A STUDY OF RETENTION OF GAINS IN READING ACHIEVEMENT OF ADULTS IN THE OKLAHOMA CITY FEDERAL AERONAUTICS ADMINISTRA-TION'S EFFECTIVE READING PROGRAM

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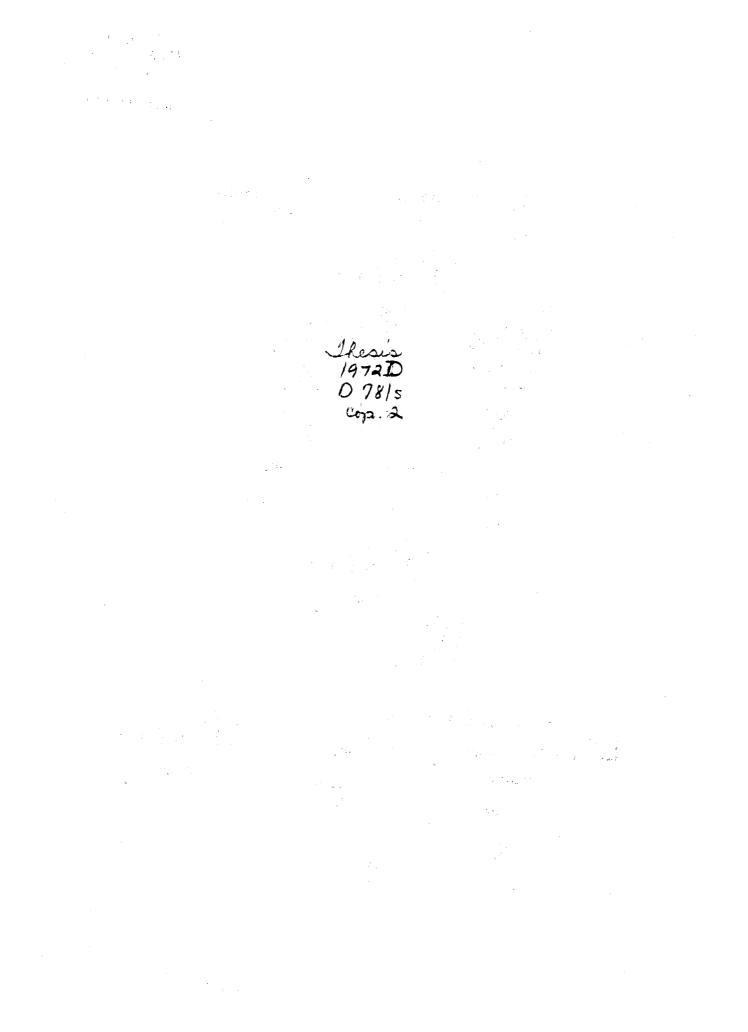
By

PAUL DAVID DRISKILL, JR.

Bachelor of Arts in Education East Central State College Ada, Oklahoma 1959

> Master of Arts Clarke College Dubuque, Iowa

Submitted to the Faculty of the Graduate College of Oklahoma State University in partial fulfillment of the requirements for the Degree of DOCTOR OF EDUCATION July, 1972



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Adviser Thesis Dean of the Graduate College

Thesis Approved:

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TABLE OF CONTENTS

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Chapter	,	Page
I	PRESENTATION OF THE PROBLEM	1
	Introduction	1 2 5 6 8
	Scope of the Study	8 9 10
	Organization of the Study	11
II.	REVIEW OF THE LITERATURE	12
	Introduction	12
	Organizations Resulting From Non-School Adult Reading Improvement Programs	12
	Reading Improvement Programs	16 17
III,	PERSONNEL AND PROCEDURES	20
	Introduction	20 20 22 24 25 27
IV.	TREATMENT OF DATA AND ANALYSIS OF RESULTS	29
	Introduction	29 20
	From the Effective Reading Improvement Program The Retention of Gains of All Reading Groups Result-	30
	ing From the Effective Reading Improvement Program The Incremental Gains of All Reading Groups Result- ing From the Effective Reading Improvement Program	3 4 40

·

TABLE OF CONTENTS (Continued)

hapter	Page
Summary	44
V. SUMMARY AND CONCLUSIONS	48
General Summary of the Investigations	48
Summary of Results	49
Concluding Statement	52
ELECTED BIBLIOGRAPHY	53
PPENDIX: DISTRIBUTION OF PRE-TEST, POST-ONE TEST, AND POST-	
TWO TEST RAW SCORES ON THE NELSON-DENNY READING TEST OF THE	
EFFECTIVE READING CLASSES	55

•

,

LIST OF TABLES

Table		Page
I,	Distribution of Effective Reading Groups by FAA Division and Scheduled Class Time	23
II,	Reading Gains as Shown by Comparisons of Means of Pre-Test and Post-One Test Scores on the Nelson-Denny Vocabulary Subtest	30
III.	Reading Gains as Shown by Comparisons of Means of Pre-Test and Post-One Test Scores on the Nelson-Denny Comprehen- sion Subtest	31
IV,	Reading Gains as Shown by Comparisons of Means of Pre-Test and Post-One Test Scores on the Nelson-Denny Total Score Scores	32
V,	Reading Gains as Shown by Comparisons of Means of Pre-Test and Post-One Test Scores on the Nelson-Denny Rate Sub- test	33
VI.	Retention of Reading Gains as Shown by Comparisons of Means of Post-One Test and Post-Two Test Scores on the Nelson-Denny Vocabulary Subtest	34
VII.	Retention of Reading Gains as Shown by Comparisons of Means of Post-One Test and Post-Two Test Scores on the Nelson-Denny Comprehension Subtest	36
VIII.	Retention of Reading Gains as Shown by Comparisons of Means of Post-One Test and Post-Two Test Scores on the Nelson-Denny Total Score Scores	37
IX.	Retention of Reading Gains as Shown by Comparisons of Means of Post-One Test and Post-Two Test Scores on the Nelson-Denny Rate Subtest	39
Х,	Reading Increment Gains as Shown by Comparisons of Means of Pre-Test and Post-Two Test Scores on the Nelson-Denny Vocabulary Subtest	40
XI.	Reading Increment Gains as Shown by Comparisons of Means of Pre-Test and Post-Two Test Scores on the Nelson-Denny Comprehension Subtest	41

LIST OF TABLES (Continued)

Table		Page
XII.	Reading Increment Gains as Shown by Comparisons of Means of Pre-Test and Post-Two Test Scores on the Nelson-Denny Total Score Scores	42 [.]
XIII.	Reading Increment Gains as Shown by Comparisons of Means of Pre-Test and Post-Two Test Scores on the Nelson-Denny Rate Subtest	43

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CHAPTER I

PRESENTATION OF THE PROBLEM

Introduction

Will a program of instruction designed to teach efficient reading effectively change the reading ability of non-school adults? If there is reading change, will the change be retained beyond termination of the program? Do skills attained within a reading program continue to increase? This study will try to answer these questions by examining the change in test performance by non-school adults who completed the Effective Reading programs offered by the Federal Aeronautics Administration to its employees. Two overriding factors prompt federally oriented agencies to offer effective reading programs. (1) The incidental reading workloads are more than some employees have time to accomplish and still effectively do the job they are hired to do. (2) Some jobs require additional reading essential to keeping current within the field. An employee's effectiveness is reduced when he can't accomplish the additional reading during his work hours.

The Effective Reading program of the Oklahoma City, Oklahoma, Federal Aeronautics Administration Center is a continuing service of the Training Branch of the agency. It has been offered for several years and has been staffed continuously by members of the Oklahoma State University Reading Center through the Oklahoma State University Extension Service. So far no evaluation of the reading service provided by

Oklahoma State University has been made for the recipients of the service. The proposed evaluation should help identify strengths and weaknesses of the program, and should strengthen professional ties between the two institutions.

Statement of the Problem

The study proposes to evaluate the immediate and lasting effects of reading development of non-school adults in a course of reading improvement offered to employees of the FAA by the Oklahoma State University Reading Center through the Oklahoma State University Extension Service and under the direction of the FAA Training Branch.

Three main questions will be asked. The first question considers reading gains. On tests designed to measure vocabulary, comprehension, rate and total reading ability, do immediate reading gains accrue to non-school adults who are enrolled in a reading improvement program? The second question deals with retaining the reading gains. If immediate reading gains do accrue, are these reading gains retained by non-school adults over differential time laspe intervals? The third question considers incremental gains of the separate reading groups. Do incremental reading gains accrue to non-school adults over differential time lapse intervals?

The first question will be asked of each of the six different classes of reading improvement of the study. On tests designed to measure vocabulary, comprehension, rate and total reading ability, do immediate reading gains accrue to non-school adults who are enrolled in each class of a reading improvement program? To answer the question, sub-questions to be answered are, in null hypotheses form: 1. There is no significant difference between the mean pre-test and mean post-one test vocabulary scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

2. There is no significant difference between the mean pre-test and mean post-one test comprehension scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

3. There is no significant difference between the mean pre-test and mean post-one test total score scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five, and Reading Group Six.

