

A STUDY OF THE RELATIONSHIP BETWEEN  
READING SKILLS AND ACADEMIC  
ACHIEVEMENT IN SPECIFIC  
SUBJECT MATTER AREAS

By

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## PREFACE

The development of reading skills has been recognized in recent years as an important facet in both the educational and professional lives of individuals. Reading plays an important part in the educational development of individuals as well as providing an important means of communication within and between the various professional fields involved in the world of work. This study is concerned with two primary areas related to reading skills: (1) The relationship between reading skills and academic achievement in specific subject matter areas, and (2) the retention of gains in reading skills following completion of training in a formal reading program.

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## CHAPTER I

### THE NATURE OF THE STUDY

#### Introduction

During recent years a great deal of emphasis has been placed upon the value and importance of reading skills. Reading training programs designed to improve and enhance the individual's skills and abilities in reading have been developed at the elementary and secondary school levels in the United States. Colleges and universities also have recognized the need of their students for reading improvement. Reading training programs in higher education have become more prevalent each year.

Strang, McCullough, and Traxler (1961) reported that a survey of institutions of higher learning in the United States in 1955 revealed that more than 57,000 students were enrolled in reading improvement programs. However, less than twenty-five percent of the institutions of higher learning in the United States offered programs for reading improvement. In institutions that did offer such programs, the English department was most frequently responsible for the program. Education departments ranked a close second. Guidance and Counseling departments also were found to be involved in the conduction of reading improvement programs.

This study will attempt to provide pertinent knowledge related to

the effectiveness of reading training. Are gains in reading skills retained over a prolonged period of time? Does educational experience in a university setting significantly effect the reading skills of the student? Will an intensive period of reading training significantly effect the academic performance of students who receive training?

The Oklahoma State University Reading Improvement Program is conducted under the auspices of the College of Education. The Reading Center is responsible for maintaining the program. The program, initiated in 1954, is designed to provide laboratory experience for the improvement of reading speed, vocabulary, comprehension, and study skills. Enrollment in the program is open to all students who wish to improve their reading skills or study methods. Students with reading skills ranging from weak to strong have availed themselves of the services provided.

Filmstrips, mechanical aids, workbooks, and supervised instruction are a part of the total program. Pre-training and post-training testing is conducted for evaluation purposes. Academic advisors are periodically informed of the progress of the participants in the program.

The course Education 120 is offered on a non-credit basis. A laboratory fee of \$15.00 is charged of each participant. The continued growth and demand for the program is evidence of its acceptance throughout the university.

Ray (1962) evaluated the program and reported that immediate gains in reading skills do result from participation in the reading program and that a significant amount of gains in vocabulary, comprehension, total score, and reading rate are retained after a time lapse of six months. No evaluation of the reading program has been conducted



utilizing a control group of non-participants, nor has an evaluation been made of the retention of gains over a longer period of time. The effect of improved reading skills upon academic performance has not been investigated. The purpose of this study is to investigate and evaluate these areas.

#### Statement of the Problem

The purpose of this study was to determine possible benefits derived through participation in the reading improvement program offered at the Oklahoma State University. The study has considered six basic questions. The answers to these questions should illuminate the overall value of the Oklahoma State University Reading Improvement Program.

A. Do students retain a significant amount of the gain in reading skills over a period of five semesters? Ray's (1962) study revealed that immediate gains do occur. Are these gains retained over a prolonged period of time? The hypotheses stated in null form are:

1. There will be no significant difference between the mean post-training vocabulary score of the experimental group and the mean vocabulary score obtained after a period of five semesters.
2. There will be no significant difference between the mean post-training comprehension score of the experimental group and the mean comprehension score obtained after a period of five semesters.
3. There will be no significant difference between the mean post-training rate of reading score of the experimental group and the mean rate of reading score obtained after a

period of five semesters.

4. There will be no significant difference between the mean post-training total score of the experimental group and the mean total score obtained after a period of five semesters.

B. Does academic experience in a university setting effect reading performance? Do students who have not participated in a reading improvement program realize a significant change in reading ability over a period of five semesters? The hypotheses stated in null form are:

1. There will be no significant difference between the mean first-test vocabulary score of the control group and the mean vocabulary score obtained after a period of five semesters.
2. There will be no significant difference between the mean first-test comprehension score of the control group and the mean comprehension score obtained after a period of five semesters.
3. There will be no significant difference between the mean first-test reading rate score of the control group and the mean rate score obtained after a period of five semesters.
4. There will be no significant difference between the mean first-test total score of the control group and the mean total score obtained after a period of five semesters.

C. Do participants in the reading improvement program achieve better academic grades than non-participants? The hypotheses stated in null form are:

1. There will be no significant difference between the

academic achievement of the experimental group and that of the control group with respect to grades received in English courses.

2. There will be no significant difference between the academic achievement of the experimental group and that of the control group with respect to grades received in mathematics courses.
3. There will be no significant difference between the academic achievement of the experimental group and that of the control group with respect to grades received in natural science courses.
4. There will be no significant difference between the academic achievement of the experimental group and that of the control group with respect to grades received in social science courses.

D. Do improved reading skills gained through participation in a reading improvement program affect a significant difference in the academic performance of students in the subject matter areas of English, mathematics, natural science, and social science? The hypotheses stated in null form are:

1. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in mathematics and those received in English.
2. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in mathematics and those received in

social science.

3. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in mathematics and those received in natural science.
4. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in English and those received in social science.
5. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in English and those received in natural science.
6. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in social science and those received in natural science.

E. Does non-participation in the reading improvement program affect a significant difference in academic performance between the subject matter areas of English, mathematics, natural science, and social science? The hypotheses stated in null form are:

1. There will be no significant difference in the academic achievement of the control group with respect to grades received in mathematics and those received in English.
2. There will be no significant difference in the academic achievement of the control group with respect to grades received in mathematics and those received in

social science.

3. There will be no significant difference in the academic achievement of the control group with respect to grades received in mathematics and those received in natural science.
4. There will be no significant difference in the academic achievement of the control group with respect to grades received in English and those received in social science.
5. There will be no significant difference in the academic achievement of the control group with respect to grades received in English and those received in natural science.
6. There will be no significant difference in the academic achievement of the control group with respect to grades received in social science and those received in natural science.

F. Does participation in the reading improvement program significantly effect the over-all academic performance of the participants?

The hypothesis stated in null form is:

1. There will be no significant difference between the academic achievement of the experimental group and the control group with respect to grades received in all academic courses.

#### Need for the Study

Reading improvement programs at the college and university level have been developed at a slower rate than those developed in the public

schools of the United States. Parr (1930) reported that only seven institutions of higher learning offered reading instruction to students. A survey by Fulker (1956) revealed that reading training in higher education did not receive very much attention until the era following World War II. Strang, McCullough, and Traxler (1961) reported that in 1955 less than twenty-five percent of institutions of higher learning offered an organized reading training program to students. However, Summers (1962) found that an ever increasing number of colleges and universities were recognizing the reading needs of their students and were providing the students with various types of reading programs.

Most reading programs in higher education tend to be centered upon vocabulary development, comprehension improvement, and increased reading rate. These programs have placed much emphasis upon immediate gains in reading skills and have given too little attention to the retention of gains or to the relationship existing between reading skills and academic achievement. It would seem appropriate that each individual reading program should evaluate itself in order to identify needed changes or improvements that would benefit those students participating in the program.

Retention of gains in reading skills is a desirable result to be obtained through participation in a reading training program. Research needs to be conducted that is concerned with retention of gains in reading skills. Too little research has been done in this area.

Cosper and Kephart (1955) pointed out that reading speed can be increased in a reading training program and that this increase can be retained over a period of time. They conducted a study at Purdue University which involved an experimental group of 204 students who

received reading training and a control group of 208 students who received no formal training in reading. The experimental group exceeded the control group in reading speed at the close of the training period. Fourteen months later 38 members of the experimental group and 28 members of the control group were retested. The experimental group significantly exceeded the control group in reading speed. The results of this study did not reveal a significant difference in comprehension, although the experimental group did demonstrate more gain than the control group in comprehension.

Research has been conducted that has been concerned with the effect of reading training upon academic achievement. McGinnis (1951) conducted a study at Western Michigan College utilizing experimental and control groups. The groups were equated on the basis of sex, status in college, scholastic aptitude, and reading ability. Results of the study revealed that the experimental group significantly exceeded the control group in over-all academic performance during a period of one semester.

This study attempts to provide information for the following areas: (1) the need for more information concerning the value of reading skills for over-all academic purposes, (2) the need for information concerning the relationship existing between reading skills and academic performance in specific subject matter areas, and (3) the need for more information concerning the permanency of gains in reading skills.

