two-week period. The report states that the remedial group composed of high-ranking students showed a gain of 15% in comprehension and 39% in rate of reading. The low-ranking group increased 18% in comprehension and 60% in speed. These results were not assessed with regard to statistical significance, nor is any mention made of the retest performance of the two control groups. It would therefore seem impossible properly to evaluate the results.

Eurich (15) reports an experimental study concerning the reading abilities of college students. He found that there was no significant improvement as the result of a remedial reading course. However, an accumulation of small and statistically insignificant differences was noted in favor of the experimental group.

A carefully controlled study of remedial reading instruction at the freshman college level is reported by Zeleny (50). The author reviewed twelve studies and found that ten reported significant improvement as the result of remedial instruction. However, she points out that only six of these studies reported any form of control, that several did not include the use of standardized tests to measure reading ability, and that most of the results were not interpreted according to accepted statistical measures.
In an effort to counteract these deficiencies, Zeleny offered a remedial reading course in the Winter Quarter, and again in the Spring, to freshmen students in a teachers college. The experimental and control groups were equated with respect to two variables; reading ability as measured by the Iowa Silent Reading Tests, and general intelligence as measured by the Thurstone Psychological Examination. The remedial class met four days a week for nine weeks, during which time the students drilled and practiced in various aspects of silent reading. After the remedial course, both groups were retested on the Iowa Silent Reading Tests. In the Winter Quarter, the practice group showed a mean gain of 31.9, while the control group gained 36.2 points. In the Spring Quarter, the experimental group gained 44.3 points and the control group gained 29.7 points.

Zeleny draws the following conclusions: "In the winter term a comparison of twenty pairs of students from the experimental and control groups, matched on the basis of their scores on the Thurstone Psychological Examination and their initial scores on the Iowa Silent Reading Tests, showed that the control group who had no remedial training in reading made a higher mean final score on the Iowa Silent Reading Tests than did the experimental group who had remedial training; however, the difference was not statistically significant. In the spring term, the twenty-one matched pairs of the experimental group made a higher mean final score than did the control group. While the difference of the mean was not three times the SDD it was approximately that......The differences in the gains made on the total comprehension score and on the various parts of the tests favor the experimental groups in every case except one, and while none of the differences are statistically significant, an accumulation of small
differences all in the same direction may be actually significant. This study appears to throw doubt upon the great efficacy of offering training of the kind given in this study to adults. While the students receiving training appear to have some superiority over those not receiving training it is a question whether the results justify the expenditure of time. It may be possible that adults have their reading habits so fixed that it is with great effort that they can be changed." (50:619-620)

In conclusion, the following brief summary can be made relative to the literature devoted to the effectiveness of remedial instruction in reading on the college level. Fifteen studies were reviewed by the writer. Of these fifteen, five reported no control whatsoever; six reported that control groups were used, but there is no indicating that the experimental and control groups were equated with respect to any variable at all; one study reports that the experimental and control groups were equated on the basis of reading test performance, but the subjects were elementary school pupils; one report states that the two groups were equated in terms of general intelligence, as measured by the American Council on Education Psychological Examination, but not in terms of reading ability; only two of the fifteen investigations stated unequivocally that the experimental and control groups were equated on the basis both of reading ability and general intelligence as measured by standardized tests.

Of these fifteen studies, only gave gave definite indication that standardized tests were used to determine the level of reading ability and intelligence. Four investigators definitely did not use standardized reading tests; on the contrary, they devised their own tests and utilized them in their experimental investigations, apparently without benefit of standardizing procedure. Of the remaining six investigators, one states that a
standardized test was used but does not identify it, while the other five make no mention of the tests used in their respective experiments.

No one will gainsay the importance of determining the statistical significance of experimental results. Statements indicating the mean gain made by a group after remedial instruction, or statements expressing improvement in percent of gain, are relatively meaningless even when set forth with results derived from a comparable control group. Measures of central tendency, such as the mean or the median, and measures of dispersion, such as the standard deviation, are entirely relative to the distribution from which they are derived and are not indicative of any absolute change in the population. Other statistical formulae are at hand which do not suffer from such relativity, and which yield absolute values. It is therefore quite surprising to note that of these fifteen investigators, eleven failed to report any analysis relative to the statistical significance of their results. Only four definitely report the presence or absence of such significance.

Finally, it may be said that a properly devised experiment in group remedial instruction should (1) utilize well-standardized tests of reading ability and general intelligence, preferably employing alternate forms for test and retest, (2) set up both a control and an experimental group which are equated with each other in terms of as many variables as possible, and (3) submit results to analysis according to accepted procedure in order to determine statistical significance. It is an implicit evaluation and criticism of the literature on remedial reading on the college level to point out that these three minimum requirements of a valid experiment are met only by one investigator, Zeleny, out of the fifteen whose reports are summarized above. It is perhaps significant, too, that of these fifteen,
Zeleny is the only one, with the exception of Eurich, who reports negative results and who is therefore dubious concerning the efficacy of group remedial reading instruction on the college level.
CHAPTER II

THE EXPERIMENT

To determine, in an objective and quantitative manner, the value of group remedial reading instruction, an experimental project was undertaken in the College of Arts and Sciences of Loyola University during the academic years 1940 - 1941 and 1941 - 1942.