4. There is no significant difference between the mean pre-test and mean post-one test rate scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

The second question will be asked of each of the six different classes of reading improvement of the study. On tests designed to measwre vocabulary, comprehension, rate and total reading ability, if immediate reading gains do accrue to non-school adults who are enrolled in each class of a reading improvement program, are the immediate reading gains retained over differential time lapse intervals? To answer the question, sub-questions to be answered are, in null hypotheses form:

1. There is no significant difference of means in retention of gains between the mean post-one test vocabulary scores and the mean post-two test vocabulary scores for Reading Group One, Reading Group

Two, Reading Group Three, Reading Group Four, Reading Group Five, and Reading Group Six.

2. There is no significant difference of means in retention of gains between the mean post-one test comprehension scores and the mean post-two test comprehension scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

3. There is no significant difference of means in retention of gains between the mean post-one test total score scores and the mean post-two test total score scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

4. There is no significant difference of means in retention of gains between the mean post-one test rate scores and the mean post-two test rate scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

The third question will be asked of each of the six different classes of reading improvement of the study. On tests designed to measure vocabulary, comprehension, rate and total reading ability, do incremental reading gains accrue over differential time lapse intervals to non-school adults in each class of a reading improvement program? To answer the question, sub-questions to be answered are, in null hypotheses form;

1. There is no significant incremental gain difference between the mean pre-test vocabulary scores and the mean post-two test vocabulary scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

2. There is no significant incremental gain difference wetween the mean pre-test comprehension scores and the mean post-two test comprehension scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

3. There is no significant incremental gain difference between the mean pre-test total score scores and the mean post-two test total score scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

4. There is no significant incremental gain difference between the mean pre-test rate scores and the mean post-two test rate scores for Reading Group One, Reading Group Two, Reading Group Three, Reading Group Four, Reading Group Five and Reading Group Six.

Need for the Study

It was shown by Ray (1962) that American colleges and universities were slow in recognizing the need for reading instruction beyond the elementary and secondary levels. Since then, however, reading instruction offered to adults has accelerated within the college and university setting. Similarly, however, American colleges and universities have been slow in offering reading instruction to institutions outside the college and university setting, Berger (1969).

Since the inclusion of reading has been established within the college and university setting, the colleges and universities could extend their professional knowhow to the reading instruction of non-school adults.

The Oklahoma State University Reading Center for some time through the Oklahoma State University Extension Division has provided reading improvement services to the non-school adult community. Yet, no comprehensive evaluations as to the benefits accruing to the participating agencies have been attempted. The sponsoring institutions have had to be content with subjective evaluations of the instructor. Subjective evaluations such as ". . . all the students did a good job" may be adequate for the particular moment, but that is not empirical nor does it give any indication of the long-term benefits that may accrue to the sponsoring institutions. There is a need for a more objective appraisal than "They all did a good job."

It is proposed by the researcher that there be an empirical study to evaluate any reading skills, the retention of any reading skills, and the continued increase of any reading skills gained by students of Effective Reading courses at the Federal Aeronautics Administration Center of Oklahoma City during the several reading courses offered over a period of 19 months.

Definitions of Terms

<u>Class</u>: Any group of students assigned to an Effective Reading program within a six-week period.

<u>Completion of Course</u>: For purposes of the study, only those students that completed seven or more of the twelve scheduled sessions and those students who took the post-one test of the appropriate <u>Nelson</u>-Denny Reading Test were considered to have completed the course.

<u>Course</u>: The completed program of study presented by the instructor from the Oklahoma State University Reading Center,

Exertest: The initial <u>Melson-Denny Reading Test</u> administered at the beginning of each Effective Reading course.

<u>Post-one test</u>: The <u>Nelson-Denny Reading Test</u> administered at the finish of each Effective Reading course. The symbol <u>P1</u> will be used to designate the test.

<u>Post-two test</u>: The <u>Nelson-Denny Reading Test</u> administered as the retest for all subjects after the differential time lapses of each reading group. The same form of the <u>Nelson-Denny Reading Test</u> was used for post-two test as was used for the pre-test. The symbol P2 will be used to designate the test.

<u>Reading Group One</u>: This term refers to the class that met from September 29, 1970 to November 4, 1970. It will be designated Group 1.

<u>Reading Group Two</u>: This term refers to the class that met from November 13, 1970 to December 21, 1970. It will be designated Group 2. <u>Reading Group Three</u>: This term refers to the class that met from February 1, 1971 to March 15, 1971. It will be designated Group 3.

<u>Reading Group Four</u>: This term refers to the class that met from April 12, 1971 to May 19, 1971. It will be designated Group 4.

<u>Reading Group Five</u>: This term refers to the class that met from September 20, 1971 to November 10, 1971. It will be designated Group 5.

<u>Reading Group Six</u>: This term refers to the class that met from January 24, 1972 to March 6, 1972. It will be designated Group 6.

<u>Effective Reading</u>: The name of the reading improvement course offered by the Federal Aeronautics Administration to its employees.

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<u>Federal Aeronautics Administration</u>: The Center at Oklahoma City, Oklahoma, that is charged with the care and administration of air travel under the United States Department of Transportation. The abbreviation FAA will be used to designate the Center.

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<u>Gains</u>: Gains refers to any reading changes in vocabulary, comprehension, total score and rate of reading made during the Effective Reading course, and the gains will be measured by the mean difference between the pre-test <u>Nelson-Denny Reading Test</u> and the post-one <u>Nelson-Denny Reading Test</u>.

<u>Retention of Gains</u>: Retention of gains refers to the measured performance on the reading test of the student after a period of time has elapsed since completion of the course, and is determined by comparing mean differences of the post-one <u>Nelson-Denny Reading Test</u> and the post-two <u>Nelson-Denny Reading Test</u>.

<u>Incremental Gains</u>: Incremental gains refers to any reading changes in vocabulary, comprehension, total score and rate of reading made during and after the Effective Reading course, and the incremental gains will be measured by the mean difference between the pre-test and the post-two Nelson-Denny Reading Test.

Delimitations

Scope of the Study

This study will analyze the results of reading tests of six different classes of Effective Reading instruction at the FAA Center, Oklahoma City, Oklahoma. Each class had twelve two-hour sessions over a period of six consecutive weeks, for a total of 24 hours of reading instruction. The class sessions were held at the FAA Center from 1:30 p.m. to 3:30 p.m. on Mondays and Wednesdays.

This study, further, will analyze the reading gains as measured by the post-one <u>Nelson-Denny Reading Test</u> at the end of the reading course. In addition, a comparison of the post-one test and the post-two test results will be made to determine any retention of gains. The same form of the <u>Nelson-Denny Reading Test</u> was used by each subject for the posttwo test as was used for the pre-test.

The study also will analyze the incremental reading gains as determined by comparing initial results of the subtests of the <u>Nelson</u>-<u>Denny Reading Test</u> pre-test to the final results of the subtests of the <u>Nelson-Denny Reading Test</u> post-two test.

The students within each session were assigned at the request of the individual's supervisor and the Training Branch of the FAA. No more than twenty-five students initially were assigned to any class.

The number of students that successfully completed the reading course and that still are employed at the FAA Center are those who were administered the post-two <u>Nelson-Denny Reading Test</u>, with the exception of those students whose duties prevented their taking the post-two test. The post-two test was given in three separate sessions: on Monday 17, Wednesday 19, and Friday 21 of April, 1972. The post-two test was administered at the FAA facility in Oklahoma City.

Limitations of the Study

This study did not attempt to control the students that were enrolled in each class. The Training Branch personnel selected and assigned enrollees to the Effective Reading Classes as requests were made by division chiefs. Any employee of the FAA Center was eligible for the Effective Reading classes. However, the enrollees met one or more of these general requirements set by the Training Branch as Standards for Selection: 1. Any employee whose job requires more essential reading than he has time for; 2. Any employee with a reading

problem; 3. Anyone whose reading workload is four hours or more per day and who desires to improve his reading efficiency.

The objectives of the Effective Reading course were established by the FAA Training Branch. The objectives were (1) to develop greater versatility so that employees could read effectively for a wide variety of purposes; (2) to improve the level and speed of reading comprehension in informational reading, study reading, and scanning. The methods and the materials used to accomplish these objectives were left to the option of the instructor.

Those who did not take the post-one test were dropped from consideration in the study. Three of those students who finished the course of study were not available to take the post-one test. The gains that each class made were established statistically after the post-one test adjustments had been made.

Assumptions

1. The reading test (<u>Nelson-Denny Reading Test</u>, Form A) used in the Effective Reading testing is a reliable and valid measurement of the reading ability of the students enrolled in the course.

2. The reading test (<u>Nelson-Denny Reading Test</u>, <u>Form B</u>) used in the Effective Reading testing is a reliable and valid measurement of the reading ability of the students enrolled in the course.

3. The reading test form used for the post-two test (forms of the Nelson-Denny Reading Test appropriate to the group tested) is a reliable and valid measure of reading performance and therefore can be used to determine significance of retention of gains.

4. The sample of students within the Effective Reading classes is representative of employees of the FAA Center who need to improve the effectiveness of their reading and can be used in the evaluation of the Effective Reading program.

Organization of the Study

Chapter I has given an introduction to the problem to be studied. It has included the need for the study, the statement of the problem, the delimitations of the study, and the definition of terms used in the study along with the assumptions made on the study.

Chapter II will present a review of the literature as it pertains to the hypotheses being tested.

Chapter III will describe the population used, the program being evaluated, the tests used to measure reading achievement, and the statistical methods used to test the significance of any change in reading performance.