#### Definition of Terms

The Oklahoma State University Reading Improvement Program is described in the Oklahoma State University Catalogue (1965-67) as "Laboratory experience for the improvement of reading speed, vocabulary,

comprehension, and study skills." The Oklahoma State University Reading Center Syllabus (1965) states that the objectives of the Reading

Improvement Center are:

1. To appraise the reading skills of the student, to develop an awareness within the student of individual weaknesses, and to build a program to strengthen those weaknesses.
2. To develop general reading skills through various training methods, including vocabulary, comprehension, and speed improvement.
3. To encourage good reading and study habits through lectures, demonstrations, and student laboratory experiences.
4. To offer counseling services as requested by the student to help solve unique reading problems.
5. To develop flexibility of approach to reading materials.
6. To make periodic evaluations of each student's progress and to make recommendations in light of these evaluations.
7. To make a post-training evaluation of reading growth and to make recommendations for continued improvement.

Reading skills will refer to those skills measured by the Nelson-Denny Reading Test (Form A and Form B) and are (1) vocabulary, (2) comprehension, (3) total reading score, and (4) rate of reading.

Retention of gains will refer to the measured stability of performance on the Nelson-Denny Reading Test of the student after a period of time has elapsed following participation in the reading improvement program.

Experimental group will refer to that group of students included in the study that successfully participated in the reading improvement program.

Control group will refer to that group of students included in the study that did not participate in the reading improvement program.

Academic achievement will refer to the grade point average of the



students based on a four-point scale. (A = 4.0, B = 3.0, C = 2.0, D = 1.0, F = 0.0.)

American College Test will refer to the battery of tests that the American College Testing Program uses in its educational assessment program.

### Delimitations

#### Scope of the Study

This study includes an analysis of reading test scores and academic grades of two groups of students; one group which successfully completed the Oklahoma State University Reading Improvement Program, and one group which was selected at random from the student body that did not participate in the reading improvement program. The students were enrolled at the university during the fall semester of the 1965-66 academic year. The number of students involved in the study includes:

- (1) 108 students who as first semester freshmen successfully participated in the reading improvement program during the fall semester of the 1963-64 academic year.
- (2) 108 students who began their academic careers as entering freshmen at the beginning of the fall semester of the 1963-64 academic year, but did not participate in the reading improvement program.

This study is concerned with the retention of gains in reading skills and the value of reading skills to academic achievement. The study will not be concerned with immediate gains in reading skills which result due to successful participation in the reading improvement program. (Ray, 1962).

### Limitations of the Study

It is not possible to control for all variables that are operant in a study of this nature which deals in the realm of the social sciences.

However, an effort was made to control for the following variables:

1. Sex, as to the number of males and females in both the experimental and control groups.
2. Initial reading skills as measured by the Nelson-Denny Reading Test (Form A).
3. Scholastic ability as measured by the American College Test.

The study does not attempt to control for other intervening variables or factors that effect the reading performance or academic achievement of university students.

### Assumptions

1. The Nelson-Denny Reading Test (Form A and Form B) is a reliable and valid measurement of the reading ability of college and university students.
2. The American College Test is a reliable and valid measurement of the scholastic ability of the individual that is tested.
3. Grades assigned by instructors are a comprehensive assessment of a student's academic achievement in the subject for which he was assigned the grade.
4. The sample utilized in the study is representative of typical students enrolling at the Oklahoma State

University and can be used in the evaluation of the problem.

### Organization of the Study

Chapter I has been an introduction to the problem to be studied. The introductory chapter has presented the need for the study, the statement of the problem, a definition of terms, and the delimitations of the study.

Chapter II will present a review of the related literature and its applicability to the study.

Chapter III will describe the population of the study, standardized testing instruments utilized, and statistical methods implemented in evaluating the data.

Chapter IV will consist of a statistical analysis of the data. A determination as to the degree of correctness of the hypotheses will also be made.

Chapter V will include a discussion of the results of the study. Recommendations concerning the need for future studies in the area will be made.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### Introduction

Various factors are presumed to influence academic achievement in higher education. Considerable attention has been given to the area of scholastic aptitude, study habits, interests, motivation, work load, and hours attempted. A fairly large number of investigations have been conducted in an attempt to identify the relationship existing between these factors and academic achievement. Much less attention has been given to determining the relationship existing between reading skills and academic performance. Less attention yet has been given to the relationship existing between reading skills and academic performance in specific subject matter areas. It would be of value to know in which subject matter areas reading skills are most important.

Retention of improved reading skills is another area which needs more investigation. A great deal of emphasis has been placed on various aspects of reading other than the retention of reading skills. A number of investigations found in the literature offer descriptions of reading programs, as reported by McCullough (1957), Mayhew and Weaver (1960), Bliesmer and Lowe (1962), and Maxwell and Magoon (1962).

Tinker (1956), Karlen (1958), and Klare, Nichols and Shuford (1958) reported investigations concerned with materials used in reading

programs. These represent but a sample of research done in the area.

Testing and use of tests has been an area that has been emphasized in reading research. A review of the literature by Bliesmer (1962) revealed 15 studies or investigations conducted during the previous year that were related in some way to this area.

Immediate gains in reading skills resulting from participation in reading improvement programs also have been given a great deal of attention. Blanchard (1957), Gray (1960), and Bliesmer (1962) have reported on a number of studies and investigations concerned with this area.

The review of the literature for this study is confined to those studies and investigations that are related to the retention of reading skills, or to the relationship of reading skills and academic achievement. This review is divided into two sections. Section one is concerned with that literature which is pertinent to reading skills and academic achievement. Section two is concerned with that literature which is related to the retention of reading skills.

#### Reading Skills and Academic Achievement

Some research has been conducted that has been concerned with the relationship existing between reading skills and academic achievement. Most of the research done in this area has been concerned with the relationship existing between reading skills and over-all academic achievement. Little research has been reported that has been concerned with reading skills and specific subject matter areas.

Kilby (1945) studied the effect of remedial reading training on academic achievement. A non-reading group was equated to the reading group on the basis of pre-reading scores and scholastic aptitude scores.

The two groups consisted of 98 matched pairs. Correlation coefficients were computed for the groups. Results of the experiment revealed significant gains in academic achievement in favor of the experimental group.

McGinnis (1951) studied the effect of corrective reading towards increasing scholastic achievement of college students. Twenty college students who participated in a reading laboratory program were selected as an experimental group. A control group was selected on the basis of sex, status in college, scholastic aptitude, and reading ability. The control group consisted of twenty students selected from the student body who had not participated in the reading laboratory program. Each group contained 15 males and five females. A t test of mean difference was used in the statistical analysis.

Results of the study showed that the experimental group significantly exceeded the control group in academic performance over a period of one semester. The experimental group also attempted more hours than did the control group.

Preston and Botel (1952) reported on a study involving the relation of reading skills to academic achievement. The 2,048 subjects involved in the study were students who enrolled at the University of Pennsylvania over a period dating from the fall semester of 1938 through the fall semester of 1945.

The Iowa Silent Reading Test was administered to all of the participants at the beginning of their respective entering semesters. College achievement was measured by computing mean grade averages for each student through his college career. Scores from the Scholastic Aptitude Test were used as measures of college aptitude.

A positive relationship was found between reading skills, as measured by the Iowa Silent Reading Test, and scholastic achievement. Correlation coefficients between reading comprehension and college grades ranged from .25 to .67 with a median of .38 existing.

Members of the selected sample for the study who had received remedial reading training were identified and matched to a control group of the sample that had not received such training. The remedial reading group highly exceeded the non-remedial reading group in academic achievement.

Mouly (1952) reported on a study involving subjects who had participated in a reading training program at the University of Miami. The study involved a control group of 164 students and an experimental group of 106 students. The groups were initially equated on the basis of reading scores and psychological test scores. A chi-square statistical method was used in the data analysis.

Results of the study indicated that the experimental group significantly exceeded the control group in academic performance as measured by grade point average.

Smith and Wood (1955) reported on a study designed to determine the effects of reading improvement on academic achievement. Results of the study revealed that reading improvement does result in improvement of academic performance.

O'Bear (1955) conducted a study involving entering college freshmen at Indiana University who completed a remedial reading course. The purpose of the study was to ascertain changes which would occur in the academic performance of those students who participated in the reading program. A control group which did not participate in the reading

program was matched with the experimental group.

Differences in achievement were studied and comparisons were made in the areas of persistency in university training, growth in reading ability, attitude towards university life, and academic achievement.

The control group tended to achieve better than did the reading group. The academic achievement of the reading group was highest during the semester in which they received reading training. The control group tended to enroll in more hours of academic study each semester than did the experimental group.

Blake (1956) reported on a study involving 128 probationary students who were required to participate in a reading training program. A control group was also identified, but no information was presented explaining how the group was selected other than the fact that they did not participate in the reading training program. Students in the experimental group were placed on probation on the basis of either high school records or college scholastic records.

The two groups were followed through a period of 54 months or to termination of their educational program. The experimental group graduated 22.6% of its members as compared to 22.9% of the control group. Also, of the original 128 members of the experimental group who attained a C grade average necessary to get off probation, 47.3% went on to graduate. On the basis of these findings, Blake indicated a belief that the required reading program proved beneficial academically to the participants.