To secure the controlled observation which is essential to experimental procedure, a remedial reading course was given to one group of students, while no instruction in reading was given to a second group. These two groups were selected and equated as follows:

In September of 1940, the Iowa Silent Reading Tests (Advanced Test, Form Am) were administered to 212 entering Freshmen. The raw and the standard scores for each of the seven subtests were found, the median standard score of each student was computed, and from this his percentile rank was derived according to the test norms. The percentile rank of each student in terms of the Loyola group was also computed.

From the total number who took the tests, a group was selected composed of all those who achieved a median standard score of 85 or below. This score corresponded to a percentile rank of 53 in terms of the test norms, 30 in terms of the Loyola norms.

This large group of approximately 80 students was then subdivided into two smaller groups. These groups were equated, student for student, on the basis of their performance on the Iowa Silent Reading Tests, the
American Council on Education Psychological Examination and the Iowa High School Content Examination. The student were paired or equated exactly in terms of the percentile ranks on the reading test. It was found impossible to equate them so accurately on the basis of the other tests, but they were nonetheless equated as closely as possible, with the sum of the differences thrown in favor of the control group. Thus, for example, if two students attained the same percentile standing on the reading test, but a slightly different rank on the intelligence test, the student with the lower intelligence rating was placed in the experimental group, while the student with the higher rating entered the control group. There was reasonable assurance, therefore, that the two groups were equal in reading ability, intelligence (as measured by the A.C.E. Psychological Examination) and scholastic achievement (as measured by the Iowa High School Content Examination).

The group with the lower mean scores relative to general intelligence and scholastic achievement was then designated the experimental group, the other being called the control group.

The experimental group was then subjected to a remedial reading course which extended over a period of eight weeks. The class met for a fifty-minute period twice each week. During this time the students were instructed in various facts and problems relative to reading, were given practice exercises to read, and were required to answer certain question about the material they read. No students were given individual instructions. No reading assignments were imposed on them outside of class, although they were urged to set aside a definite period of time each day for various forms of practice.
The control group was given no aid or instruction in reading during this period, with the exception of one lecture devoted to reading which was given as part of the Freshman Orientation Course. It should be remembered, however, that the students who comprised the control group by no means ceased to read; on the contrary, they were required, as an integral part of the various courses, to read more than most of them had ever read before.

When the remedial course was completed, both the experimental and the control groups were retested on the Iowa Silent Reading Tests. It is worthy of note that the same form of the test (Form Am) was used for the retest as for the initial test in the preliminary experiment of 1940-1941. This step was taken in the belief that practice effect, if present at all, would be slight and that, if present, it would be the same for both groups. In 1941-1942, however, when the main experiment was conducted, the alternate form of the Iowa Silent Reading Tests was used for the purpose of retesting.

Subsequent to the retest, the same remedial course was administered to the control group.

The remedial reading course itself was based on the assumption that actual reading would be more effective in establishing various reading skills and habits than detailed lectures on the nature of reading, the causes of poor reading and the various methods of improving speed and comprehension. While a knowledge of such facts was recognized as important because it serves to establish insight on the part of individual students into their own specific disabilities, it was decided to minimize instructional lectures on such topics in favor of actual reading under controlled conditions.
The class lectures, brief and almost incidental though they were, followed a definite developmental plan. The students first were introduced to the purpose and plan of the remedial course. It was interpreted to them that the reading test to which they had submitted indicated that they were capable of reading much more swiftly and with much greater comprehension. This positive statement of the situation, it was hoped, would prevent that disappointment and indifference which the students might naturally feel upon realization that they had been selected from a much larger group as poor or indifferent readers. Further, it was held that this approach was much sounder from the point of view of motivation, and would render the prognosis more hopeful, than any negative approach which impressed upon the students their disabilities and their low percentile standing relative to other freshmen students. Finally, this approach was selected in the hope that it would awaken in the students realization and acceptance of their shortcomings, particularly in view of the fact that many seemed blissfully unaware that their reading ability left anything to be desired.

The students then were requested to participate in a limited discussion of the importance of reading. The jejune ness of the comments in this respect was not altogether unexpected, although many were quick in pointing out that to read is to acquire knowledge. The many implications of this truth were then elaborated upon to the extent that time permitted.

The nature of the reading process was the next topic of discussion. Eye movements in reading were described in connection with the span of perception; the latter phenomenon was explained in terms of the fovea centralis and the distribution of rods and cones in the retina. The students were given several pages of columnized material, spaced in a manner conducive
to a minimal number of fixations per line. The nature of eye movements as neuromuscular habits was emphasized, and it was suggested that the students devote a determinate period of time each day to practice of these exercises. To familiarize them with the technique, they were led through the series once to the accompanying beat of a metronome; other than this, however, no time was devoted in class to this particular problem.

