

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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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

2. There is no significant incremental gain difference between 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

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

Completion of Course: 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 Nelson-Denny Reading Test were considered to have completed the course.

Course: The completed program of study presented by the instructor from the Oklahoma State University Reading Center.

Pre-test: The initial Nelson-Denny Reading Test administered at the beginning of each Effective Reading course.

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

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

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

Reading Group Two: This term refers to the class that met from November 13, 1970 to December 21, 1970. It will be designated Group 2.

Reading Group Three: This term refers to the class that met from February 1, 1971 to March 15, 1971. It will be designated Group 3.

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

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

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

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

Federal Aeronautics Administration: 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.

Gains: 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 Nelson-Denny Reading Test and the post-one Nelson-Denny Reading Test.

Retention of Gains: 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 Nelson-Denny Reading Test and the post-two Nelson-Denny Reading Test.

Incremental Gains: 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 Nelson-Denny Reading Test 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 Nelson-Denny Reading Test was used by each subject for the post-two 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 Nelson-Denny Reading Test pre-test to the final results of the subtests of the Nelson-Denny Reading Test 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 Nelson-Denny Reading Test, 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

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 1½ hours once a week. Standardized improvement was measured by The Speed of Comprehension Test, Part I of the Van Wagenen-Dvorak Diagnostic Examination of Silent Reading Abilities, and by both forms of the Minnesota Speed of Reading Test 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 t 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 Form Am of the Iowa Silent Reading Test, and either Form Cm or Dm was the post-test. A mean rate increase of 15 standard-score points was achieved on the Iowa Tests 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 Iowa Silent Reading Test, Advanced, Form Am; the post-test was the Iowa Silent 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, ($t = .01$ 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 Diagnostic Reading Tests. 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 Survey Section of the Diagnostic Reading Tests 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 made by the control group. Five months later, the experimental

group still read at a significantly greater rate. The pre-test, post-test, 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 as "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 resistant 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

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 Nelson-Denny Reading Test 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 Nelson-Denny Reading Test 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 Nelson-Denny Reading Test 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 Controlled Reader 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 College Reading Program One 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.

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.

Immediate Gains: 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).

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

TABLE I

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

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*	
<u>FAA Division</u>							<u>Total</u>
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	—	—	—	<u>2</u>	—	—	<u>2</u>
Totals	16	11	15	17	19	16	94

* 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 Nelson-Denny Reading Test (Form A and Form B), 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 Form A and Form B of the test.

The Nelson-Denny Reading Test 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 Nelson-Denny Reading Test 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 Nelson-Denny Reading Test 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 Nelson-Denny Reading Test.

Form A of the Nelson-Denny Reading Test was administered to four of the sample populations before training to determine the initial performance level, and Form B 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 t 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 t 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 t test of difference between means of two correlated samples, and was calculated using the following formula:

$$t = \frac{\bar{X} - \bar{Y}}{\frac{\sqrt{\Sigma D^2 - \frac{(\Sigma D)^2}{N}}}{N(N - 1)}}$$

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 t 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 t 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 Nelson-Denny Reading Test also were retested with the post-two administration of the Nelson-Denny Reading Test. 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 Nelson-Denny Reading Test (Form A and Form B), 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 Form A and Form B of the test.

The statistical method was the t test of correlated means and was calculated from scores obtained in a pre-test, post-one test and a post-two 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.

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

Group	Pre- Test Mean	Post-One Test Mean	Mean Difference	t 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

**Significant beyond .01 level.

***Significant beyond .001 level.

Tabulated t 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 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	t 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 t 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	t value
1	233.13	428.31	195.18	8.5055***
2	282.09	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 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	\underline{t} value Gains (Pre-P1)	Time Lapse Months	P1 Test Mean	P2 Test Mean	Mean Difference	\underline{t} 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	\underline{t} value Gains (Pre-P1)	Time Lapse Months	P1 Test Mean	P2 Test Mean	Mean Difference	\underline{t} 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.

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 t values of gains, the mean post-one test scores, the mean post-two test scores, the mean difference, the 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	t value Gains (Pre-P1)	Time Lapse Months	P1 Test Mean	P2 Test Mean	Mean Difference	t 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 mean pre-test scores, the mean post-two test scores, the mean difference, the 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	t 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***

***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.