McDonald (1957) reported on a study conducted at Cornell University which involved 116 members of an experimental group who participated in a reading training program and a control group of 142 members who



received no formal training in reading. The experimental and control groups were divided into sub-groups on the basis of having taken either the Scholastic Aptitude Test or the Ohio State University Psychological Test. One or the other of these tests is used by the various divisions of the University as part of the Admissions Test Battery. The number of students in each sub-group was proportional with respect to sex and enrollment in a division of the University.

The experimental and control groups were not considered to be random samples of college freshmen in general or of Cornell University freshmen. The experimental group was considered to be less capable academically than the control group on the basis of standardized test scores.

The experimental and control groups were compared with respect to academic achievement based on grade-point averages over a three-semester period. A discriminate analysis technique was used to compare the group. Results of the comparison revealed that the experimental group significantly exceeded the control group in academic achievement. The experimental group also had a significantly smaller proportion of drop-outs over the three-semester period covered in the study.

Vineyard and Massey (1957) investigated the relationship between college grade-point average and objective measures of vocabulary, speed of comprehension, and intelligence. The investigation involved a group of 176 entering freshmen at Panhandle A and M College of Goodwell, Oklahoma. The subjects were administered the Nelson-Denny Reading Test, Form A, to measure reading ability, and the American Council on Education Psychological Examination which was used as a measure of intelligence. First semester grades were used as a measure of academic

performance. Correlations were obtained between grades and reading ability.

Results of the study indicated that reading ability was significantly related to all subject matter areas considered. Reading training was found to be more beneficial to males than to females.

Entwistle (1960) reviewed progress reports for 22 reading improvement and study skills courses and concluded that such courses are usually followed by retention of gains in reading skills and an increase in academic performance. The modal gain in academic performance was usually about .5 of one grade point.

Vineyard and Bailey (1960) conducted a study designed to identify the relationship existing between reading ability, listening skill, intelligence, and scholastic achievement. Subjects for the study were 114 second semester freshmen students enrolled at Southwestern State College of Weatherford, Oklahoma. Scores from the reading section of the Cooperative English Test were used as a measure of reading ability. The American Council on Education Psychological Examination was used as a measure of intelligence, and the Listening Test of the Sequential Tests of Educational Progress was utilized as a measure of listening skill. Intercorrelations were computed.

Findings of the study revealed that reading ability, listening skill, and intelligence are highly interrelated, and each of these are related to academic achievement. However, upon the removal of intelligence and listening skill, the relationship between reading skills and academic achievement becomes less significant.

Hinton (1961) studied a group of 71 entering freshmen who participated in a reading improvement program at the University of Wichita.

She compared their academic program to that of an honors group over a three-semester period. Members of the honors group had not participated in a reading improvement program. A t test of mean differences was used in the data analysis. The comparison revealed that on the basis of change in grade-point means for succeeding semesters, the reading group showed significant improvement, whereas the honors group tended to show a decrease in mean grade-point average. Hinton concluded that the reading improvement program was academically beneficial to participants.

Wilson (1961) conducted a study involving 39 students who completed a remedial reading program in elementary school. The subjects were followed through to conclusion of their public school program. Information and data on the subjects were taken from (1) reading laboratory files, (2) school records of grades, (3) test results, (4) attendance records, (5) health and activity records, (6) parent and student interviews, (7) teacher interviews, and (8) reading test scores of the subjects.

The findings of the study revealed that students who are successful in a remedial reading program do improve in scholastic performance. Reading skills gained in the remedial reading program are retained and tend to become refined over the educational career of the participant.

Bloomer (1962) reported on a study involving an experimental group of 40 college freshmen who had received reading training and a control group of 39 subjects who did not participate in the reading training program. Form A of the Diagnostic Reading Survey Test was given to both groups. The experimental group met for two one-hour sessions each week for a period of twelve weeks for reading training. Both groups were then given Form B of the Diagnostic Reading Survey Test. Grade-point averages were determined for students in both groups at the close of

the semester. Correlation coefficients were computed between reading ability and academic grades.

No differences were found between groups in achieved grade-point average at the end of the semester. However, when the grade-point averages were corrected on the basis of predicted college averages, results revealed a significant difference in favor of the reading group.

The 14 studies reported here were concerned with reading ability and over-all academic achievement. Results of each of the studies indicated a significant or positive relationship existing between reading ability and over-all academic achievement. One study (O'Bear, 1955) revealed that academic achievement was highest in the semester that formal reading training was experienced. Vineyard and Massey (1957) reported that reading training was more academically beneficial to males than it was to females. This review indicates that a significant relationship exists between reading ability and over-all academic achievement.

Very few studies have been reported that have been concerned with reading skills and academic achievement in specific subject matter areas.

Drake (1940) found that teaching the vocabulary of Algebra had a significant effect upon the academic performance of the participants in the study of Algebra. Subjects from seven different school settings participated in the experiment. Control and experimental groups were utilized within each school setting. The experimental groups received training in developing a vocabulary for Algebra, whereas the control groups received no such training. Diagnostic tests were given at the beginning of the semester and again at the close of the semester. The

experimental design used in the study was a matched group procedure. Correlations were computed in the data analysis.

Results of the experiment revealed that the vocabulary groups achieved at a higher level than did the non-vocabulary groups in Algebra. The most favorable effects were observed in the solving of simultaneous equations, factors and roots, powers, and radicals.

Humber (1944) studied the relationship between reading efficiency and academic success in university curricula. Senior students at the University of Minnesota were included in the experiment. The students were selected from a cross section of enrollment in order to sample a wide range of content material.

Reading tests were administered during the winter semester of 1941 when each student was classified as a senior. Academic grades were obtained for each subject that a student had taken that was listed by the university catalogue as being in his major field. Scores made on the American Council on Education Psychological Examination were used as a measure of scholastic aptitude. The study revealed that reading efficiency was frequently related to academic success in the humanities but infrequently related to academic success in courses emphasizing science material. Correlation coefficients were obtained in the data analysis. Results of the study also revealed that the difference between an A grade and a C grade in the senior year of college is more closely related to reading efficiency than to scholastic aptitude.

Coussan (1957) studied the effect of developmental reading instruction upon reading ability and general achievement. Two groups of students were equated on the basis of (1) mental ability, (2) reading ability, (3) chronological age, (4) academic achievement, and (5)

good

number. The testing instrument used was the California Test of Achievement.

The experimental group met one hour each day for reading instruction, whereas the control group used the hour for a study period. Results of the experiment revealed that the experimental group exceeded the control group in achievement in arithmetic, social science, and general academic achievement. This result was found to exist throughout the group.

Mills (1957) reported on an investigation which compared a conventional approach of teaching English to an experimental approach which emphasized the teaching of reading skills. The experimental group instructors emphasized reading speed, critical reading, and development of ideas. Students in the experimental group received no direct instruction in grammar or rhetoric; the responsibility for learning grammar rested with the students.

Both groups were pre-tested and post-tested on the Cooperative English Test. Results of the investigation revealed that the experimental group showed greater improvement in English than did the control group, although the control group had initially higher percentile scores at the beginning of the experiment.

Sweeney (1962) found no significant relationship between the amount of high school English taken and college grades received in freshman English at the college level. She found that reading proficiency actually had more effect than any other factor upon academic performance in English beyond the freshman year. Sweeney concluded that a great deal more emphasis needed to be placed upon reading skills in the high school years.

*good*

Two studies, Coussan (1957) and Drake (1940), reported that reading skills are positively related to mathematics achievement. Only one study, Humber (1944), reported was concerned with natural science and reading ability. The results of his investigation revealed little or no relationship between reading efficiency and academic achievement.

Two studies, Mills (1957) and Sweeney (1962), were reported that were concerned with reading ability and academic achievement in English. Results of these studies revealed a positive relationship between academic achievement and reading proficiency.

Two studies, Humber (1944) and Coussan (1957), were reported that were concerned with reading ability and academic achievement in social sciences. The results of these investigations revealed a positive relationship between these two areas.

#### Retention of Improved Reading Skills

##### Resulting From Participation in a Reading Improvement Program

Deal (1934) reported on a study of retention of comprehension skill involving 42 subjects. The subjects received training in a reading improvement program and then were administered a test for evaluation purposes. One year later, the subjects were retested with the results revealing a significant amount of retention.

Weber (1939) conducted a study involving 83 subjects. An experimental group of 41 members and a control group of 42 members were identified. The experimental group received remedial reading training, whereas the control group did not participate in the training program. Members of each group were tested after a lapse of one year. The

experimental group exceeded the control group in reading skills at this time. The experimental group's test scores also exceeded their post-training test scores.

Staton (1950) reported on a study involving 12 Air Force Officers who had participated in a reading improvement course. The participants were retested over a period of time ranging from four to twelve months following completion of the training program. Scores from these tests were compared to post-training test scores. The comparison revealed that the participants retained part of the gains that had resulted during the training program.

Barbe (1952) studied a group of 50 college subjects who were divided into experimental and control groups of 25 members each. The experimental group consisted of students who had participated in a reading improvement program while the control group consisted of students who had not participated in such a training program.