It was then pointed out that reading, when considered as a psychobiological function, involves much more than perception of printed characters, and recognition of them as symbols representing various entities. Rather, reading was characterized as involving certain intellectual functions, such as the apprehension of abstract relationships, the grasping of implicit meanings, the formation of judgments, the drawing of inferences and the critical evaluation of the matter being read. In short, to read efficiently is to think intelligently and critically, which in turn is one of the most important abilities which the educational process attempts to develop.

Following a brief class discussion of this point, the reading process was considered from the viewpoint of a psychobiological habit. The nature of habit in general was touched upon, and the importance of consistent repetition, or practice, in the establishment of any habit was emphasized. An analogy was drawn between reading and more overt types of activity, exemplified by typing and golfing. The students were asked to consider that they were much more advanced in the art of reading than were the neophyte typist or golfer at the beginning of the instruction period. If, by attention to certain fundamentals and by diligent and unremitting practice, the student typist or golfer could exhibit proficiency in a relatively short
The lectures were then devoted to consideration of rate of reading, or speed, on the one hand, and comprehension on the other. It was suggested to the students that there is a rather high positive correlation between these two reading variables. This was interpreted to mean simply that of two persons, the one who reads more swiftly will probably comprehend more adequately. As one gradually increases his rate of reading through practice, his ability to grasp the meaning of what he reads also grows. However, the instructor was careful to state his relationship only as an hypothesis carrying a rather high degree of probability, because of the inconclusive or negative character of the results as set forth in the literature. The students were advised to select relatively easy and interesting material, and then to strive consciously to read at a speed greater than their normal rate, so that adequate comprehension became difficult. They were encouraged to continue this practice with the assurance that eventually they would be able to grasp meaning at the new speed as readily as they had at the old. Throughout this discussion, they were reminded that of these two variables, comprehension is far more important than speed, because it is the most immediate aim of the reading process and because without it reading becomes a meaningless exercise in eye movements and the perception of printed symbols. This fact was brought to the attention of the students throughout the course to prevent overly enthusiastic competition in increasing rate of reading at the sacrifice of comprehension and retention.

Because it was considered obvious, the importance of an adequate vocabulary was discussed but briefly. More attention was given to methods
of developing a sufficiently large and functioning vocabulary. The students were first informed that their vocabularies would grow but slowly unless they assiduously turned to a dictionary each time they encountered an unfamiliar word. They were encouraged to enter in a notebook every day ten words whose meaning they had newly learned, and each day to review the meaning of words entered on previous days in cumulative fashion. Since most of the students had at least a nodding acquaintance with Latin or Greek, they were encouraged, before consulting a dictionary, to try to determine the meaning of words by recalling their derivation. Finally, it was pointed out that once a word has been learned, it can remain an active or functional part of one's vocabulary only through being used to convey meaning. For this reason, it was suggested to the students that they bend every effort to use newly acquired words in everyday conversation and in writing.

Sentence structure was the next topic considered in the lectures. It was pointed out to the students that knowledge of the structure of sentences is an important asset in reading, because it gives the reader a mental set or pattern, which in turn enables him, once he has read the first few words of a sentence, to anticipate almost subconsciously the structure of the rest of the sentence, and thus to read it more swiftly and with greater comprehension. The instructor thereupon selected several different types of sentences, and analyzed their structure through the method of diagramming. As little time could be spent on this topic, those students who were not familiar with diagramming, or who felt themselves lacking in knowledge of sentence structure, were encouraged to select sentences while reading and submit them to diagrammatic analysis. It was also
suggested that they bring their work to the instructor for inspection and individualized assistance.

A discussion of paragraph structure followed. It was pointed out that in expository prose the typical paragraph contains one thought, together with subordinate statements intended to elucidate, exemplify or substantiate this thought. In this connection the nature and importance of the topic sentence was emphasized. It was pointed out that the topic sentence is not always explicitly set forth, but frequently is implicit. The suggestion was made to the students that they pause frequently in their reading and attempt to express in their own words the central thought of each paragraph, together with some of the illustrative or explanatory details.

Closely related to the ability to select the topic sentence of a paragraph, is the ability to grasp the central idea of longer selections, such as the chapters or sections of a book, magazine or newspaper articles, or an entire book itself. The importance of such ability for adequate comprehension and subsequent retention was considered obvious. To acquire and develop this ability, it was suggested to the students that they should practice by attempting to summarize relatively short selections, such as magazine articles or chapters and smaller sections of books. It was pointed out that unless a consistent and conscious effort was made in this direction, their ability to summarize the content of such selections, and hence to retain the given information as working knowledge, would increase but slowly if at all. The instructor explained that a reader can very well understand each sentence as he progresses, and yet upon completion of the article or book, be unable to give an account of the central thesis. Such an inability is directly traceable to the reader's absorption in isolated
facts and statements to the exclusion of the meaningful and integrated whole. To illustrate, the students were requested to make a written summary of several articles read in class. The majority expressed surprise and chagrin at their inability to do so after one reading of the articles; it was necessary for most of them to consult the text several times to prepare an adequate summary. It was suggested that they continue such efforts in connection with their routine reading assignments, including the preparation of written summaries.