Chapter IV will contain a statistical analysis of the data. This chapter will indicate the degree to which the hypotheses are found to be correct within recognized limitations.

Chapter V will present a discussion of the results of this study and will include recommendations regarding future studies in this area.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The review of the literature of the study is limited to research designed to report the resulting immediate and retained gains of non-school reading improvement endeavors. These program areas will be considered.

(1) Those non-school adult reading improvement programs that report immediate gains and that are operated by government and industrial organization for the benefit of the specific members.

(2) Those non-school adult reading improvement programs that report retained gains and that are operated by government and industrial organizations for the benefit of their specific members.

> The Immediate Gains Among Government and Industrial Organizations Resulting From Non-School Adult Reading Improvement Programs

Many studies have been reported in the literature concerning immediate reading gains to adults within the college or university setting. However, relatively few studies have dealt with adult reading improvement outside educational institutions; that is, within governmental and industrial institutions.

Holmes (1953) reported on a program where 15 executives of the Standard Oil Company of Ohio participated in a 12-week reading program. The sessions ran 1¹/₂ hours once a week. Standardized improvement was measured by <u>The Speed of Comprehension Test</u>, Part I of the <u>Van Wagenen</u>-<u>Dvorak Diagnostic Examination of Silent Reading Abilities</u>, and by both forms of the <u>Minnesota Speed of Reading Test</u> by Eurich.

The mean reading rate gain was 160 words per minute, from 198 to 358 words per minute. The null hypothesis to test the significance of the gain was the population mean difference is really zero and therefore observed difference of 160 is due to chance fluctuations in sampling. For 11 degrees of freedom, the <u>t</u> value was 4.60, which rejected the null hypothesis, exceeding the .01 level of confidence.

Cardwell (1955) reported on the reading improvement of a group of men from Lynchburg Foundry in Radford, Virginia. After pre-testing, a 24 hour reading improvement program was given. The pre-test mean rate was 297 words per minute. The post-test mean rate was 417 words per minute, a mean increase of 220 words per minute. The pre-test mean comprehension was 70 percent. The post-test mean comprehension was 88.75 percent, a mean increase of 18.75 percent. Both reading rate gains and comprehension gains were significant at the .01 level of confidence.

Thompson (1956) reported a study on two different methods of teaching reading improvement. At the Air Command and Staff School, Air University, 438 officers were placed randomly and equally in two experimental groups and one control group. The experimental groups met for one hour, three times a week, for seven weeks. Both methods showed that each experimental condition produced significant gains at the .01 level of confidence for rate, but that comprehension gains were not

significant for either group. The control group did not meet, but was tested on the pre-test and the post-test with the experimental group. The control group had no significant gains.

Witty, Stolarz, and Cooper (1959) reported on a study where 24 men in a Traffic Police Administration Training Program at Northwestern University were given reading instruction. Classes met for a two-hour period each week for six weeks. Gains were evaluated by pre-testing with <u>Form Am</u> of the <u>Iowa Silent Reading Test</u>, and either <u>Form Cm</u> or <u>Dm</u> was the post-test. A mean rate increase of 15 standard-score points was achieved on the <u>Iowa Tests</u> which was significant at the .01 level of confidence. The greatest gain was in rate of reading with "some" gain in comprehension. ". . . despite increased speed, the fact that these men improved their scores in comprehension indicates that they probably made general improvement."

Carrillo (1959) reported a study in which 15 adults attended evening classes at Long Beach City College. One evening a week for one semester a two-hour course was offered. Educational background of the subjects varied from third grade through two years of college. Occupations represented were minister, professional boxer, aircraft plant supervisor, butcher, secretary, and housewife. No selection was attempted previous to the course, and all who indicated interest were accepted. Four members could not read, these were treated separately. The median reading level of the remainder of the group was 9.0 according to the norms of the test. The pre-test was the <u>lowa Silent</u> <u>Reading Test</u>, <u>Advanced</u>, <u>Form Am</u>; the post-test was the <u>lowa Silent</u> Reading Test, Advanced, Form Cm. Fifteen of the total group present during most of the semester took both the pre-test and the post-test.

The adults improved in mean standard scores as follows: Word Meaning, 171.33 to 191.73; Comprehension, 165.33 to 180.13, and Rate, 167.07 to 209.33. The improvement was statistically significant at .01 for Word Meaning; at .05 for Comprehension, and at .01 for Rate.

A series of Air Force classes covered in a study by Brim (1968) showed rate gains significant at the .01 level of confidence, with no significant comprehension losses when using a combination of teaching methods. The purpose of the program was to influence reading speed and comprehension.

The program was made of 26 one-hour sessions using a specially designed projector. Twelve separate groups of 16 subjects each were used over a period of one year. The evaluation of the program was made during the second year the reading program was presented. The subjects were primarily Air Force retrainees, though some permanent personnel were included. Pre-test and post-test scores were used from the Perceptual Development Laboratories' battery of tests consisting of 2000-word articles followed by 10-item multiple choice tests. The results reported were based on total words read per minute, percentage of words comprehended per minute, and total words read and comprehended per minute.

Each of the 12 groups showed a significant gain in rate significant at the .01 level of confidence, ($\underline{t} = .01$ level) without a significant loss of comprehension. Comprehension was based on the percent of words comprehended of the total number read per minute. The magnitude of increase in reading comprehension from pre-test to post-test appeared to be fairly constant, suggesting that groups with low initial achievement gained at a rate consistent with groups with high initial achievement.

Harden, Bray, Ford (1969) reported on a study of a reading program for managers in the Quaker Oat Company. Reading rate increased significant at the .01 level, while comprehension remained the same. The mean gain for reading rate was 268 words per minute. The control group showed a decrease in the reading rate, but some increase in comprehension. The writers thought that comprehension increased for the control group because of practice effect from the pre-test to the post-test while nothing happened in the 12-week interim to contaminate it.

> The Retained Gains Among Government and Industrial Organizations Resulting From Non-School Adult Reading Improvement Programs

Potter (1954) reported on a study conducted at the U.S. Naval Academy. An experimental group and a control group of 161 students each were selected. Using the United States Naval Academy norms, all students in both groups had rate of reading scores below the 40th percentile. Their vocabulary score was at least at the 50th percentile, and their comprehension was at least at the 30th percentile on the <u>Diagnostic Reading Tests</u>. The groups were comparable in regard to rate of reading, but the experimental group had significantly higher vocabulary and comprehension scores. Twenty periods of training were given the experimental group. Parallel forms of the <u>Survey Section</u> of the <u>Diagnostic Reading Tests</u> were given to both groups immediately after training and again five months later. Gains in reading rate by the experimental group during training were significantly greater than those gains mide by the control group. Five months later, the experimental group still read at a significantly greater rate. The pre-test, posttest, and retest rate of reading scores of the experimental group were 261.5, 430.9, and 370 words per minute. For the control group, the corresponding scores were 261.5, 323.1, and 281 words per minute.

Kallen and Kyser (1956) in a report of the Bureau of Ships, Navy Department, reported on a 28-hour, seven-week course of reading improvement for Navy officers and civilians. Pre-tests were given to 87 subjects at the beginning of the training sessions, at the end of the training sessions, and one after the sessions were ended. The Robinson-Hall Silent Reading History Test was given to 73, while 14 took a Science Research Associates reading test as the post-test. A control group received no reading training, but were pre-tested then post-tested one year later. Results reported were: the training group increased from 230.56 words per minute to 322.36 words per minute, a gain of 91.79 words per minute, significant at the .01 level of confidence. One year later the training group had retained much of the gain, 296.34 words per minute, a retained increase of 65.78 words per minute. On comprehension there was no significant change. The control group did not achieve a significant increase in reading speed, either at the end of the course or one year later. The authors concluded that both service and civilian personnel may benefit about equally in a course of reading improvement.

Summary

This chapter has been a review of the literature pertaining to immediate reading gains as the result of having been in a reading improvement program, and a review of the literature pertaining to

retention of reading gains over a period of lapsed time after the termination of reading programs.

There were seven studies cited that dealt with immediate reading gains. Reading rate gains in all seven studies were significant at .01 level of confidence. One of these studies mentioned that reading rate gains continued to increase beyond the termination of the reading program. Comprehension gains for two of these seven studies were significant, one at the .05 level of confidence and one at the .01 level of confidence. One study reported comprehension gains as "not significant," one reported comprehension gains as the "same," one reported comprehension gains "some" and another said comprehension showed "no significant loss."

Only one study of immediate gains reported any vocabulary results. It indicated that vocabulary gains were significant at the .01 level of confidence.

All seven immediate gains studies indicated that rate of reading improved. Comprehension improved or was maintained in six studies, and only one study reported that vocabulary increased.

From these results it would appear that rate of reading is the easiest to improve of the three reading skills mentioned. When comprehension was included in a study, the comprehension gains seemed to be consistent. In these studies reported, vocabulary appeared to be the most resistent to immediate change.

Two of the studies cited dealt with retention of reading gains. One study reported that reading rate was significantly higher for the experimental group than for the control group at the termination of the reading program, and after the lapse of five months, the reading rate

showed retention of gains still significantly greater than the reading rate of the control group. One other study reported that reading rate gains were significant at the .01 level of confidence. After one year's lapsed time, there was good retention of the rate gains, but the gain above the initial rate was no longer statistically significant. Comprehension level was not reported for the initial testing, but one year later, while testing for retention of gains, comprehension was reported as having made "no significant change."