Both groups were pre-tested for reading rate and comprehension at the beginning of the training program and retested at the close of the program. Following a lapse of six months both groups were tested. A t test of mean differences was used in the analysis of the data. The experimental group made significant gains in rate during the training period and retained the gain over the six-month period. The control group showed a gain in rate, but it was not found to be significant. No information was presented regarding gains or losses in the area of comprehension.

Hunt (1954) reported on a study of a reading program designed to improve the reading skills of managerial level workers in industry. The training classes were limited to 12 members each and were conducted over



a 10-weeks period with members meeting twice weekly for one-hour sessions. Diagnostic tests were used throughout the program. The training sessions were divided into two parts, group and individual work. Practice reading material was utilized in the program and was taken from various popular magazines.

Results of the study revealed that an immediate increase in reading speed of 86% was realized by the participants. Comprehension increased by 17%. The participants were retested five months after the close of the training program, with test scores indicating that the group retained 51% of their original increase in reading rate and 50% of their increase in comprehension.

Potter (1954) conducted a study involving freshmen students at the United States Naval Academy. Experimental and control groups consisting of 161 members each were selected for the study. Each group was pre-tested for initial reading rate. The experimental group received reading training through a period of 20 class sessions, whereas the control group received no formal reading training. The groups were then post-tested. The post-test scores revealed that the experimental group had significantly out-gained the control group in reading rate. Following a time lapse of five months the groups were again tested. The results of this testing revealed that the experimental group still retained a significant amount of gains in reading rate.

Smith and Wood (1955), while investigating reading skills and academic achievement also included in their study an investigation of retention of improved reading skills. A sample of 27 subjects were selected at random 60 weeks after completion of the reading training program and retested with a standardized reading instrument. Test

results revealed that members of the sample retained a significant amount of gain in level and speed of comprehension. Retention of gains in vocabulary proved to be insignificant.

Cosper and Kephart (1955) conducted a study which compared the reading skills of an experimental group of 204 subjects to a control group of 208 members. The experimental group had participated in a reading improvement program, whereas the control group members had not received formal reading training. Both groups were pre-tested and post-tested for reading skills. Following a time lapse of 14 months after completion of the program, 38 members of the experimental group and 28 members of the control group were retested. A t test of mean differences was used in the data analysis.

The test results revealed that the experimental group significantly exceeded the control group in reading speed, but no difference was found in vocabulary or comprehension scores.

Reed (1956) conducted a study involving 36 subjects who were divided into experimental and control groups of 18 members each. The experimental group received 27 hours of reading training, whereas the control group did not receive any formal reading training. The two groups were post-tested with the results revealing that the experimental group significantly exceeded the control group in reading rate and vocabulary. Seven months later the groups were retested. The experimental group significantly exceeded the control group in reading rate, but no differences were found between comprehension and vocabulary scores of the two groups.

Schwartz (1957) studied three groups of United States Naval School pre-flight cadets who had participated in a reading training program.

Mean pre-test and post-test scores were compared for speed of reading. The comparison revealed an increase of 104% improvement for the total population. Twelve weeks later the groups were retested, and the test results indicated that a 92% increase over pre-test scores still existed.

Kingston and George (1957) conducted an experiment involving 73 male students who had participated in a reading training program and 87 male students who had not participated in the program. Members of the experimental group had participated in the training program as freshmen. All subjects involved in the experiment were tested during the second semester of their third year in college. The obtained test scores were compared to scores derived for the subjects as entering college freshmen. Both groups had made significant gains in comprehension.

Dumler (1958) conducted a study to determine the amount and permanency of gains in reading skills as a part of a factor study of reading. The study involved 50 subjects who had participated in a college reading improvement program.

A comparison of pre-test and post-test scores revealed a significant increase in reading speed while no significant change occurred in comprehension. A retest of 22 subjects was conducted following a 170 day time lapse after completion of the training program. A significant amount of reading speed was retained by the subjects tested.

Lee (1958) studied the effect of a freshman reading improvement program, evaluating for immediate gains and retention of gains. Using a group of 71 students who at mid-semester had achieved the program goal of reaching or exceeding the fiftieth percentile rank, he retested these students after a six-months time lapse and found that their retention of

gains was significant.

Kenworthy (1959) studied a group of 57 non-college participants of a reading improvement program which consisted of 18 clock-hours of time. One year following completion of the training program the group was retested. Results of the testing indicated that the training program had little effect on comprehension and vocabulary for retention purposes.

Beasley (1959) reported that he found a significant amount of retained gains in reading speed in a group of 144 college freshmen who had participated in a reading training program. The subjects had been retested three months after completion of the training program, and chi-squares were computed from the data.

Murdick (1959) reported on an experiment involving a reading training program for executives. Initial gains in speed and comprehension were observed but were found to be not permanent. Murdick indicated a belief that the reason for greater persistence of retention of gains in a college program is due to students being in a setting that is conducive to the practice of the newly-learned skills.

Wilson (1961) reported that he found that reading skill gains made in a reading improvement program are permanent and that they tend to become refined following completion of the program.

Siegel (1962) conducted a study that covered a five-year period, involving an adult non-college reading improvement program. Data collected on 1,197 participants revealed an improvement in reading skills. Retest scores on these subjects were obtained six months after completion of the training program. The test scores indicated that gains made in speed and comprehension are retained over a six-month period.

Ray (1962) conducted a study which involved 177 college subjects who completed a reading improvement program. One aspect of the study was to determine the retention of gains in reading skills following completion of the reading program. A group of 65 subjects were retested at intervals of three months and six months after completion of the program. A t test of mean differences was used in the data analysis.

Ray found that a significant amount of gains in reading skills in vocabulary, comprehension, total score, and reading rate were retained over a six-months period of time after completion of the training period.

The review of the literature reveals that the retention of reading gains seems to vary from program-to-program. Of the 18 investigations reported in this review, the results of 13 of them revealed that retention occurred in at least one area of reading skills.

Rate of reading appears to be the reading skill most often retained after formal training in a reading improvement program. Most of the investigations reported retention of increased reading rate, with only one investigation reporting no retention of reading rate.

Two of the investigations reported retention of comprehension skills. However, the general trend of the findings of the reported investigations seem to indicate that vocabulary and comprehension skills are not significantly retained.

#### Summary

Chapter II has been a review of the literature that pertains to reading improvement programs in the areas of (1) retention of gains made in a reading improvement program, and (2) the effect of reading training

upon academic achievement.

The review of the literature reveals that reading improvement programs do produce gains in reading skills for participants and that in most instances these gains are retained. Gains in rate of reading appear to be more often retained than are comprehension and vocabulary skills.

The literature reviewed indicates that improved reading skills significantly effect over-all academic achievement. Few studies were reported that were concerned with the effect of reading training upon academic achievement in specific subject matter areas. Academic improvement in specific subject matter areas appears most prevalent in the areas of English and social science. Only one study was reported that was concerned with the effect of reading training on academic achievement in the natural science field. Two studies were reported that pertained to the area of mathematics. This review indicates a need for more research that is concerned with all of these subject areas.

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## CHAPTER III

### METHODOLOGY AND DESIGN

#### Introduction

The purpose of this chapter is to present (1) the Oklahoma State University reading program, (2) the population of the study, (3) the testing instruments utilized in the study, and (4) the statistical methods used to test the hypotheses of the study.

#### The Reading Improvement Program

The reading improvement program enrollment is open to any student who desires to improve his reading skills. Classes consist of students ranging from freshman to graduate classification. The classes meet for 30 clock hours during the nine weeks period in which they are scheduled. Pre-training and post-training testing is conducted for diagnostic and evaluative purposes. Multiple sections of the reading improvement course are scheduled two times each semester to provide maximum opportunity of participation to the university student body.

Various aids are used in the reading program to help facilitate the development and improvement of the students' reading skills. These aids are used in conjunction with lecture instruction, and the over-all program allows the participating students to progress at a rate that is compatible with their abilities.

The following aids are utilized:

- A. The Controlled Reader, which projects an image of the reading material on a reception screen. Speed of material projection can be controlled by the operator.
- B. The Shadowscope, which casts a moving beam of light on the material to be read. This machine can be controlled for speed by the reader.
- C. The SRA Laboratory IV (college prep edition), a graded set of materials designed to strengthen comprehension, improve vocabulary skills, and increase reading speed.
- D. Workbooks which are available for use in the reading program. Use of workbooks is determined by the needs of the individual student and class situation.

The staff of the Reading Improvement Center utilizes various exercises to develop study skills, comprehension and vocabulary skills, and reading speed. Many of these exercises are designed and prepared by staff members to meet the individual needs of the students.

Small group instruction is used in conducting the training sessions. Pre-training test scores are used to divide enrollees into instructional groups. Each group receives instruction and guidance throughout the training program. Each participant receives a periodic informal evaluation of his progress. In addition the college advisor of each participant is periodically informed of the participation of his advisee.