Next the instructor discussed different types of reading. An analogy was drawn between reading and driving an automobile. As a person who uses only one gear in driving is at a disadvantage, so the person who reads only in one way is handicapped. The nature of the material to be read and the purpose the reader has in mind should determine the manner in which he reads. It was pointed out that one does not read a treatise in economics as he would read a detective story. The students agreed that, when reading in the field of economics, one proceeds slowly, searching for fundamental laws and principles, noting carefully various facts, passing critical judgment on the validity of different propositions, often pausing, at times rereading sentences or paragraphs. When one reads light fiction, however, he skims rapidly along, paying but little attention to details, passing over descriptive passages, never searching for fundamental implications. Further, it was made clear that two persons may read the same book in entirely different ways if their purposes are different. One who reads A Tale of Two Cities simply for pleasure will read much more swiftly and with much less attention to details and implications than one who reads the book for the purpose of producing the essence of the story in the form of
a three-act play. In view of these facts, the students were urged to determine the nature of any material they planned to read, as well as their purpose in reading it.

Various factors extraneous to the reading process itself, but nonetheless influencing it, were then discussed. The instructor emphasized the importance of the physical and mental condition of the reader, pointing out that fatigue or emotional tension, for example, seriously impede efficiency. It was noted that environmental factors, including light, ventilation and distracting influences, have a pronounced effect upon reading ability. The importance of correct posture and of the proper position of the reader relative to the printed page and the light source was pointed out. A brief class discussion brought forth admissions that many of the students read while in a reclining or hunched-over position, with little regard for light conditions, ventilation and other conditioning factors.

Finally, the nature of attention and its relation to reading were taken up. It was pointed out that inattention is one of the chief causes contributing to inefficient reading. The nature of attention was discussed briefly, as were the causes of inattention. The students agreed that lack of determination, or failure to make a strong voluntary effort, is often responsible for wandering attention. The effect of various distracting influences upon attention was considered obvious. More emphasis was placed upon interest in the material being read as a factor which generates attention. It was also pointed out that when one has a definite and important reason or motive for reading, his attention is much less likely to wander. It was suggested to the students that, before reading a book or article, they reflect upon the importance of the material and thus generate interest.
in the subject as well as a motive for reading.

The above points were taken up in the form of very brief lectures between periods of actual reading. None of these lectures consumed more than ten minutes; the majority of them were terminated in five to eight minutes.

The problem of providing reading material for the class periods was not easy of solution. In the first place, it was evident that the material must be suited to the achievement level of the group, both with respect to reading ability and general conceptual background. Further, the time factor imposed additional limitations on the selection of practice material. It was necessary that the exercises be sufficiently long to provide practice in sustained reading without consuming too large a portion of the class period. Finally, it was decided that the material should take the form of complete articles rather than of excerpts from various sources, because of the greater unity of theme and logical coherence of the former.

A booklet of practice exercises specifically designed for group reading instruction and practice was finally selected. Written by Ruth Strang and assistants, entitled *Study Type of Reading Exercises*, this booklet consisted of twenty exercises, each exercise being one thousand words in length. Each unit dealt with a different aspect of reading, the diagnosis of reading defects and the improvement of reading ability. This made it possible for the students to gain valuable practice in reading and, at the same time, to learn more of the nature of reading and the causes and cures of poor reading.

Following each exercise in the booklet were four questions. Each of the first ten exercises was followed by three multiple-choice items and
one question to be answered in the students' own words. The last ten exercises were followed by four questions which were to be answered in writing in a few brief words. It was deemed impractical for the students to answer the questions by writing their answers in the booklets. Therefore, the questions after each exercise were reproduced on a single page, together with a blank line for the student's name, and a space in which they were to insert the number of words read per minute. These question sheets were distributed among the students face down, with instructions that they were to be filled in after the exercises had been read.

For the second year that the course was offered, it was decided that additional material for practice reading should be provided. The lectures were therefore abbreviated so that they consumed less time. After some search, it became apparent that articles from the Reader's Digest might very well meet the requirements. Although the articles varied in length, it proved not at all difficult to select several from each issue which ranged from one thousand to two thousand words. Further, these articles dealt with current topics which almost invariably proved of interest to the majority of the students. The Reader's Digest was therefore used in conjunction with Study Type of Reading Exercises.