From these two studies of results of retention of reading skill gains, it appears that reading rate gains are the most tenacious of the reading skills reported. Both the studies showed significant gains in reading rate, and both the studies showed a degree of retention of those gains. In the one study that reported on retention of gains for comprehension, those gains showed a degree of permanency.

CHAPTER III

PERSONNEL AND PROCEDURES

Introduction

This chapter will describe the Effective Reading program at the Federal Aeronautics Administration Center at Oklahoma City, Oklahoma. Further, it will describe the population of the study, the tests used to measure reading performance and the statistical methods used to test the significance of any change in reading performance.

The Effective Reading Program

The Effective Reading program at the Federal Aeronautics Administration Center in Oklahoma City consists of 24 clock hours of testing and instruction.

Twelve two-hour sessions were conducted on Monday and Wednesday afternoons from 1:30 to 3:30. Approximately one hour of the first session was used to orient the students to the emphases of the program and to acquaint students with the individual bookkeeping of the course. One hour was used for the administration of the <u>Nelson-Denny Reading</u> <u>Test</u> for placement of individual readers. One hour was used during the last session to recapitulate the session's emphases and one hour was used to administer the <u>Nelson-Denny Reading Test</u> for the purpose of evaluating progress.

During the first hour of the first session, the instructor requested that subjects bring a representative sample of the kinds of reading that they were required to read in the position they held at the FAA Center. The instructor grouped similar kinds of reading material together and during the last hour of the third session he held conferences with subjects who had similar reading material. Within the conferences an attempt was made to ascertain each individual's reading load and level of reading difficulty. Suggestions were made to the individual subject that might help lighten his reading load.

The first hour of the second session was used to explain results of the <u>Nelson-Denny Reading Test</u> to the subjects. Suggestions were made by the instructor of ways the individual subject would benefit most from the program according to test results. Vocabulary building and comprehension materials were displayed and the uses were explained.

Relative to the set purposes of the courses, as given in Chapter I, the Effective Reading program was designed to develop versatility and to improve the level and speed of comprehension in informational reading, study reading, and scanning. Material aids to implement the program were:

A. The <u>Controlled Reader</u> which projects an image of material to be read on a screen and can be pre-set for the desired speed for pacing.

B. Science Research Associates <u>College Reading Program One</u> material was used to practice reading skills that were learned during the Controlled Reader sessions.

C. Vocabulary building and comprehension books from the Oklahoma State University Reading Center were used by the subjects on a voluntary check-out basis.

i

The primary emphasis of the program, commensurate with the purposes of the program, was improvement of the subject's rate of reading, while the initial comprehension level was maintained or improved. The SQ3R technique described by Robinson (1962) was explained in lecture sessions and the technique was used during the reading sessions.

The Population

Twenty to 25 enrollees were in each class. There was an initial total of 135 enrollees in the six sections, and a total of 131 finished the courses.

In rescheduling for administration of the post-two test, 114 were scheduled to take the test. Seventeen others who finished the courses were not rescheduled to take the post-two test. Reasons for their not being rescheduled to take the post-two test were varied, but mostly attrition and transferrals were the factors. Immediate business prevented 20 who had been rescheduled from taking the post-two test. A total of 94 was tested on the post-two test, (see Table I).

The population for the six groups of the study was selected by the Training Branch directors during the course of the 19 months as the reading classes were scheduled. The groups were composed of the following.

<u>Immediate Gains</u>: Table I shows the composition of the combined groups according to the FAA division in which the subjects work. The individual groups will be considered separately in determining each group's immediate gains (Pre-P1).

<u>Retention of Gains</u>: Table I shows, concurrently, the composition of the combined groups as considered for retention of gains and

					1 	· · ·	
Scheduled Class Time	Group 1 9-29-70 11- 4-70 21.5*	Group 2 11-13-70 12-21-70 22.3*	Group 3 2- 1-71 3-15-71 19.6*	Group 4 4-12-71 5-19-71 22.7*	Group 5 9-20-71 11-10-71 21.8*	Group 6 1-24-72 3- 6-72 23.1*	
FAA Division		<u></u>		<u></u>			Total
Operations Staff			-			1	1
Accounting	3	2	4	4	5	1	19
Plant Engineering	1	1	1	1		2	6
Medical	3	1	1	1	1, ,	2	9
Flight Standards Technical	3	1	3	2	4	1	14
Data Services		1				1 .	2
FAA Depot	2		1	1	1	1	6
Procurement		1	1	1	1		4
Aircraft Services Base	2	2	3	2	5	4	18
FAA Academy	2	2	1	3	2	3	13
U.S. Coast Guard				_2			_2
Totals	16	11	15	17	19	16	94

DISTRIBUTION OF EFFECTIVE READING GROUPS BY FAA DIVISION AND SCHEDULED CLASS TEME

TABLE I

* Average Clock Hours

incremental gains. The individual groups will be considered separately in determining each group's retention gains and incremental gains (retention, P1-P2; incremental, Pre-P2).

Instrument Used in Study

The <u>Nelson-Denny Reading Test</u> (Form <u>A</u> and <u>Form B</u>), was used in this study for the following reasons: (1) it is the measuring device used with students in the Oklahoma State University Reading Improvement Program, (2) the tests were standardized using a large sample, and (3) the total correlation for these tests is .92 which signifies a high reliability between <u>Form A</u> and <u>Form B</u> of the test.

The <u>Nelson-Denny Reading Test</u> was revised by James I. Brown, University of Minnesota, and was published in 1960 by Houghton Mifflin Company. The test consists of 100 vocabulary items, 36 comprehension items with one longer passage designed to measure rate of reading.

The normative population of the revised form of the <u>Nelson-Denny</u> <u>Reading Test</u> included a total of 7497 subjects in grades 13, 14, 15 and 16 who were enrolled in Junior Colleges, Universities, Liberal Arts Colleges, Technical Schools, and State Teachers Colleges selected from all sections of the United States.

The mean validity index for Form A is 47.5 and for Form B is 47.4. Garrett (1958) states that ". . . items with validity indices of .20 or more are regarded as satisfactory." In Form A (revised) and Form B (revised) all items with validity indices below .31 were discarded.

To measure the consistency, or reliability, of the <u>Nelson-Denny</u> <u>Reading Test</u> the equivalent form method was used. This is particularly appropriate since this test utilizes speed as a factor. The reliability coefficient for vocabulary is .93, for comprehension .81, for total .92, for rate (initial) .93, and for rate (after training) .82. These reliability coefficients are sufficiently high to indicate a rather high reliability between the revised forms of the <u>Nelson-Denny Reading</u> Test.

Form A of the <u>Nelson-Denny Reading Test</u> was administered to four of the sample populations before training to determine the initial performance level, and <u>Form B</u> was administered to two of the sample populations before training to determine the initial performance level. Alternate forms were administered to the sample populations after training to measure growth in reading performance. The test form initially used as the pre-test was administered to the sample population as the post-two test. Results of the post-two test were used to measure residual effects of the course after lapsed time of 19, 17, 15, 12, seven and three months after completion of the course.

Statistical Design

The statistical method selected for testing the significance of the change in reading performance was the <u>t</u> test of difference between means of two correlated samples.

The data collected for this study was from a representative sample of adult employees working at the FAA Center in Oklahoma City. The method of selection of the subjects for the Effective Reading course from all divisions within the FAA Center allows randomness within the limitations of the population from which the sample was drawn.

The <u>t</u> test used in the study to test the hypotheses dealing with immediate gains, retained gains, and incremental gains is the test described by Tate (1965), Runyon and Haber (1967) and Bruning and Kintz

(1968) as the <u>t</u> test of difference between means of two correlated samples, and was calculated using the following formula:

$$t = \frac{\overline{x} - \overline{y}}{\sqrt{\frac{\Sigma D^2 - \frac{(\Sigma D)^2}{N}}{N(N-1)}}}$$

in which D is the difference score between each X and Y pair, $\bar{X} - \bar{Y}$ is the mean difference, ΣD^2 is the sum of the differences squared, $(\Sigma D)^2$ is the sum of the difference squared, and N is the number of pairs of scores.

Using this formula it is unnecessary to test for homogeneity of variance, since, as stated by Tate (1965), "The only assumption needed to validate the procedure is that the sample of differences is randomly taken from a normal population of differences."

Out of comparisons of 72 pairs of scores to find the F ratio to determine homogeneity of variance, only four comparisons were found to be significant. Therefore, in a great majority of comparisons, homogeneity of variances was obtained. One of the assumptions for the use of the <u>t</u> distributions is "Both samples are drawn from populations whose variances are equal, . . . referred to as homogeneity of variance." The cases where homogeneity of variances were not found probably will not affect greatly any interpretations made. ". . . failure to find homogeneity of variance will probably not seriously affect our interpretations." "If anything, a significant difference in variances . . . has lowered the likelihood of rejecting the null hypothesis," (Runyon and Haber). Raw score data was used for all portions of the study. The computations were based on the distribution of differences of performance between the pre-test, the post-one test, and the post-two test.