#### The Population of the Study

During the fall semester of the 1963-64 academic year, a total of



393 students enrolled in the reading improvement program. Enrollees were administered the Nelson-Denny Reading Test (Form A) and sectioned into 19 classes for instructional purposes. Eighty-seven enrollees dropped out or did not appear for instruction, while 306 enrollees completed the reading improvement program. The Nelson-Denny Reading Test (Form B) was administered at the close of the training program to those students who completed the program.

The experimental population for this study was drawn from enrollees in the course Education 120 who, as entering freshmen during the fall 1963 semester, completed the reading improvement program and were enrolled in the university during the fall 1965 semester as third year students. A control group was selected from the fall 1963 entering freshmen class. Members of the control group did not participate in the reading improvement program. The two groups were equated on the basis of scholastic ability as measured by the ACT, initial reading skills as measured by the Nelson-Denny Reading Test (Form A), and sex.

Table I shows the distribution of the experimental and control groups according to quartile rank on the American College Test composite standard score.

Each group was composed of 108 members. A distribution of the ACT composite standard scores for the experimental group and the control group is presented respectively in Appendixes A and B. The mean composite score for the experimental group was 21.195, while the mean composite score for the control group was 21.203.

Table II shows the initial distribution of the experimental group and the control group with respect to quartile rank on the Nelson-Denny Reading Test total raw score.

TABLE I

DISTRIBUTION OF THE EXPERIMENTAL AND CONTROL GROUPS  
WITH RESPECT TO QUARTILE RANK ON THE  
ACT COMPOSITE STANDARD SCORE

| ACT<br>Quartile<br>Rank | Experimental<br>Group |        | Control<br>Group |        |
|-------------------------|-----------------------|--------|------------------|--------|
|                         | Male                  | Female | Male             | Female |
| Q1                      | 20                    | 6      | 20               | 6      |
| Q2                      | 26                    | 9      | 26               | 9      |
| Q3                      | 27                    | 9      | 27               | 9      |
| Q4                      | 4                     | 7      | 4                | 7      |

TABLE II

DISTRIBUTION OF THE EXPERIMENTAL GROUP AND THE CONTROL GROUP  
WITH RESPECT TO QUARTILE RANK ON THE NELSON-DENNY  
READING TEST TOTAL RAW SCORE

| Nelson-<br>Denny | Experimental<br>Group |        | Control<br>Group |        |
|------------------|-----------------------|--------|------------------|--------|
|                  | Male                  | Female | Male             | Female |
| Q1               | 14                    | 5      | 14               | 5      |
| Q2               | 25                    | 11     | 25               | 11     |
| Q3               | 25                    | 8      | 25               | 8      |
| Q4               | 13                    | 7      | 13               | 7      |
| Total            | 77                    | 31     | 77               | 31     |

Each group was composed of 108 members. A distribution of the Nelson-Denny Reading Test total scores for the experimental group and the control group is presented respectively in Appendixes A and B. The mean of the Nelson-Denny Reading Test total scores for the experimental group was 77.398, while the mean total score for the control group was 77.389.

Table III shows the total number of semester hours of academic course work attempted by the experimental group and the control group in the specific subject matter areas involved in the study.

TABLE III

TOTAL SEMESTER HOURS OF ACADEMIC COURSE WORK ATTEMPTED  
BY THE EXPERIMENTAL GROUP AND THE CONTROL GROUP  
IN THE SPECIFIC SUBJECT MATTER AREAS  
INVOLVED IN THE STUDY

| Subject Area    | Experimental Group | Control Group |
|-----------------|--------------------|---------------|
| Mathematics     | 995.0              | 844.0         |
| English         | 1073.0             | 1050.0        |
| Natural Science | 1650.0             | 1724.0        |
| Social Science  | 2462.0             | 2454.0        |
| Total           | 6180.0             | 6072.0        |

## Standardized Testing Instruments

This section of Chapter III is a description of the standardized testing instruments that were utilized in the study. Test scores obtained through the use of these instruments were used in equating the two groups.

The American College Test battery is designed to measure the ability of the student to perform intellectual tasks that he meets in his college program. The test battery places emphasis on general skills and abilities rather than on a knowledge of factual organization or content of course work. The tests provided information concerning the student's potential for academic achievement in four specific subject areas; these being English, mathematics, social studies, and the natural sciences. The battery is administered five times each year at various test centers in the United States and Canada.

The English Usage examination consists of 80 items and has a 50 minute time limit. The test measures the student's ability in the use of correct and effective writing. Several written exercises are included in the test in which a number of errors have been inserted. The student must identify these errors and choose a more acceptable substitute for them. About three-fourths of the test items are concerned with correct usage of words and phrases, paragraph construction, diction, style, idea organization, and language facility. The remaining area of the test deals with formal correctness of punctuation, capitalization, and grammar.

The mathematics examination consists of 40 items with a 50 minute time limit, and measures the student's ability in the use of

mathematical principles for solving quantitative problems and interpreting graphs and charts. The test is composed of two kinds of problems: (a) quantitative reasoning based on timely situations, and (b) formal exercises in geometry, algebra, and advanced arithmetic. The reasoning problems cover such topics as proportions and percentiles, interest, costs and profits, and interpretations of tables and graphs. Students must solve problems involving equations in one and two unknowns, work with roots and powers, factor quadratics, simplify algebraic expressions, and work with angular relationships. The test includes a sampling of mathematical methods covered in high school courses and emphasizes the solving of problems encountered in college courses.

The Social Studies Reading Test consists of 52 items with a 40 minute time limit and is designed to measure the student's ability to read materials from the social studies with understanding and to perform the types of reasoning and problem solving that is associated with the social studies area. The test requires a reading of passages followed by test questions related to the passages. Factoral questions dealing with prior knowledge are also included in the test.

The Natural Science Test consists of 52 items and has a 40 minute time limit. This test measures the student's ability to interpret and evaluate reading materials in the natural sciences. The test is designed to draw from the student's science background and places emphasis on his ability to understand the content of the reading passages. Questions accompanying the reading passages are designed to evaluate the student's understanding of scientific methods, nature of experiments, and the logical steps of scientific inquiry.

The composite score on the American College Test is the mean

(average) of the four subject area tests. This score may be viewed as an index of total scholastic ability and has proven to be of value in predicting academic success in college. The ACT composite score was used to equate the two groups for scholastic ability.

The revised forms of the Nelson-Denny Reading Test are designed to measure reading skills in the areas of vocabulary, comprehension, and reading rate. The total score, which is the summation of the vocabulary and comprehension scores, is most useful for screening purposes and for predicting academic success.

There are two comparable forms of the revised test, Form A and Form B. Each test contains 100 items to measure vocabulary and 36 items to measure reading comprehension. The total score is the best single index of reading ability obtained through the use of the test. A correlation coefficient of .92 exists between the two forms of the test.

Research with the earlier form of the Nelson-Denny Reading Test indicated a close relationship between test scores and academic achievement. Garrett (1949) reported that a summary of 57 reported correlations between scholastic achievement and achievement test scores revealed a range of correlations from .10 to .70 with a median of .40. The Nelson-Denny Reading Test showed a correlation of .67 with achievement. This compares favorably with the correlation between scholastic success and intelligence as measured by various intelligence tests.

The Nelson-Denny Reading Test (Form A) is administered to all entering freshmen at the Oklahoma State University. The total score obtained from this testing was used for equating the two groups for initial reading level. The Nelson-Denny Reading Test (Form B) was administered to the experimental population following completion of the

reading training program to measure change in reading performance. The Nelson-Denny Reading Test (Form A) was administered to sample populations of both groups five semesters later to measure the level of reading skills existing at that time.

### Statistical Procedures

The purpose of this section is to present the statistical procedures used to test the hypotheses of the study. Two statistical procedures were utilized to accomplish this goal.

The t test used to test the hypotheses dealing with change in reading skills was a t test of difference of means of two correlated samples.

The t test used to test the hypotheses dealing with the comparison of the academic performance between the two groups was a t test of difference of means of two independent samples.

The statistical procedure used to test the hypotheses dealing with differences existing between academic achievement in subject areas was a single classification analysis of variance.

The equations for these statistical methods are presented in Appendix C.

## CHAPTER IV

### PRESENTATION AND ANALYSIS OF THE DATA

#### Introduction

The purpose of this chapter is to present a detailed description of the statistical treatment of the data and tests made of the hypotheses of the study.

Findings of the investigation are reported under two headings; first, the retention of gains made in a college reading improvement program; and second, the academic achievement of the experimental and control groups.

This study was not concerned with immediate gain in reading skills that occurs as a result of participation in the reading improvement program. However, it was necessary to calculate these gains to provide the basis for determining the significance of retention of gains over the designated period of time.

#### Retention of Gains Made in a College

##### Reading Improvement Program

Table IV is a presentation of the mean pre-training reading test scores, the mean post-training reading scores, the mean difference, the standard error of the mean difference, the  $t$  values, and the levels of significance between the pre-training reading scores and the



post-training reading scores for the Experimental Group.