To determine the increase or lack of increase in rate of reading, it was necessary to devise a method of measuring the speed with which individual students read the practice exercises. For this purpose, the following device was utilized. Since each exercise in Study Type of Reading Exercises was one thousand words in length, the number of words read per minute became a function of the total time consumed by each student in reading each article. If one student read an article in five minutes, he was
reading at the rate of two hundred words per minute; if another read it in three minutes, he was reading three hundred and thirty three words a minute. The instructor therefore equipped himself with a stopwatch, the face of which was clearly marked off in ten-second intervals. He also prepared a set of large cards, one for each ten-second interval. Each card bore a clearly discernible number which represented the number of words read per minute by students who completed an article during the ten seconds it was held aloft before the class. Because it was apparent that no student would be able to complete an article of one thousand words in less than one minute, no rate cards were prepared for the first minute. Beginning with seventy seconds, however, and ranging through to five minutes, a card was prepared for each ten second interval. For example, if a student completed a thousand-word exercise in seventy seconds, he was reading at the rate of 14.3 words per second or 858 words per minute. (Needless to say, only one or two of the students developed the ability to skim with such rapidity.) If a student finished in two and one half minutes, he was reading at the rate of 400 words per minute. Whatever the rate, each card was held aloft before the class by the instructor during the proper ten-second interval. Upon completion of each exercise, it was only necessary for the students to glance up at the card being displayed by the instructor, note the number of words read per minute, and enter this figure in the space provided on the answer sheet.

It was not possible to compute rate of reading on the Reader's Digest articles in this manner because they varied in length, none being exactly one thousand words in length. This difficulty was surmounted simply by determining which was the one thousandth word in each article. Before
reading the article in class, the students were directed to this word and requested to encircle it. They were then informed that when they reached this word, they would have completed one thousand words, at which point they were instructed to note, as before, the number of words read per minute as indicated on the rate card exposed by the instructor. After entering this figure on the answer sheet, the students completed their reading of the article.

A graphic record of speed, as measured by the above method, was kept by the students. Each of them was given a blank graph upon which he represented his rate of reading for each exercise. The various points on the graph were then connected by a line in the usual manner. Each student constructed his own graphic record of his increase or decrease in speed of reading.

A test of comprehension followed the reading of each exercise. It has been mentioned above that each of the articles in Study Type of Reading Exercises was followed by four questions. From each of the Reader's Digest articles, the instructor drew a number of objective test items. These items were of several types: true-false, completion, yes-no and multiple choice. They were grouped together on the prepared answer sheet according to type of item. An effort was made to construct these items so that some of them tested the students' grasp of the central thesis and its implications, while others tested the comprehension of specific supporting facts and details.

After the students had filled in their responses to the items concerning any given article, their answer sheets were collected. These sheets were subsequently graded carefully, each erroneous response being clearly
indicated. On the basis of the performance of the entire class, the number of errors made by each student was made equivalent to a certain grade, with 100 as the perfect score indicating no errors. The grade achieved by each student was then entered on his answer sheet, which was returned to him during the next class meeting. A graphic record of these grades was kept by each student.

Although such measures of comprehension had no statistical significance because the tests were not standardized, it was nevertheless felt that they served a useful purpose. In the first place, they enabled the instructor to determine, in a rough way, the relative ability of different students. They also proved useful in estimating the progress or lack of progress of individual students. Further, there is every probability that these tests prompted the students to read more carefully and attentively than they would have read if no tests had been given. Because they knew that they would be required to give an account of the contents, they made a particular effort to comprehend as they read each exercise; it was hoped that this would facilitate the development of careful, thoughtful habits of reading.

The importance of motivation was not underestimated in this study. Every effort was made in the lectures to generate in the students a genuine desire to improve their reading ability. It was emphasized over and over again that reading ability can be improved with exertion and diligent practice. The importance to the student of being able to read swiftly and with a good degree of comprehension was pointed out. The practical significance of reading in later life was not ignored. Knowledge and pleasure were held forth as the two chief rewards for any effort made to achieve competence in
reading. These points were frequently repeated in various forms and were illustrated by concrete and, if possible, dramatic examples.

In connection with the topic of motivation, mention should be made of the graphic charts which the students kept of their progress in speed and comprehension. The great value of these charts as motivational devices from the fact that they constituted very tangible evidence of progress or lack of progress. If a student gradually increased his rate of reading and his comprehension scores, he was given the very real and stimulating experience of observing the steady rise of the speed and comprehension lines on his chart. This visual proof of progress invariably was described by the students as highly gratifying and conducive to even more intensive efforts. "Nothing succeeds like success". On the other hand, those students who did not make satisfactory progress were confronted with a definite challenge in the form of the flat or falling lines on their charts. It soon became the conviction of the instructor that such visual evidence of improvement or lack of improvement constitutes a much more dynamic motive than any verbal reference to the value of efficient reading.

Finally, it should be mentioned for the sake of completeness that the remedial reading course bore no academic credit which might function as a motive inducing the students to make a greater effort. As a matter of fact, the students were frankly informed that they would receive no additional credit for the course; their participation was urged on the grounds that they themselves would profit or lose in proportion to the amount of genuine effort they expended.