The <u>t</u> test of correlated means was used to test the hypotheses dealing with immediate gains, the retained gains, and the incremental gains of the several groups.

Summary

This chapter has described the Effective Reading program presented by the Federal Aeronautics Administration Center of Oklahoma City and staffed by the Oklahoma State University Reading Center through the services of the Oklahoma State University Extension Service. It has described the sample selected for the study, the tests used to measure reading performance and the statistical methods used to test the significance of any change in reading performance.

The sample was made up of non-school adults working for a civilian governmental installation and represents a cross-section selection of the personnel. Almost 63 percent of the subjects who initially were pre-tested on the <u>Nelson-Denny Reading Test</u> also were retested with the post-two administration of the <u>Nelson-Denny Reading Test</u>. A mean of 21.6 clock hours of a possible 24 was registered by each reading group's members who took the post-two test.

The measuring instrument was the revised <u>Nelson-Denny Reading Test</u> (Form <u>A</u> and <u>Form B</u>), which was chosen because (1) it is the measuring instrument used in the Oklahoma State University College Reading Improvement Program for College Students and Other Adults, (2) the tests were standardized using a large sample, and (3) the total correlation

for these tests is .92 which signifies reliability between $\underline{Form \ A}$ and $\underline{Form \ B}$ of the test.

The statistical method was the \underline{t} test of correlated means and was calculated from scores obtained in a pre-test, post-one test and a posttwo test. The results were used to determine any change due to being enrolled in an Effective Reading improvement program. Additionally, the results were used to determine residual and incremental effects of the course over differential time lapse intervals.

CHAPTER IV

TREATMENT OF DATA AND ANALYSIS OF RESULTS

Introduction

The following chapter is composed of a detailed account of the statistical treatment of the data and the analysis of the results. This chapter will indicate the degree to which the hypotheses are found to be tenable within recognized limitations.

The data will be discussed under the following headings: (1) the immediate gains for all reading groups resulting from the Effective Reading improvement program, (2) the retention of gains of all reading groups resulting from the Effective Reading improvement program, and (3) incremental gains of all reading groups resulting from the Effective Reading improvement program.

<u>^ ^</u>

The Immediate Gains of All Reading Groups Resulting From the Effective Reading Improvement Program

The mean pre-test scores, the mean post-one test scores, the mean difference, the \underline{t} values, the degrees of freedom, and the levels of significance between the pre-test scores and the post-one test scores on vocabulary for all groups are presented in Table II.

TABLE II

Group	Pre- Test Mean	Post-One Test Mean	Mean Difference	<u>t</u> value	df
1	47.81	46.50	1.31	0.7666	15
2	46.73	57.45	10.72	5.2333***	10
3	47,93	56.07	8.14	3.5349**	14
4	46.88	49,65	2.77	1.8851	16
5	44.84	53.68	8.84	3.8644**	18
6	42.13	50 .56	8.43	5.4849***	15

READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-ONE TEST SCORES ON THE NELSON-DENNY VOCABULARY SUBTEST

**Significant beyond .01 level.
***Significant beyond .001 level.

Tabulated <u>t</u> for a two-tailed test at .05 for the following degrees of freedom is: 15 df, 2.131; 10 df, 2.228; 14 df, 2.145; 16 df, 2.120, and 18 df, 2.101. These degrees of freedom will be used in Tables II through XIII.

Null hypotheses for immediate gains for vocabulary can be rejected on the basis of evidence presented in Table II for Groups 2, 3, 5 and 6. The mean pre-test scores, the mean post-one test scores, the mean difference, the \underline{t} values, and the levels of significance between the pre-test scores and the post-one test scores on comprehension for all groups are presented in Table III.

TABLE III

READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-ONE TEST SCORES ON THE NELSON-DENNY COMPREHENSION SUBTEST

Group	P re- Test Mean	Post-One Test Mean	Mean Difference	<u>t</u> value
1	39. 25	42.25	3.00	1.2950
2	38.36	43.82	5.46	2.1550
3	38,40	42.80	4.40	1.3302
4	41.65	41.76	0.11	0.0537
5	36.42	41.89	5.47	2.2507*
6	37.75	43.00	5.25	3.4903**

*Significant beyond .05 level. **Significant beyond .01 level.

The null hypotheses regarding immediate gains for comprehension can be rejected on the basis of the evidence presented in Table III for Groups 5 and 6. The mean pre-test scores, the mean post-one test scores, the mean difference, the \underline{t} values, and the levels of significance between the pre-test scores and the post-one test scores on total score for all groups are presented in Table IV.

TABLE IV

READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-ONE TEST SCORES ON THE NELSON-DENNY TOTAL SCORE SCORES

Group	Pre- Test Mean	Post-One Test Mean	Mean Difference	<u>t</u> value
1	87.69	88.75	1.06	0.3644
2	85.09	100.36	15.27	5.4177***
3	86.33	98.87	12.54	3.3073**
4	88.53	91.41	2.88	1.1761
5	82.32	95.63	13.31	4.1683***
6	79.88	93.44	13.56	5.5370***

**Significant beyond .01 level.
***Significant beyond .001 level.

The null hypotheses regarding immediate gains for total score can be rejected on the basis of the evidence presented in Table IV for Groups 2, 3, 5 and 6. The mean pre-test scores, the mean post-one test scores, the mean difference, the <u>t</u> values, and the levels of significance between the pre-test scores and the post-one test scores on rate for all groups are presented in Table V.

TABLE V

READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-ONE TEST SCORES ON THE NELSON-DENNY RATE SUBTEST

Group	Pre- Test Mean	Post-One Test Mean	Mean Difference	<u>t</u> value
1	233.13	428.31	195.18	8.5055***
2	28 2. 09	417.82	135.73	8.7631***
3	282.93	398.80	115.87	7.2173***
4	279.82	380.12	100.30	6.4633***
5	259.05	368.63	109.58	8.0321***
6	272.50	434.19	161.69	5.5129***

***Significant beyond .001 level.

The null hypotheses regarding immediate gains for reading rate can be rejected on the basis of the evidence presented in Table V for Groups 1, 2, 3, 4, 5 and 6. The Retention of Gains of All Reading Groups Resulting

From the Effective Reading Improvement Program

The pre-test to post-one test \underline{t} values of gains, the mean post-one test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the post-one test scores and the post-two test scores on vocabulary for all groups are presented in Table VI.

TABLE VI

RETENTION OF READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF POST-ONE TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY VOCABULARY SUBTEST

Group	<u>t</u> value Gains (Pre-Pl)	Time Lapse Months	P1 Test Mean	P2 Test Mean	Mean Difference	<u>t</u> value
1	0.7666	19	45,50	55.63	9.13	5.7532*** (G)
2	5.2333***	17	57.45	54.82	2.63	1.2913 [†]
3	3.5349**	15	56.07	50.07	6.00	4.6476*** (L)
4	1.8851	12	49.65	50.94	1.29	0.9706 [†]
5	3.8644**	7	53.68	53.32	0.36	0.2291 [†]
6	5.4849***	3	50.56	52.44	1.88	1.0443 [†]

**Significant beyond .01 level.
***Significant beyond .001 level.
[†]Significant retention of gain.
(G) = Gains; (L) = Loss.

The null hypotheses regarding retention of gains for vocabulary can not be rejected on the basis of the evidence presented in Table VI for Groups 2, 4, 5 and 6. The null hypotheses regarding retention of gains for vocabulary can be rejected on the basis of the evidence presented in Table VI for Groups 1 and 3.

Table VI, further, indicates significant retention of vocabulary gains for Groups 2, 4, 5 and 6.

Table VI also indicated an observed gain for vocabulary for Group 1 after 19 months, and indicates an observed loss of gains for vocabulary for Group 3 after 15 months. The pre-test to post-one test \underline{t} values of gains, the mean post-one test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the post-one test scores and the post-two test scores on comprehension for all groups are presented in Table VII.

TABLE VII

RETENTION OF READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF POST-ONE TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY COMPREHENSION SUBTEST

Group	<u>t</u> value Gains (Pre-P1)	T i me Lapse Months	P 1 Test Mean	P2 Test Mean	Mean Difference	<u>t</u> value
1	1.2950	19	42.25	43.25	1.00	0.4564 [†]
2	2.1550	17	43.82	43.27	0.55	0.2063 [†]
3	1.3302	15	42.80	43.07	0.27	0.0716 [†]
4	0,0537	12	41.76	44.53	2.77	1.2368 [†]
5	2.2507	7	41.89	41.26	0.63	0.4213 [†]
6	3.4903**	3	43.00	45.63	2.63	1. 3853 [†]

*Significant beyond .05 level. **Significant beyond .01 level. [†]Significant retention of gain.

The null hypotheses regarding retention of gains for comprehension can not be rejected on the basis of the evidence presented in Table VII for Groups 1, 2, 3, 4, 5 and 6.

Table VII, further, indicates a significant retention of gains in comprehension after 19, 17, 15, 12, seven and three months.

The pre-test to post-one test \underline{t} values of gains, the mean post-one test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the post-one test scores and the post-two test scores on total score for all groups are presented in Table VIII.