TABLE IV  
 STATISTICAL COMPARISON OF PRE-TRAINING  
 AND POST-TRAINING READING SCORES  
 (EXPERIMENTAL GROUP)

| Test   | Pre-<br>training<br>Mean | Post-<br>training<br>Mean | Mean<br>Difference | Error<br>Mean<br>Difference | <u>t</u> Value |
|--------|--------------------------|---------------------------|--------------------|-----------------------------|----------------|
| Vocab. | 34.769                   | 39.861                    | 5.092              | .771                        | 6.602**        |
| Comp.  | 42.722                   | 46.713                    | 3.991              | .916                        | 4.358**        |
| Total  | 77.398                   | 86.796                    | 9.398              | 1.230                       | 7.641**        |
| Rate   | 236.481                  | 359.324                   | 122.843            | 7.538                       | 16.296**       |

\*\*With 107 degrees of freedom significant beyond .01 level of confidence.

The t value required for significance at the .05 level (107 d.f.) is 1.984. All t values presented in Table IV are significant beyond the .01 level of confidence, which reaffirms that participation in the reading improvement program does result in immediate gains in vocabulary, comprehension, total score, and reading rate.

Table V is a presentation of the mean post-training reading scores, the mean retest reading scores, the standard error of the mean difference, the t values, and the level of significance for the sample of the Experimental Group that was retested following completion of five

semesters of academic work.

TABLE V  
STATISTICAL COMPARISON OF POST-TRAINING  
AND RETEST READING SCORES  
(EXPERIMENTAL GROUP)

| Test   | Post-<br>training<br>Mean | Retest<br>Mean | Mean<br>Difference | Error<br>Mean<br>Difference | <u>t</u> Value |
|--------|---------------------------|----------------|--------------------|-----------------------------|----------------|
| Vocab. | 40.222                    | 47.444         | 7.222              | 1.149                       | 6.285**        |
| Comp.  | 44.200                    | 46.325         | 2.175              | 1.325                       | 1.626          |
| Total  | 84.422                    | 93.769         | 9.397              | 1.806                       | 4.203**        |
| Rate   | 335.690                   | 357.378        | 21.688             | 10.474                      | 2.071*         |

\*\*With 44 degrees of freedom significant beyond the .01 level of confidence.  
\*With 44 degrees of freedom significant beyond the .05 level of confidence.

The t value required for significance at the .05 level (44 d.f.) is 2.020. The t values presented in Table V not only revealed that the immediate gains in reading skills realized through participation in the reading training program were retained over a five-semester period, but also revealed that skills gained in vocabulary, total score, and reading rate were significantly improved over the period of time that elapsed between post-training testing and retesting. No significant change occurred in comprehension.

On the basis of these findings, the following hypotheses were rejected:

- A-1. There will be no significant difference between the mean post-training vocabulary score of the experimental group and the mean vocabulary score obtained after a period of five semesters.
- A-3. There will be no significant difference between the mean post-training rate of reading score of the experimental group and the mean rate of reading score obtained after a period of five semesters.
- A-4. There will be no significant difference between the mean post-training total score of the experimental group and the mean total score obtained after a period of five semesters.

However, the basis for rejection of these hypotheses was that the significant differences found, revealed a gain occurring in these skills rather than a loss. Initial gains in these reading skills were apparently retained and improved over a five-semester period of time.

The following hypothesis could not be rejected:

- A-2. There will be no significant difference between the mean post-training comprehension score of the experimental group and the mean comprehension score obtained after a period of five semesters.

Although improvement in comprehension did occur, the change was not statistically significant. This finding does reveal that initial gains made in comprehension were at least retained if not improved over a five semester period of time.

Table VI is a presentation of the mean pre-test reading scores, the mean retest reading scores, the mean differences, the standard error of the mean differences, the  $t$  values, and the level of significance for the control group sample that was retested after five semesters of academic work.

TABLE VI  
STATISTICAL COMPARISON OF PRE-TEST  
AND RETEST READING SCORES  
(CONTROL GROUP)

| Test   | Pre-test Mean | Retest Mean | Mean Difference | Error Mean Difference | $t$ Value |
|--------|---------------|-------------|-----------------|-----------------------|-----------|
| Vocab. | 35.400        | 42.000      | 6.600           | 1.085                 | 6.083**   |
| Comp.  | 45.200        | 45.600      | .400            | .729                  | .549      |
| Total  | 80.800        | 87.600      | 6.800           | 1.564                 | 4.347**   |
| Rate   | 271.125       | 319.525     | 48.400          | 8.628                 | 5.610**   |

\*\*With 39 degrees of freedom significant beyond the .01 level of confidence.

The  $t$  value required for significance at the .05 level (39 d.f.) is 2.023. The  $t$  values presented in Table VI for vocabulary, total score, and reading rate are significant beyond the .01 level of confidence. The  $t$  value for comprehension is not significant.

These findings revealed that college students who did not

participate in a reading improvement program significantly improved their reading skills in vocabulary, total score, and reading rate over a five-semester period of academic work. Their comprehension skills did not significantly change from the time they entered as freshmen through completion of their first five academic semesters.

On the basis of the stated findings, the following hypotheses were rejected:

- B-1. There will be no significant difference between the mean first-test vocabulary score of the control group and the mean vocabulary score obtained after a period of five semesters.
- B-3. There will be no significant difference between the mean first-test reading rate score of the control group and the mean rate of reading score obtained after a period of five semesters.
- B-4. There will be no significant difference between the mean first-test total score of the control group and the mean total score obtained after a period of five semesters.

These college students, over a five-semester period of time, did significantly improve their reading skills in vocabulary, total scores, and reading rate without the benefit of formal training in reading improvement.

The following hypothesis could not be rejected:

- B-2. There will be no significant difference between the mean first-test comprehension score obtained after a period of five semesters.

The statistical analysis revealed that college students who had not had formal training in reading improvement did not significantly improve in reading comprehension.

Table VII is a presentation of the statistical comparison of the differences in mean gains of the experimental and control groups in vocabulary, comprehension, total score, and rate of reading after five semesters of academic work.

TABLE VII

A STATISTICAL COMPARISON OF THE DIFFERENCES IN  
MEAN GAINS OF THE EXPERIMENTAL AND CONTROL  
GROUPS AFTER FIVE SEMESTERS OF ACADEMIC WORK  
(PRE-TEST - RE-TEST)

| Test   | Experimental<br>Mean<br>Gain | Control<br>Mean<br>Gain | Mean<br>Difference | Error<br>Mean<br>Difference | <u>t</u> Value |
|--------|------------------------------|-------------------------|--------------------|-----------------------------|----------------|
| Vocab. | 11.533                       | 6.600                   | 4.933              | .957                        | 5.155**        |
| Comp.  | 7.111                        | 0.400                   | 6.711              | .814                        | 8.245**        |
| Total  | 19.047                       | 6.800                   | 12.247             | 1.386                       | 8.836**        |
| Rate   | 110.312                      | 48.400                  | 61.912             | 8.389                       | 7.143**        |

\*\*With 83 degrees of freedom significant beyond the .01 level of confidence.

No hypotheses were formulated for the study which referred to the data presented in Table VII. However, previously stated findings of the investigation dictate a need for the presentation and treatment of the

data in Table VII. The relationship of this data to the study will be discussed in the summary section of Chapter V.

### The Academic Achievement of the Experimental and Control Groups

This section of Chapter IV is a presentation of the data that pertains to the academic achievement of the experimental and control groups.

Table VIII presents a statistical comparison of the academic achievement of the experimental and control groups over a five-semester period. Data presented are the mean grade averages of the experimental and control groups in English, mathematics, natural sciences, social sciences, and over-all academic achievement. Also presented are the mean differences, standard error of the mean differences, the t values, and the levels of significance of the t values.

TABLE VIII  
STATISTICAL COMPARISON OF THE ACADEMIC ACHIEVEMENT  
OF THE EXPERIMENTAL AND CONTROL GROUPS OVER A  
FIVE-SEMESTER PERIOD

| Subject Area | Experimental Mean-grade Average | Control Mean-grade Average | Mean Difference | Error Mean Difference | <u>t</u> Value |
|--------------|---------------------------------|----------------------------|-----------------|-----------------------|----------------|
| English      | 2.5349                          | 2.3412                     | .1938           | .144                  | 1.346          |
| Mathematics  | 2.5468                          | 2.3362                     | .2102           | .125                  | 1.682          |
| Nat. Science | 2.5008                          | 2.3565                     | .1443           | .116                  | 1.244          |
| Soc. Science | 2.4678                          | 2.2364                     | .2314           | .089                  | 2.600*         |
| Over-all     | 2.5126                          | 2.3175                     | .1851           | .074                  | 2.501*         |

\*With 107 degrees of freedom significant beyond .05 level of significance.

The  $t$  value required for significance at the .05 level (107 d.f.) is 1.984. The analysis of the data revealed that the experimental group significantly exceeded the control group in academic achievement in social sciences and in over-all academic performance. The experimental group received higher grades than did the control group in English, mathematics, and natural sciences, but the difference was not statistically significant.