Early in the course the students were given a questionnaire relative to various factors which might have influenced their reading ability in a
positive or negative direction. The questionnaire was two pages in length. The students were first of all requested to list the primary and secondary schools which they had attended. In this manner, it was hoped to determine whether frequent transfers from school to school had an unfavorable influence on the development of reading ability. The students were also requested to indicate what languages, if any, other than English, were spoken in the schools or taught. This question was asked in view of the fact that certain schools, maintained by and servicing citizens sharing a common rationality of descent, offered instruction in reading, writing and speaking the mother tongue. It was conjectured that such training, particularly in primary school, might have a negative effect upon development of reading ability in English. In this same regard, the students were asked if any language other than English was or had been spoken in the home, and if so, they were requested to indicate, on a graduated continuum, the extent to which it was spoken. In the same manner, the students were requested to indicate whether, and to what extent, they read any foreign language.

A second series of questions attempted to determine how many students wore or had at one time worn glasses. Again, those students who answered in the affirmative were requested to estimate the relative extent to which they wore glasses by placing a mark in a certain position on a graduated continuum. They were also instructed to state the age at which they began to wear glasses.

Finally, the students were asked how much they had read in primary and secondary school, exclusive of class assignments and home work. Again, they were asked to indicate their answer by placing a cross (x) on a graduated line, both for grade school and for high school. The continuum was divided
in the following manner to indicate that a student read (1) to the exclusion of play and other interests, (2) a good deal because he enjoyed reading, (3) a moderate amount, (4) when there was nothing else to do, (5) not at all. It was thought that a significant relationship might become apparent between present reading ability and amount of past reading, even though the measure of the latter variable was rough and open to the objection that it was based on a subjective estimate.
RESULTS OF THE EXPERIMENT

In setting forth the results of this experiment, it must be borne in mind that during the first year, in the preliminary experiment, the same form of the Iowa Silent Reading Tests was employed both for the original test and for the retest, while in the main experiment the following year Form Am was administered for the test and Form Bm was utilized for purposes of retesting.

A convenient method of determining the effectiveness of the remedial reading program is to compare the mean percentile rank achieved by the students on the original test with the mean percentile rank attained on the retest after remedial instruction.

Table I sets forth the difference in mean percentile rank achieved by the students of the 1940 - 1941 preliminary group. The mean percentile rank secured by the control group on the original test closely approximates that attained by the experimental group. This correspondence is due to the fact that the control and experimental groups were equated, student for student, on the basis of the percentile rank. On the retest, the experimental group attained a mean percentile rank of 56.1, an increase of 16.9 percentile points over the mean score on the original test. This represents a gain, roughly, of 43 per cent. Surprisingly enough, however, the control group, without any remedial instruction, attained a mean percentile rank of 60.1 on the retest, a gain of 20.5 percentile points, which in turn repre-
sents an increase of almost 52 per cent. In other words, the control group gained slightly more than the experimental group, even though the former did not receive remedial instruction. Expressed in terms of percentile points, the control group gained 3.5 points more than the experimental group.

TABLE I
Mean Percentile Rank Achieved by Experimental and Control Groups on Initial Test and Retest Preliminary Experiment, 1940 - 1941

<table>
<thead>
<tr>
<th>Mean Percentile Rank</th>
<th>Percent of gain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test</td>
</tr>
<tr>
<td>Control</td>
<td>39.62</td>
</tr>
<tr>
<td>Experimental</td>
<td>39.17</td>
</tr>
<tr>
<td>Experimental 1</td>
<td>38.39</td>
</tr>
</tbody>
</table>

It is to be noted, however, that two students in the experimental group committed a response error on the retest. Test 7 of the Iowa Silent Reading Tests is primarily concerned not with reading as such, but with the ability of the student to locate various items of information under the proper categories of an index. Part B of Test 7, "Selection of Key Words", requires the student to select one word out of four which would not, if consulted in an index, lead to the information requested by the corresponding question. On the retest, two students failed to note the negative aspect of this subtest. They therefore selected the word most likely to lead to the desired information. Scoring procedure does not take into account the possibility of such a response error. It was therefore not
possible to give these two students any credit for their responses on this subtest. This in turn detracted significantly from the performance of the entire experimental group.

It was therefore decided to exclude entirely the test results of these two students. When this allowance was made, the mean percentile rank of the experimental group was on the initial test was 38.3 and on the retest was 58.6. This was a gain of 20.3 percentile points, which constituted an increase of 52.8%. If, therefore, this response error is taken into account, the results indicate that the control group gained 20.5 percentile points while the experimental group gained 20.3 points. Although this difference between the gains of the two groups is negligible, the results are an indication that the remedial instruction did not produce the desired results.

Relative to the significance of the difference between the mean percentile scores attained by both groups from test to retest, the following figures are of interest. If the two students who committed the response error mentioned above are included in the experimental group, it is evident that this class of twenty-four students achieved a mean gain of 17.0 percentile points. The Probable Error of this difference between the means on the test and the retest is 3.03. It is therefore apparent that the difference between the means is 5.61 times the probable error of the difference. This in turn indicates that the chances are much less than one out of 100 that the observed difference could be traceable to a chance variation. In other words, it is practically a certainty that the difference was produced by some factor other than chance, and from the purely statistical point of view the difference is highly significant.
When the two students who committed the response error on Test 7 are excluded from the experimental group, the difference between the test mean and the retest mean is 20.3 percentile points. The probable error of this difference is 2.88. This difference is therefore 7.05 times the probable error of the difference. Again, it is indicated that the difference could not have been produced by any chance variation and that the result is statistically significant.