TABLE VIII

RETENTION OF READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF POST-ONE TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY TOTAL SCORE SCORES

Group	<u>t</u> value Gains (Pre-P1)	Time Lapse Months	P1 Test Mean	P2 Test Mean	Mean Difference	<u>t</u> value
1	0.3644	19	88.75	98.88	10.13	3.4428**
2	5.4177***	17	100,36	98,09	2.27	0.7370 [†]
3	3.3073**	15	98.87	93.13	5.74	1.4074 [†]
4	1.1761	12	91.41	95.47	4.06	1.4354
5	4.1683***	7	95.63	94.53	1.10	0.6451 [†]
6	5.5370***	3	93.44	98.06	4.62	1.5787 [†]

Significant beyond .01 level. *Significant beyond .001 level. [†]Significant retention of gain.

The null hypotheses regarding retention of gains for total score can not be rejected on the basis of the evidence presented in Table VIII for Groups 2, 3, 4, 5 and 6.

The null hypotheses regarding retention of gains for total score can be rejected on the basis of the evidence presented for Group 1.

37

Table VIII, further, indicates a significant retention of gains for total score after 17, 15, 12, seven and three months. It also indicates a significant gain in total score after 19 months. The pre-test to post-one test \underline{t} values of gains, the mean post-one test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the post-one test scores and the post-two test scores on rate for all groups are presented in Table IX.

TABLE IX

RETENTION OF READING GAINS AS SHOWN BY COMPARISONS OF MEANS OF POST-ONE TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY RATE SUBTEST

Group	<u>t</u> value Gains (Pre-P1)	Time Lapse Months	P1 Test Mean	P2 Test Mean	Mean Difference	<u>t</u> value
1	8.5055***	19	428.31	392.00	36.31	1.8358 [†]
2	8.7631***	17	417.82	398.27	19.55	0.9622+
3	7.2173***	15	398.80	378.53	20.27	0.8304
4	6.4633***	12	380.12	415.53	35.41	1,3458 [†]
5	8.0321***	7	368.63	386.37	17.74	1.1445
6	5.5129***	3	434.19	437.31	3.12	0 .1361 [†]

***Significant beyond .001 level. [†]Significant retention of gain.

The null hypotheses regarding retention of gains for reading rate can not be rejected on the basis of the evidence presented in Table IX for Groups 1, 2, 3, 4, 5 and 6.

Table IX, further, indicates a significant retention of gains in rate after 19, 17, 15, 12, seven and three months.

The Incremental Gains of All Reading Groups Resulting

From the Effective Reading Improvement Program

The mean pre-test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the pre-test scores and the post-two test scores on vocabulary for all groups are presented in Table X.

TABLE X

Group	Time Lapse Months	Pre- Test Mean	Post-Two Test Mean	Mean Difference	<u>t</u> value
1	19	47.81	55.63	7.82	4.7529***
2	17	46.73	54.82	8.09	3.8222**
3	15	47.93	50.07	2.14	0.9055
4	12	46.88	50.94	4.06	1.9731
5	7	44.84	53.32	8.48	4.3218***
6	3	42.13	52.44	10.31	5.2976***

READING INCREMENT GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY VOCABULARY SUBTEST

**Significant beyond .01 level.
***Significant beyond .001 level.

The null hypotheses regarding incremental gains for vocabulary can be rejected on the basis of the evidence presented in Table X for Groups 1, 2, 5 and 6.

Table X, further, indicates a significant increment gain in vocabulary after 19, 17, seven and three months.

The mean pre-test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the pre-test scores and the post-two test scores on comprehension for all groups are presented in Table XI.

TABLE XI

READING INCREMENT GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY COMPREHENSION SUBTEST

Group	Time Lapse Months	Pre- Test Mean	Post-Two Test Mean	Mean Difference	<u>t</u> value
1	19	39.25	43.25	4.00	1.9215
2	17	38.36	43.27	4.91	2.6450*
3	15	38.40	43.07	4.67	2.0088
4	12	41.65	44.53	2.88	1.2910
5	7	36.42	41.26	4.84	1.9698
6	3	37.75	45.63	7.88	4.5100***

*Significant beyond .05 level. ***Significant beyond .001 level.

The null hypotheses regarding incremental gains for comprehension can be rejected on the basis of the evidence presented in Table XI for Groups 2 and 6.

Table XI, further, indicates significant increment gains in comprehension for Groups 2 and 6 after 17 and three months.

The mean pre-test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the pre-test scores and the post-two test scores on total score scores for all groups are presented in Table XII.

TABLE XII

READING INCREMENT GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY TOTAL SCORE SCORES

Group	Time Lapse Months	Pre- Test Mean	Post-Two Test Mean	Mean Difference	<u>t</u> value
1	19	87.69	98.88	11.19	4.0778***
2	17	85.09	98.09	13.00	5.1756***
3	15	86.33	93.13	6.80	1.8542
4	12	88.53	95.47	6.94	1.9913
5	7	82.32	94.53	12.21	4.2742***
6	3	79.88	98.06	18.18	5.8977***

***Significant beyond .001 level.

The null hypotheses regarding incremental gains for total score can be rejected on the basis of the evidence presented in Table XII for Groups 1, 2, 5 and 6.

Table XII, further, indicates significant increment gains in total score for Groups 1, 2, 5 and 6 after 19, 17, seven and three months.

The mean pre-test scores, the mean post-two test scores, the mean difference, the \underline{t} values, and the levels of significance between the pre-test scores and the post-two test scores on rate for all groups are presented in Table XIII.

TABLE XIII

READING INCREMENT GAINS AS SHOWN BY COMPARISONS OF MEANS OF PRE-TEST AND POST-TWO TEST SCORES ON THE NELSON-DENNY RATE SUBTEST

Group	Time Lapse Months	Pre- Test Mean	Post-Two Test Mean	Mean Difference	<u>t</u> value
1	19	233.13	392.00	158.87	5.9084***
2	17	282.09	398.27	116.18	8.0792***
3	15	282.93	378.53	95.60	4.5263***
4	12	279.82	415.53	135.71	5.6891***
5	7	259.05	386.37	127.32	7.0157***
6	3	272.50	437.31	164,81	6.2321***
0	5	272.50	437.31	104.01	0.232

***Significant beyond .001 level.

The null hypotheses regarding incremental gains for reading rate can be rejected on the basis of the evidence presented in Table XIII for Groups 1, 2, 3, 4, 5 and 6.

Table XIII, further, indicates significant increment gains in rate for Group 1, 2, 3, 4, 5 and 6 after 19, 17, 15, 12, seven and three months.

Summary

This chapter has presented a detailed analysis of the statistical treatment of the data. The first question was: On tests designed to measure vocabulary, comprehension, rate and total reading ability, do immediate reading gains accrue to non-school adults who are enrolled in each class of a reading improvement program? The following hypotheses were rejected for the first question;

1. There is no significant différence between the mean pre-test and mean post-one test vocabulary scores. This hypothesis was rejected for Reading Groups 2, 3, 5 and 6 (see Table II).

2. There is no significant difference between the mean pre-test and mean post-one test comprehension scores. This hypothesis was rejected for Reading Groups 5 and 6 (see Table III).

3. There is no significant difference between the mean pre-test and mean post-one test total score scores. This hypothesis was rejected for Reading Groups 2, 3, 5 and 6 (see Table IV).

4. There is no significant difference between the mean pre-test and mean post-one test rate scores. This hypothesis was rejected for all reading groups (see Table V).

The second question was: On tests designed to measure vocabulary, comprehension, rate and total reading ability, if immediate reading gains do accrue to non-school adults who are enrolled in each class of a reading improvement program, are the immediate reading gains retained over differential time lapse intervals? The following hypothesis was rejected for the second question:

44

1. There is no significant difference of means in retention of gains between the mean post-one test vocabulary scores and the mean post-two test vocabulary scores. This hypothesis was rejected for Reading Group 1 and Reading Group 3 (Group 1 had a gain; Group 3 had a loss) (see Table VI).

The third question was: On tests designed to measure vocabulary, comprehension, rate and total reading ability do incremental gains accrue over differential time lapse intervals to non-school adults in each class of a reading improvement program? The following hypotheses were rejected for the fourth question:

1. There is no significant incremental gain difference between the mean pre-test vocabulary scores and the mean post-two test vocabulary scores. This hypothesis was rejected for Reading Groups 1, 2, 5 and 6 (see Table X).

2. There is no significant incremental gain difference between the mean pre-test comprehension scores and the mean post-two test comprehension scores. This hypothesis was rejected for Reading Groups 2 and 6 (see Table XI).

3. There is no significant incremental gain difference between the mean pre-test total score scores and the mean post-two test total score scores. This hypothesis was rejected for Reading Groups 1, 2, 5 and 6 (see Table XII).

4. There is no significant incremental gain difference between the mean pre-test rate scores and the mean post-two test rate scores. This hypothesis was rejected for all groups (see Table XIII).

The following hypotheses could not be rejected:

The second question was: On tests designed to measure vocabulary, comprehension, rate and total reading ability, if immediate reading gains do accrue to non-school adults who are enrolled in each class of a reading improvement program, are the immediate reading gains retained over differential time lapse intervals? The following hypotheses could not be rejected for the second question:

1. There is no significant difference of means in retention of gains between the mean post-one test vocabulary scores and the mean post-two test vocabulary scores. This hypothesis could not be rejected for Reading Groups 2, 4, 5 and 6. However, in rejecting Group 1, the significant difference indicated a gain above retention (see Table VI).