On the basis of these findings, the following hypotheses were rejected:

- C-4. There will be no significant difference between the academic achievement of the experimental group and that of the control group with respect to grades received in social science courses.
- F-1. There will be no significant difference between the academic achievement of the experimental group and the control group with respect to grades received in all academic courses.

Participants in the reading training program do achieve significantly better grades in the social sciences than do non-participants. They also achieve significantly better grades on an over-all basis than do non-participants.

The following hypotheses could not be rejected:

- C-1. There will be no significant difference between the academic achievement of the experimental group and that of the control group with respect to grades received in English courses.



C-2. There will be no significant difference between the academic achievement of the experimental group and that of the control group with respect to grades received in mathematics courses.

C-3. There will be no significant difference between the academic achievement of the experimental group and that of the control group with respect to grades received in natural science courses.

Although the experimental group exceeded the control group in academic performance in English, mathematics, and natural sciences, the difference in the academic performance of the two groups was not statistically significant.

Table IX is a presentation of the results obtained in a statistical comparison of the academic achievement of the experimental group in English, mathematics, natural sciences, and social sciences.

TABLE IX

ANALYSIS OF VARIANCE COMPARISON OF ACADEMIC ACHIEVEMENT  
IN ENGLISH, MATHEMATICS, NATURAL SCIENCES,  
AND SOCIAL SCIENCES  
(EXPERIMENTAL GROUP)

| Source of Variation | Degrees of Freedom | Sums of Squares | Mean Squares | F Value |
|---------------------|--------------------|-----------------|--------------|---------|
| Total               | 431.0              | 274.5318        |              |         |
| Students            | 107.0              | 172.8185        | 1.6151       |         |
| Subject Area        | 3.0                | 0.4124          | 0.1375       |         |
| Residual            | 321.0              | 101.3008        | 0.3156       | .4357   |

The  $F$  value required for significance at the .05 level (3,321 d.f.) is 8.53. This greatly exceeds the computed  $F$  value of .4357, revealing that no significant differences exist between the grade averages achieved in the four subject areas.

The experimental group did not achieve significantly better grades in one subject area than another. Therefore, the following hypotheses could not be rejected:

- D-1. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in mathematics and English.
- D-2. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in mathematics and social science.
- D-3. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in mathematics and natural science.
- D-4. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in English and social science.
- D-5. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in English and natural science.

D-6. There will be no significant difference in the academic achievement of the experimental group with respect to grades received in social science and natural sciences.

The greatest variance existed between achievement in mathematics and social science; but this variance was not statistically significant. Variance between the other subject areas was less than the variance between these two areas. However, social studies achievement appeared to be more affected by reading training than other subjects, as revealed by other statistical analyses made in the study.

Table X is a presentation of the results obtained in a statistical comparison of the academic achievement of the control group in English, mathematics, natural sciences, and social sciences.

TABLE X

ANALYSIS OF VARIANCE COMPARISON OF ACADEMIC ACHIEVEMENT  
IN ENGLISH, MATHEMATICS, NATURAL SCIENCES,  
AND SOCIAL SCIENCES  
(CONTROL GROUP)

| Source of Variation | Degrees of Freedom | Sums of Squares | Mean Squares | <u>F</u> Value |
|---------------------|--------------------|-----------------|--------------|----------------|
| Total               | 431.0              | 271.2022        |              |                |
| Students            | 107.0              | 162.9175        | 1.5226       |                |
| Subject Area        | 3.0                | 0.9742          | 0.3241       | .9695          |
| Residual            | 321.0              | 107.3123        | 0.3343       |                |

The  $F$  value required for significance at the .05 level (3,321 d.f.) is 8.53. This exceeds the computed  $F$  value of .9695. Thus, no significant differences existed between the grade averages achieved in the four subject areas.

The academic achievement of the control group did not significantly differ from one subject area to another. Therefore, the following hypotheses could not be rejected:

- E-1. There will be no significant difference in the academic achievement of the control group with respect to grades received in mathematics and English.
- E-2. There will be no significant difference in the academic achievement of the control group with respect to grades received in mathematics and social science.
- E-3. There will be no significant difference in the academic achievement of the control group with respect to grades received in mathematics and natural science.
- E-4. There will be no significant difference in the academic achievement of the control group with respect to grades received in English and social science.
- E-5. There will be no significant difference in the academic achievement of the control group with respect to grades received in English and social science.
- E-6. There will be no significant difference in the academic achievement of the control group with respect to grades received in social science and natural science.

### Summary

This chapter has presented a detailed account of the statistical analysis of the data for the investigation. The findings of the investigation were utilized in the determination of the rejection or non-rejection of the stated null hypotheses of the study. The results presented in Chapter IV will receive further consideration in Chapter V.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

The purpose of this chapter is to present a summary and discussion of the findings of the study, to make recommendations for additional research in the area involved in the investigation, and to present conclusions drawn from the results of the study.

This investigation was concerned with two primary areas: (1) the relationship of reading abilities to academic achievement in specific subject matter areas and (2) the retention of gains in reading skills over a prolonged period of time. Experimental and control groups were utilized in the conduction of the investigation.

The experimental group used in the study was composed of students who, as entering freshmen at the Oklahoma State University in the 1963 fall semester, participated in the Oklahoma State University Reading Improvement Program. The control group was composed of students who were entering freshmen at the Oklahoma State University in the 1963 fall semester, but did not receive any formal training in reading improvement. The two groups were equated on the basis of scholastic aptitude as measured by the American College Test, initial reading ability as measured by the Nelson-Denny Reading Test, and sex. Each group consisted of 108 members.

Data collected on the two groups consisted of academic grades in English, mathematics, natural science, social science, and standardized

reading test scores. Reading test scores obtained for the experimental group were pre-test scores (Nelson-Denny, Form A), post-test scores following completion of the reading program (Nelson-Denny, Form B), and retest scores following completion of the fifth semester of academic work (Nelson-Denny, Form A). Reading test scores obtained on the control group were pre-test and retest scores (Nelson-Denny, Form A).

The data were statistically tested to establish bases for rejection or non-rejection of the stated hypotheses of the study. The statistical methods used in the data analyses were: (1) a single classification analysis of variance and (2) a t test of mean differences.

The findings of the study that pertained to the retention of reading skills (Table V, Chapter IV) revealed that the experimental group not only retained gains in the areas of vocabulary, total score, and reading rate, but significantly improved them over a five-semester period of college work. Comprehension gains were retained but not significantly improved. The change (improvement) in vocabulary and total score was significant beyond the .01 level of confidence, while the change (improvement) in rate was significant beyond the .05 level of confidence. These findings are in general agreement with those reported by Ray (1962).

The findings of the study (Table VI, Chapter IV) that pertained to the change in reading ability of the control group revealed that college students who had not received formal reading training did significantly improve their reading skills in vocabulary, total score, and reading rate. The improvement in these areas was significant beyond the .01 level of confidence. A slight improvement occurred in comprehension skills but was not significant.

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report*

The results of this study revealed that the experimental and control groups both realized significant improvement in reading skills over a five-semester period of time, excepting the area of comprehension for the control group. The experimental group showed a significant gain in comprehension following training and retained this gain over a five-semester period, while the control group showed no significant change over the same period of time. A comparison of the difference of mean gains was made to determine if a significant difference existed in the degree of improvement realized by the two groups. The results of this comparison (Table VII, Chapter IV), revealed that the gains made by the experimental group in vocabulary, comprehension, total score, and reading rate significantly exceeded beyond the .01 level of confidence the gains realized by the control group in those areas.

Although the control group made significant gains in reading skills over a five-semester period of time, the gains made by the experimental group were much greater. Academic experience in a college setting and maturation may account for a part of these gains, but it would appear that formal reading training did significantly affect the reading abilities of those students who had received this training.

The results of the study that pertained to the academic achievement of the two groups (Table VIII, Chapter IV) revealed that the experimental group received better grades in all of the subject matter areas involved in the investigation. Significant differences were found in academic achievement in the social sciences and in over-all academic achievement. The differences between the two groups' achievement in these areas was significant beyond the .05 level of confidence. These findings are in agreement with most of the findings reported in the



review of the literature.

The experimental group's grades exceeded those of the control group in the areas of English, mathematics, and natural science, but the differences were not significant.

An analysis of variance comparison was made of the achievement of the experimental group (Table IX, Chapter IV) comparing the achievement of the group in the subject matter areas involved in the study. This comparison revealed that although differences in academic achievement did exist between subject areas for the group, the differences were not significant. A similar comparison was conducted for the control group (Table X, Chapter IV) and revealed that no significant differences existed between academic performance in the various subject matter areas.

These findings would seem to indicate that participation in the reading improvement program results in an improvement in the academic performance of the participants. A limitation that must be kept in mind in this interpretation is that it is not possible to determine or compare the motivation of the participants involved in this study. Students who have voluntarily attempted to improve their reading abilities might be more highly motivated academically than are students who have not made this effort.