At this point in the analysis of the results of the preliminary experiment, one might be tempted to conclude that the differences mentioned above are the results of remedial instruction, and to draw the further inference that, since the differences are highly significant, the remedial course must have been effective. Judging from the literature, such conclusions are frequently drawn from analogous results.

Illustrative of the value and indispensibility of controlled experimentation, however, is the inescapable fact that the control group manifested a similar gain from test to retest, and that this gain is highly significant from the statistical point of view. The control group showed a gain of 20.5 percentile points. The Probable Error of this difference is 2.80. The difference between the two means is therefore 7.32 times the Probable Error of the difference. As in the case of the experimental group, therefore, one is forced to the conclusion that this difference cannot be a chance variation and is statistically significant.

This surprising gain on the part of the control group, who received no remedial instruction in reading other than one lecture devoted to the general topic in Freshmen Orientation class, casts an entirely different light on the results observed in the case of the experimental group. Although
the statistical significance of the gain made by the experimental group cannot be denied, it is impossible, in view of the similar and equally significant gain made by the control group, to ascribe the increase to the remedial instruction.

It has not been possible to designate that factor, or complex of factors, which produced the increase on the part of both groups. That the factor was not pure chance is indicated by the high degree of statistical significance attaching to the respective differences. It is highly improbable that the one lecture on the general topic of reading, which was directed to the control group as members of the Freshmen Orientation class, could have been responsible for the observed increase in reading ability made by this group. Furthermore, the experimental group also entered into the Orientation class. It is possible that a variety of undetected but potent influences in the test environment contributed to the gains made by both groups. The initial test was administered in a large gymnasium, with over 200 students participating; the final test, after remedial instruction of the experimental group, was administered in a large science lecture-room to only 70 students. The most plausible hypothesis, however, seems to be that the gains made by both groups were the effects of practice, because of the fact that the same form of the Iowa Silent Reading Tests, Form Am, was used both for the initial test and for the final test. It would seem reasonable to conclude, therefore, that the remedial reading instruction during the preliminary experiment was not effective, and that both groups made an almost identical gain simply due to practice effect.

The results, however, of the main experiment, which conducted during the academic year of 1941 - 1942, were quite different. As pointed out
above, two different forms of the Iowa Silent Reading Tests were used during this phase of the experiment. Form Am was used for the initial test, while Form Bm was administered for retest purposes. Further, no response errors occurred. Table II sets forth the difference in mean percentile rank achieved by both groups from test to retest.

TABLE II

Mean Percentile Rank Achieved by Experimental and Control Groups on Initial Test and Retest
Main Experiment, 1941 - 1942

<table>
<thead>
<tr>
<th>Mean Percentile Rank</th>
<th>Percent of gain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test</td>
</tr>
<tr>
<td>Experimental</td>
<td>44.0</td>
</tr>
<tr>
<td>Control</td>
<td>44.0</td>
</tr>
</tbody>
</table>

It is to be noted that while the experimental group gained 11.4 percentile points, the control group lost 2.0 points. This rather puzzling development becomes less surprising when it is remembered that there is some evidence that Form Bm of the Iowa Silent Reading Tests is more difficult than Form Am. For example, Kennedy reports that results achieved by two groups, previously equated with respect to intelligence, and general scholastic achievement, indicated that Form Bm is eight percentile points more difficult than Form Am. If this estimate is accurate, it is possible that the control group gained six percentile points while the experimental group actually may have gained almost 20 points. Disregarding this possibility, however, the gain made by the experimental group is equivalent to

1Kennedy, Thomas. "The Radio as a Distractor in Silent Reading." Master's Thesis, Loyola University, 1940.
an increase of 30%, while the control group manifested a loss of 1.5% in mean percentile standing.

The significance of the gain made by the experimental group is attested to by the following figures. The difference between the test mean and the retest mean, in terms of percentile scores, is 11.4 points. The Probable Error of the difference between these two means is 2.64. The difference is therefore 4.32 times the Probable Error of the difference. Since it is generally accepted that chance cannot account for a difference which is four or more times larger than its probable error, it may be inferred that the gain manifested by the experimental group is statistically significant. Since the equated control group made no such gain, but actually lost 2.0 percentile points it is to be inferred that the gain of the experimental group resulted from the remedial reading instruction.

The scores attained by both groups on the seven subtests of the Iowa Silent Reading Tests were analyzed to determine if the remedial instruction had produced any significant increase in the specific reading abilities purportedly measured by the subtests. The seven subtests and their related abilities are as follows: Test 1: Part A: Rate, Part B: Comprehension; Test 2: Directed Reading; Test 3: Poetry Comprehension; Test 4: Word Meaning; Test 5: Sentence Meaning; Test 6: Paragraph Comprehension; Test 7: Location of Information.