2. There is no significant difference of means in retention of gains between the mean post-one test comprehension scores and the mean post-two test comprehension scores. This hypothesis could not be rejected for any reading group (see Table VII).

3. There is no significant difference of means in retention of gains between the mean post-one test total score scores and the mean post-two test total score scores. This hypothesis could not be rejected for Reading Groups 2, 3, 4, 5 and 6. However, in rejecting Group 1, the significant difference indicated a gain above retention (see Table VIII).

4. There is no significant difference of means in retention of gains between the mean post-one test rate scores and the mean post-two test rate scores. This hypothesis could not be rejected for any reading group (see Table IX).

The third question was: On tests designed to measure vocabulary, comprehension, rate and total reading ability do incremental gains accrue over differential time lapse intervals to non-school adults in each class of a reading improvement program? The following hypotheses could not be rejected for the third question:

1. There is no significant incremental gain difference between the mean pre-test vocabulary scores and the mean post-two test vocabulary scores. This hypothesis could not be rejected for Reading Groups 3 and 4 (see Table X).

2. There is no significant incremental gain difference between the mean pre-test comprehension scores and the mean post-two test comprehension scores. This hypothesis could not be rejected for Reading Groups 1, 3, 4 and 5 (see Table XI).

3. There is no significant incremental gain difference between the mean pre-test total score scores and the mean post-two test total score scores. This hypothesis could not be rejected for Reading Groups 3 and 4 (see Table XII).

CHAPTER V

SUMMARY AND CONCLUSIONS

General Summary of the Investigations

This investigation examined the change in reading test performance of non-school adults who were enrolled in the Effective Reading program at the Federal Aeronautics Administration Center in Oklahoma City, Oklahoma. Three areas of concern were investigated: (1) the change in reading performance from pre-instruction tests to post-instruction tests, (2) the change in reading performance over differential time lapse intervals after the completion of the Effective Reading course, and (3) the incremental change in reading performance from the initial testing to final testing. Null hypotheses that no differences existed between pre-testing, post-one testing and post-two testing were used.

All students who enrolled for the Effective Reading course, who successfully completed seven or more of twelve instructional sessions and who participated in the final retesting, were used for this investigation. Overall, there were six different Effective Reading classes.

Each reading group was given a pre-test, a post-one test, and a post-two test on an equivalent forms reading test. The groups, the number of students in each group who took the post-two reading test, and the time lapse intervals from the post-one test to the post-two test are listed: Group 1, 16 students, 19 months; Group 2, 11 students, 17

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months; Group 3, 15 students, 15 months; Group 4, 17 students, 12 months; Group 5, 19 students, seven months; Group 6, 16 students, three months.

The testing instruments used were the Nelson-Denny Reading Test (Form <u>A</u>) and the <u>Nelson-Denny Reading Test</u> (Form <u>B</u>) with an examination being made of each vocabulary and comprehension subtest, the total score scores, and the rate of reading.

Summary of Results

The part of the study that deals with immediate gains indicates a strong, though not always statistically significant, upward trend for almost all areas of reading skills. The calculated \underline{t} values showed gains in vocabulary, comprehension, total score, and reading rate which exceeded .05 level of significance. The number of groups that registered significant \underline{t} values (see Tables II, III, IV, V) in immediate gains on the separate subtests make it feasible to conclude that the Effective Reading improvement program materially changed the reading performance of most adults completing the reading program. These results tend to confirm the findings of other studies reported in Chapter II, though considerably more significant gains were made in vocabulary in this study than were reported in other studies.

The data shows that gains were made in this reading improvement program. All areas of reading skills indicated improvement, with the exception of vocabulary for Group 1. Of the skills emphasized in this study, reading rate made the most dramatic changes, but was followed closely by the combined influences of vocabulary and comprehension in the total reading score. The increase in reading rate agrees with results of all the studies of Chapter II.

49

These changes would suggest that reading strengths materially improved during the Effective Reading program, and would suggest that the reading program as presented at the Federal Aeronautics Administration Center in Oklahoma City by Oklahoma State University Reading Center did cause substantial increases in the subjects' reading skills.

The retention of gains portion of this study indicated a significant retention of gains for all reading groups in all reading areas, except Group 3 in vocabulary. The general trend of retention of gains in all reading areas indicates that where gains were made in the Effective Reading program, these gains are retained without significant loss for the period of differential time lapses covered by the study. The tendency to retain reading gains over differential time intervals for this study appears to affirm the tenacity of reading skills once those skills have been attained. The tendency to retain reading skills reported in this study essentially agrees with findings of other studies reported in Chapter II.

This investigation indicated consistent retention of skills in vocabulary, comprehension, total reading score, and reading rate, whereas the studies in Chapter II reported similar gains mostly for rate and comprehension, with a dearth of results in vocabulary being evident. The effect of the combined strengths of vocabulary and comprehension was not considered in the literature, but this study indicates strong positive trends of overall retention whenever both are considered in combination. This introduces the possibility that the individualized approach to reading used in the Effective Reading programs provided a more generalized increase in reading ability. For the reading skills emphasized in this study and for the sample tested at the FAA, it is feasible to conclude, from the evidence presented, that reading gains are made in a reading improvement program and that these gains are retained over differential time lapses. It can also be concluded, from the evidence presented here, that the element of time seems to have little, if any, effect upon the retention of gains.

Increment gains were noted in all reading skills for all groups of the Effective Reading programs. All mean differences showed an upward trend. Most, though not all, were statistically significant. It is noteworthy that Group 1, from an initial mean loss, showed a significant increase for vocabulary,

This investigation indicated consistent positive incremental gains in vocabulary, comprehension, total score, and reading rate. For the reading skills emphasized in this study for the sample tested at the FAA Center, it can be concluded, from the evidence presented, that incremental reading gains are made by non-school adults that participated in a reading improvement program. These incremental gains appear to function generally independent of differential time lapse intervals. The one exception is the consistent incremental gains of Group 1 after the lapse of 19 months.

Evaluation of an institutional reading program is important to the sponsoring institution, the institution conducting the program and the individuals within the program. This investigation suggests the need for further research in the following areas:

1. Studies designed to study retention of skills over longer periods of time.

2. Studies that will show comparative gains of enrollees and non-enrollees.

3. Studies designed to show more distinct trends of incremental changes over time for the areas of emphasis.

Concluding Statement

The results of this study are offered as an attempt to aid in the evaluation of immediate and lasting benefits in reading accruing to both students and the sponsoring institutions that avail themselves of the professional services of Oklahoma State University. It is hoped that the results may be useful in guiding the future direction of others who become reading instructors in similar educational-institution to governmental-institution endeavors. Further, it is hoped that the results of this study may afford direction to others toward their improving reading programs in similar non-school adult reading programs. Lastly, if professional ties between the civilian governmental community and the civilian educational community have been strengthened also, then it is hoped that this investigation will have served a useful purpose.

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APPENDIX

DISTRIBUTION OF PRE-TEST, POST-ONE TEST, AND POST-TWO TEST RAW SCORES ON THE NELSON-DENNY READING TEST OF THE EFFECTIVE READING CLASSES

DISTRIBUTION OF PRE-TEST,	POST-ONE TEST, AND POST-TWO
TEST RAW SCORES, GROUP	1, SEPTEMBER 29, 1970,
	AND APRIL 21, 1972

Pre-Test Nelson-Denny Form B				Velso	One Ter n-Denny rm A		Post-Two Test Nelson-Denny Form B					
V	C	T	R	v	С	T	R	V -	Ç	Т	R	
40	20	60	129	34	38	72	480	46	36	82	499	
54 -	32	86	309	34	30	74	318	52	40	92	327	
46	34	80	17	44	36	80	338	59	36	95	275	
52	44	96	368	49	56	105	591	52	62	114	438	
36	38	74	188	31	34	65	426	53	42	95	290	
72	56	138	235	70	66	136	468	78	64	142	403	
53	38	91	214	55	44	89	491	64	30	94	488	
49	26	75	85	55	38	93	327	61	42	103	333	
12	14	26	177	13	14	27	287	13	14	27	235	
46	44	90	226	48	40	88	480	63	56	119	356	
51	52	103	235	44	40	84	327	51	48	99	226	
44	34	78	257	48	50	98	468	50	32	82	511	
58	56	114	333	64	60	124	436	76	60	136	599	
41	42	83	356	34	32	66	480	45	34	79	475	
49	38	87	257	52	46	98	456	53	38	91	379	
62	60	122	344	69	52	121	480	74	58	132	438	

DISTRIBUTION OF PRE-TEST, POST-ONE TEST, AND POST-TWO TEST RAW SCORES, GROUP 2, NOVEMBER 13, 1970, DECEMBER 21, 1970 AND APRIL 21, 1972

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Pre-Test Nelson-Denny Form B				Nelso	Dne Tei n-Denny rm A		Post-Two Test Nelson-Denny Form B				
V	С	T	R	v	Ç	T	R	V	С	T	R
41	34	75	371	55	3 8	93	450	48	3 8	86	591
60	28	88	226	67	36	103	319	59	28	87	319
35	28	63	185	50	32	72	319	39	30	69	262
53	60	113	327	76	54	130	461	64	64	128	456
35	22	57	262	39	40	79	403	43	38	81	407
29	32	61	226	38 -	40	78	379	43	24	67	384
56	50	106	275	57	52	109	403	60	56	116	338
55	36	91	338	57	34	91	524	54	46	100	446
43	42	85	207	56	46	102	413	61	48	109	338
66	50	116	436	83	48	131	475	86	54	140	491
41	40	81	250	54	62	116	450	46	50	96	349