Continued evaluation of a program should be promoted and the results of this study indicate a need for further research in the following areas:

1. Studies designed to investigate the relationship between reading skills and academic achievement at different ability levels.
2. Studies designed to examine the relationship existing

between reading skills and academic achievement in specific subjects in the college curriculum.

3. Studies designed to determine the relationship of reading skills to persistency of college students toward completion of degree requirements.
4. Studies designed to identify factors related to comprehension skills. This was the only reading skill that was not significantly improved by the experimental group after formal reading training and the only reading skill that was not significantly improved by the control group over a period of five semesters.
5. Studies designed to compare the academic performance of students who have participated in the reading improvement program to the academic performance of students who have indicated a desire to participate, but have not been able to do so. Motivation towards the improvement of reading skills may have a significant affect upon academic performance.
6. Studies designed to examine the effect of a varied emphasis of reading rate upon the other areas of reading skills. The Oklahoma State University Reading Improvement Program does not specifically emphasize rate of reading during the training program, but rate of reading does significantly improve, and is retained and improved following training. A varied emphasis upon the development of reading rate might significantly affect the other reading skills areas.

## Conclusions

Several conclusions were made from the analyses of the data.

First, participation in the reading improvement program resulted in a significant improvement in academic performance in social science and over-all academic achievement. Academic performance in English, mathematics and natural science improved, but the improvement was not significant.

Second, gains in reading skill in vocabulary, total score, and reading rate made in the reading improvement program were retained and significantly improved over a five-semester period of time. Gains made in comprehension were retained but were not significantly improved.

Third, students who did not receive formal reading training significantly improved their reading skills in vocabulary, total score, and reading rate over a five-semester period of time. Comprehension skills did not significantly change over a five-semester period of time for these students.

Fourth, academic achievement did not significantly differ between subject matter areas within either the control or experimental groups. Differences in achievement between subject matter areas were not significant.

Fifth, the subject matter area achievement most affected by the improvement of reading skills was social science. Academic achievement in social science showed significant improvement while academic achievement in English, mathematics, and natural science showed an improvement that was not significant.

The results revealed by this study appear to indicate that the

methods utilized in the Oklahoma State University Reading Improvement Program are successful in promoting the acquisition and retention of desirable reading skills. The findings also indicate that students who are successful in acquiring these skills tend to use them in an academically beneficial way.

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APPENDIX A

DISTRIBUTION OF A.C.T. COMPOSITE TEST SCORES FOR  
THE EXPERIMENTAL AND CONTROL GROUPS  
(USED FOR EQUATING PURPOSES)

TABLE A-I

DISTRIBUTION OF THE A.C.T. TEST COMPOSITE SCORES  
FOR THE EXPERIMENTAL AND CONTROL GROUPS

| Experimental Group |    |    |    | Control Group |    |    |    |
|--------------------|----|----|----|---------------|----|----|----|
| 25                 | 22 | 26 | 22 | 15            | 24 | 18 | 19 |
| 22                 | 25 | 16 | 12 | 24            | 28 | 28 | 27 |
| 20                 | 15 | 10 | 26 | 24            | 17 | 27 | 19 |
| 16                 | 14 | 30 | 19 | 26            | 18 | 21 | 26 |
| 26                 | 18 | 22 | 21 | 21            | 19 | 17 | 14 |
| 20                 | 21 | 19 | 16 | 13            | 21 | 21 | 27 |
| 17                 | 27 | 21 | 22 | 29            | 22 | 27 | 26 |
| 22                 | 25 | 20 | 29 | 25            | 25 | 25 | 27 |
| 19                 | 15 | 23 | 26 | 26            | 24 | 22 | 23 |
| 20                 | 21 | 23 | 24 | 28            | 18 | 20 | 21 |
| 21                 | 20 | 18 | 18 | 20            | 19 | 21 | 22 |
| 19                 | 18 | 18 | 16 | 19            | 21 | 21 | 20 |
| 20                 | 22 | 27 | 24 | 19            | 17 | 24 | 17 |
| 19                 | 24 | 25 | 19 | 23            | 18 | 20 | 17 |
| 29                 | 26 | 28 | 19 | 20            | 19 | 22 | 19 |
| 31                 | 18 | 09 | 19 | 22            | 21 | 20 | 21 |
| 22                 | 18 | 21 | 20 | 18            | 21 | 25 | 23 |
| 22                 | 24 | 27 | 22 | 19            | 13 | 14 | 14 |
| 24                 | 23 | 17 | 18 | 19            | 17 | 10 | 26 |
| 22                 | 23 | 24 | 27 | 21            | 22 | 21 | 17 |
| 20                 | 21 | 17 | 22 | 22            | 22 | 21 | 26 |
| 21                 | 19 | 24 | 27 | 21            | 24 | 21 | 19 |
| 22                 | 26 | 22 | 19 | 27            | 21 | 16 | 19 |
| 13                 | 20 | 20 | 29 | 25            | 22 | 24 | 23 |
| 18                 | 29 | 24 | 23 | 19            | 19 | 23 | 30 |
| 19                 | 18 | 19 | 18 | 20            | 20 | 19 | 26 |
| 20                 | 19 | 24 | 22 | 22            | 13 | 17 | 21 |

APPENDIX B

DISTRIBUTION OF THE NELSON-DENNY TEST TOTAL READING SCORES  
FOR THE EXPERIMENTAL AND CONTROL GROUPS  
(USED FOR EQUATING PURPOSES)

TABLE B-I

DISTRIBUTION OF THE NELSON-DENNY READING TEST TOTAL SCORES  
FOR THE EXPERIMENTAL AND CONTROL GROUPS

| Experimental Group |     |     |     | Control Group |     |     |     |
|--------------------|-----|-----|-----|---------------|-----|-----|-----|
| 112                | 94  | 100 | 94  | 63            | 46  | 110 | 113 |
| 75                 | 88  | 47  | 51  | 110           | 116 | 100 | 51  |
| 68                 | 57  | 54  | 92  | 102           | 50  | 58  | 69  |
| 58                 | 55  | 109 | 93  | 84            | 94  | 73  | 85  |
| 84                 | 54  | 86  | 90  | 66            | 48  | 43  | 51  |
| 91                 | 99  | 61  | 71  | 84            | 117 | 107 | 133 |
| 53                 | 106 | 67  | 71  | 129           | 100 | 79  | 58  |
| 120                | 118 | 68  | 133 | 90            | 108 | 93  | 96  |
| 69                 | 45  | 79  | 102 | 82            | 84  | 121 | 92  |
| 72                 | 72  | 105 | 77  | 122           | 110 | 107 | 83  |
| 67                 | 67  | 73  | 41  | 80            | 77  | 81  | 60  |
| 38                 | 74  | 65  | 56  | 88            | 82  | 89  | 61  |
| 59                 | 83  | 107 | 88  | 56            | 76  | 61  | 75  |
| 81                 | 91  | 71  | 56  | 59            | 95  | 71  | 70  |
| 103                | 99  | 68  | 35  | 53            | 93  | 59  | 66  |
| 113                | 49  | 41  | 66  | 81            | 65  | 73  | 78  |
| 97                 | 77  | 78  | 85  | 73            | 70  | 54  | 55  |
| 94                 | 85  | 89  | 73  | 29            | 26  | 53  | 42  |
| 61                 | 79  | 38  | 56  | 51            | 58  | 57  | 101 |
| 90                 | 102 | 82  | 77  | 64            | 77  | 69  | 39  |
| 67                 | 85  | 79  | 79  | 80            | 76  | 70  | 130 |
| 124                | 69  | 97  | 75  | 88            | 80  | 93  | 60  |
| 59                 | 95  | 68  | 86  | 76            | 82  | 59  | 53  |
| 45                 | 60  | 76  | 111 | 82            | 61  | 83  | 72  |
| 73                 | 120 | 102 | 90  | 65            | 64  | 78  | 125 |
| 68                 | 74  | 59  | 36  | 106           | 64  | 60  | 77  |
| 80                 | 62  | 61  | 85  | 85            | 44  | 66  | 66  |

APPENDIX C

STATISTICAL EQUATIONS USED  
IN THE ANALYSIS OF THE DATA

## STATISTICAL EQUATIONS

## Single Classification Analysis of Variance

$$S.S._{total} = \Sigma X^2 - \frac{(\Sigma X)^2}{N}$$

$$S.S._{groups} = \frac{(\Sigma X_1)^2 - (\Sigma X_2)^2 + \dots (\Sigma X_k) - \frac{(\Sigma X)^2}{N}}{k}$$

$$S.S._{within} = [S.S._t - S.S._g]$$

$$F = \frac{\text{Group Variance Estimate}}{\text{Within Variance Estimate}} \quad (\text{Wert, Neidl, and Ahmann})$$

t Test of Mean Differences

$$\underline{t} = \frac{X_1 - X_2}{X_D} \quad (\text{Balsley})$$



VITA

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