It is apparent from the figures set forth in Table III that the experimental group made a very large gain only in one category: rate or speed of reading. With respect to this ability, the mean subtest standard score for the group on the first test was 78, and on the retest 97, an increase of 19 subtest standard score units. The Probable Error of this difference
### TABLE III

Difference between Mean Subtest Standard Scores on Initial Test and Retest 1941 - 1942

<table>
<thead>
<tr>
<th>Subtest</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>Av</td>
<td>A</td>
<td>B</td>
<td>Av</td>
<td>A</td>
</tr>
<tr>
<td>Test</td>
<td>78</td>
<td>89</td>
<td>83</td>
<td>76</td>
<td>90</td>
<td>84</td>
<td>82</td>
</tr>
<tr>
<td>Retest</td>
<td>97</td>
<td>87</td>
<td>93</td>
<td>78</td>
<td>85</td>
<td>92</td>
<td>89</td>
</tr>
<tr>
<td>Diff.</td>
<td>19</td>
<td>-2</td>
<td>10</td>
<td>2</td>
<td>-5</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Test</td>
<td>73</td>
<td>82</td>
<td>78</td>
<td>76</td>
<td>82</td>
<td>86</td>
<td>85</td>
</tr>
<tr>
<td>Retest</td>
<td>76</td>
<td>86</td>
<td>81</td>
<td>77</td>
<td>79</td>
<td>88</td>
<td>80</td>
</tr>
<tr>
<td>Diff.</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-3</td>
<td>2</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain of Experimental over Control Group</td>
<td>16</td>
<td>-6</td>
<td>7</td>
<td>1</td>
<td>-2</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

The difference between the mean subtest standard scores on the initial test and the retest is 1.98. In other words, with respect to rate, the difference between the test mean and the retest mean is 9.6 times the probable error of the difference. This indicates that the difference cannot be the result of chance variation. In other words, the remedial instruction produced a markedly significant increase in rate of reading on the part of the remedial or experimental group. No such increase in rate was manifested by the control group. The obvious inference is that the remedial instruction had been quite effective in increasing the speed of reading of members of the experimental group.

Further analysis revealed that increases made by the two groups on the other subtests were not statistically significant and therefore might well have been produced by chance variations. The criterion used in judging statistical significance is the accepted rule that, unless the observed difference is four or more times its probable error, the change may have been produced by chance and is therefore not significant. The ratio be-
between the respective differences on the other subtests and their corresponding probable errors ranged from 2.5 to 3.4. This last ratio approaches statistical significance, and was apparent in the gain made by the experimental group on subtest 4, which allegedly measures word meaning. In general, however, the gains or losses manifested by both groups on the remaining subtests were small, lacking in statistical significance and quite probably due to chance variations.
CHAPTER IV

SUMMARY AND CONCLUSION

In view of the admitted importance for college students of the ability to read rapidly and with the maximum of comprehension, and because no unequivocal evidence exists concerning the value of remedial reading instruction on the college level, an experimental program was undertaken in the College of Arts and Sciences of Loyola University in Chicago. It was the purpose of this experiment to determine whether the reading ability of college Freshmen, as measured by a standardized reading test, can be improved significantly by a remedial reading course in which the students meet twice a week for one hour periods during one-half of a semester.

The writer reviewed fifteen reports in the literature concerning remedial reading programs on the college level. Two of these studies expressed scepticism concerning the value and effectiveness of group instruction on the college level. The remaining studies reported varying degrees of success with different types of remedial programs. Some question is raised concerning the validity of the experimental techniques employed in fourteen of the fifteen studies.

In the present investigation, a remedial reading course was administered to freshmen in the College of Arts and Sciences during the academic years of 1940 - 1941 and 1941 - 1942. This course was given during one half of one semester, the class meeting twice each week for a period of fifty minutes. A description is given of the lectures and the material used for practice purposes. An account is also set forth of the manner in
which the control groups were selected and equated with the experimental or practice groups.

The results of the preliminary experiment during 1940 - 1941 were negative. Both the experimental and the control groups manifested a significant and almost equal gain in reading ability as measured by the Iowa Silent Reading Tests. This gain on the part of both groups was attributed to practice effect, as the same form of the reading test was used both for the initial test and the subsequent retest.

The main experiment of 1941 - 1942 yielded positive results in favor of remedial reading instruction. The practice or experimental group manifested a gain of about 25 per cent, which proved to be statistically significant. The control group, on the contrary, sustained a loss of about four per cent, although this difference proved to be statistically insignificant. The chief gain made by the experimental group was in rate of reading. Little difference was noted in comprehension scores after remedial instruction.

From these results of the main experiment, the conclusion is drawn that group remedial instruction in reading on the college freshman level is effective, and that the expenditure of the necessary time, efforts and funds is justified by the improvement in reading ability which results from such a remedial program.
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APPROVAL SHEET

The thesis submitted by Mr. William T. Wallace, Jr. has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

May 21, 1945

[Signature of Adviser]