		Test			Post-One Test					Post-Two Test					
		n-Denn	У .	1	Velso	n-Denn	y.			Nelson	n-Denn	У			
	Fo	rm B			Fo	rm A				Foi	rm B				
V	C	T	R	V	С	T	R	7	7	С	T	R			
18	12	30	250	30	14	44	379		22	20	42	426			
75	58	133	309	82	62	144	450		79	64	143	407			
91	68	159	275	91	62	153	356		37 -	68	155	298			
61	26	87 ·	250	77	44	121	368		71	50	121	338			
79	40	119	396	63	52	115	488	(50	42	102	396			
21	26	47	468	33	18	51	573		29	40	69	468			
44	34	78	275	55	46	101	413	1	53	30	83	407			
14	30	44	185	27	44	71	319		27	28	55	216			
42	42	84	338	46	46	92	461		29	32	61	287			
68	68	136	275	89	48	137	551	8	30	66	146	426			
29	10	39	195	34	34	68	203		25 -	20	45	396			
37	28	65	289	49	40	89	309		45	26	71	359			
37	44	81	226	38	26	64	327		36	54	90	359			
46	60	106	238	63	62	125	335		¥7	60	107	396			
57	30	87	275	64	44	108	450		51	46	107	499			

DISTRIBUTION OF PRE-TEST, POST-ONE TEST, AND POST-TWO TEST RAW SCORES, GROUP 3, FEBRUARY 1, 1971, MARCH 15, 1971 AND APRIL 21, 1972

DISTRIBUTION OF PRE TEST, POST-ONE TEST, AND POST-TWO TEST RAW SCORES, GROUP 4, APRIL 12, 1971 MAY 19, 1971 AND APRIL 21, 1972

Pre-Test						One Te		Post-Two Test					
Nelson-Denny				1	Nelson	n-Denny	9	Nelson-Denny					
	For	m B			For	rm A			For	rm B			
<u>V</u> .	C	T	R	• V	С	T	R	V	С	T,	R		
44	26	70	245	38	40	78	238	38	28	66	257		
61	58	119	413	66	34	100	501	72	54	126	438		
57	44	101	214	57	48	105	436	63	60	123	450		
52	56	108	309	50	46	96	396	53	42	95	499		
47	40	87	299	52	44	96	396	53	50	103	413		
36	40	76	195	46	44	89	359	46	36	82	319		
56	34	90	257	50	36	86	338	58	30	88	438		
37	28	65	356	40	42	82	384	31	41	72	551		
37	38	75	214	46	40	86	359	54	52	106	425		
69	56	125	290	69	52	121	359	64	42	106	403		
41	28	69	277	36	36	72	426	39	36	75	299		
32	44	76	327	38	38	76	396	37	48	85	475		
33	46	79	379	37	46	83	501	41	46	87	403		
55	48	103	333	59	44	103	371	55	54	109	309		
41	42	83	235	40	42	82	426	43	40	83	399		
59	40	99	226	63	34	97	238	54	44	98	561		
40	40	80	188	57	44	101	338	65	54	119	425		

	Pre	-Test		موجد ويؤدرون فرريا والأرزين والمراجعة	Post-	One Te	st	, , , , , , , , , , , , , , , , , , , 	; . ÷	Post-	Iwo Te	st
]	Nelson	n-Denny	y		Nelso	n-Denn	y.			Nelson	n-Denn	y.
	For	rm B			Fo	rm A				For	rm B	
V	C .	Т	R	V	C	Т	R	•	V	C	Ť	R
38	24	62	150	37	36	73	327		37	32	69	501
52 37	58	110	338	77	50	125	521		78	50	128	396
3/	34	71	185	47	54	101	379		47	60	107	359
45 54	50 48	95 102	327 309	47 68	46 62	93 130	356 413		47 72	40 58	87 130	407 407
54	34	88	226	47	38	85	269		54	42	96	298
35.	20	55	226	46	28	74	309		44	24	74	318
21	2 2	43	226	31	32	63	356		25	32	57	298
69	56	125	468		44	135	615		81	42	123	707
61	40	101	250	72	52	124	425		57	60	117	407
29	28	57	262	59	46	105	309		44	46	90	396
41 45	32	73	174	41 43	32	73	344		42	36	78	426
45	28	93	275	43	50	93	333		45	40	85	384
71 56	58	129	262	81	52	133	391		86	52	138	384
56	34	90	262	67	22	90	391		65	38	103	396
42	30	72	195	59	44	103	235		63	38	101	226
29	34	63	238	32	38	71	403		33	38	70	327
19 54	36	55	262	25	38	63	309		37	26 30	63 86	333
54	26	80	287	50	34	84	319		56		00	371

DISTRIBUTION OF PRE-TEST, POST-ONE TEST, AND POST-TWO TEST RAW SCORES, GROUP 5, SEPTEMBER 20, 1971, NOVEMBER 10, 1971 AND APRIL 21, 1972

DISTRIBUTION OF PRE-TEST, POST-ONE TEST, AND POST-TWO TEST RAW SCORES, GROUP 6, JANUARY 24, 1972, MARCH 6, 1972 AND APRIL 21, 1972

	n-Denn rm B T 84 136 75 66 33 83	y R 250 349 216 195 185 407	V 62 89 53 42 14 48	Fo C 40 68 42 32 20	n-Denn rm A 100 157 95 74 34	R 407 707 456 396 195	V 53 88 61 61 19		n-Denn rm B 7 158 105 115 35	y 417 789 309 309 174
V C 46 38 70 66 41 34 36 30 15 18 39 44 28 34 63 54	T 84 136 75 66 33	250 349 216 195 185	62 89 53 42 14	C 68 42 32 20	T 100 157 95 74 34	407 707 456 396 195	53 88 61 61	C 44 70 44 54	T 97 158 105 115	417 789 309 309
46 38 70 66 41 34 36 30 15 18 39 44 28 34 63 54	136 75 66 33	250 349 216 195 185	62 89 53 42 14	68 42 32 20	157 95 74 34	407 707 456 396 195	53 88 61 61	44 70 44 54	158 105 115	417 789 309 309
70 66 41 34 36 30 15 18 39 44 28 34 63 54	136 75 66 33	349 216 195 185	89 53 42 14	68 42 32 20	157 95 74 34	707 456 396 195	88 61 61	70 44 54	158 105 115	789 309 309
41 34 36 30 15 18 39 44 28 34 63 54	75 66 33	216 195 185	53 42 14	42 32 20	95 74 34	456 396 195	61 61	44 54	105 115	309 309
36 30 15 18 39 44 28 34 63 54	66 33	1 95 185	14	32 20	74 34	396 195	61	54	115	309
15 18 39 44 28 34 63 54	33	185	14	20	34	195				
39 44 28 34 63 54							19	16	35 -	174
28 34 63 54	83	407								
63 54				60	108	639	49	50	<u>99</u>	639
	62	238	30	42	72	238	31	48	79	396
43 32	117	259	71	58	129	436	61	62	123	468
	75	338	53	40	<u>93</u>	513	48	38	86	571
40 32	72	371	44	30	74	338	45	34	79	318
40 46	86	318	47	42	89	491	45	56	101	571
34 40	74	238	37	36	73	609	43	34	77	513
51 30	66	195	70	48	118	639	71	50	121	468
21 20	41	195	30	32	62	207	29 56	32		238
21 20 48 36 59 44	103	309 207	48 71	42 56	90 127	327 349	56 79	48 50	$104 \\ 129$	446 371

VITA

Paul David Driskill, Jr.

Candidate for the Degree of

Doctor of Education

Thesis: A STUDY OF RETENTION OF GAINS IN READING ACHIEVEMENT OF ADULTS IN THE OKLAHOMA CITY FEDERAL AERONAUTICS ADMINISTRATION'S EFFECTIVE READING PROGRAM

Major Field: Elementary Education

Biographical:

- Personal Data: Born at Pauls Valley, Oklahoma, December 27, 1931, the son of Paul David and Ena Elsie Driskill.
- Education: Attended grade school at Klondike, Oklahoma; graduated from Pauls Valley High School in 1949; received Bachelor of Arts degree from East Central State College, Ada, Oklahoma, 1959; received the Master of Arts degree from Clarke College, Dubuque, Iowa, in August, 1969; completed requirements for the Doctor of Education degree in July, 1972.
- Professional Experience: Taught business and social studies at Mason High School, Mason, Oklahoma, 1961 - 1963; taught business and social studies at Lenapah High School, Lenapah, Oklahoma, 1963 - 1966; Principal-Teacher of 5th, 6th, 7th and 8th grades in 1966, teacher of 5th, 6th, 7th and 8th grades in 1967, at Sunrise School, Okemah, Oklahoma; served as reading teacher at Mason Elementary School, Mason, Oklahoma, 1969; served as graduate assistant at the Oklahoma State University, 1970 - 1971, summer 1972; served as reading instructor at Northern Oklahoma College, Tonkawa, Oklahoma, spring, 1972.

2