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DIFFERING PRACTICE SCHEDULES FOR COLLEGE
DEVELOPMENTAL READING CLASSES.**

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DIFFERING PRACTICE SCHEDULES FOR COLLEGE

DEVELOPMENTAL READING CLASSES

A DISSERTATION

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BY

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1969

DIFFERING PRACTICE SCHEDULES FOR COLLEGE
DEVELOPMENTAL READING CLASSES

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CHAPTER I

INTRODUCTION

If one pauses to reflect on the modern American scene, he can scarcely fail to be aware of the "need to read" which exists today. The need for an educated and thinking population has never been so keenly pointed up as in recent years. We have seen the paradox of technological and scientific achievements which have at once simplified and complicated the lives of modern Americans. Technology has created a greater demand than ever before for high-level skills, the acquisition of which requires proficiency in the skills of reading. At the same time, advanced technology has made it possible for larger numbers of people to work fewer hours and to retire at earlier ages. As a result, there is more leisure time in which to read as a form of recreation and as a means of self-improvement.

In addition to the influence of technology on the reading needs of our people, a pyramiding population growth¹

¹Britannica Book of the Year, 1969 (Chicago: William Benton, 1969), p. 617, states: "World population reached 3.5 billion by the end of 1968, an increase of 70 million in one year . . . With growth in population continuing at the rapid rate of 2% a year, the earth appeared headed for a doubling of its 1968 population by the year 2006, according to compilations based on United Nations statistics."

with all the concomitant problems has further piqued interest in reading improvement. Problems of human survival, health, social justice, conservation of natural resources, transportation and communication, international peace, and cultural enrichment are all intensified as the population grows.

There have been other developments which have highlighted the "need to read." Great changes in social and economic mobility have opened up new opportunities for education and employment to previously disadvantaged groups in our society. Again, reading skills loom large as a prerequisite for taking advantage of these new opportunities. Business and professional people, impelled by the need to "keep up" with the growing body of knowledge in their respective fields, also are seeking more efficient reading and study skills.²

Dr. William C. Davies has pointed up the need for establishing developmental reading programs in every college in America.³ He suggested that the pioneer admonition of reading instruction, "He who ne'er will learn his ABC's--forever will a blockhead be," still has

²Guy L. Bond and Miles A. Tinker, Reading Difficulties: Their Diagnosis and Correction (2nd ed.; New York: Appleton-Century-Crofts, 1967), p. 5.

³William C. Davies, "Why Every College Needs A Developmental Reading Program," College Reading Association, ed. Clay A. Ketcham (Rochester, New York: College Reading Association, 1967), pp.96-101.

relevance today. Davies cited Smith's chronicle of American reading instruction in which Dr. Smith referred to the period between 1950 and 1965 as the "Period of Expanding Knowledge and Technology Revolution." It was during this period that there occurred a most dramatic event which greatly influenced American reading instruction, the launching of Sputnik I on October 4, 1957. Also during this period, in 1964,

President Lyndon B. Johnson announced his intention to make war on joblessness and on poverty. The basic medium advocated furthering these objectives was education, and reading is commonly recognized as the foundation upon which education is built.⁴

Dr. Smith further wrote, "There is an urgent need for reading instruction at college-adult levels."⁵ Heilman seconded: "Today there is an almost universal respect for reading as a key to learning."⁶ Davies extended his reference to the historical parallels in goals of reading instruction as he wrote,

Again, we have come full circle. From a nation founded on the belief that every man had to read his Bible to save his own soul to a nation now equally convinced that it is contingent upon improved reading and learning skills for all.

⁴ Ibid., p. 98.

⁵ Nila B. Smith, "Foreword," College-Adult Reading Instruction, ed. Paul D. Leedy (Newark, Delaware: International Reading Association, 1964), p. iv.

⁶ Arthur W. Heilman, "The Nature and Nurture of College-Reading Programs," I.R.A. Proceedings (Newark, Delaware: International Reading Association, 1964), pp. 90-91.

members of our society if man is going to have a soul to save.⁷

The hue and cry about the "explosion of knowledge" and its corollary, the "explosion of publications" together with the recognized need for "more effective communication" have not fallen on deaf ears. College enrollments all across the country are bulging. Young people are responding to the call for higher education as a prerequisite for more productive living and adults are returning to complete or to upgrade their education. Unfortunately, it has been observed that many students are entering college with inadequate reading skills for coping with the demands of higher education.⁸ Therefore, along with increased enrollments the past two decades have witnessed an astounding growth of various types of college and university reading programs.

In recent years educators have begun to turn their attention to the improvement of the quality of these reading programs, as well as to meet the demand for a greater quantity. Accordingly, at the twelfth annual convention of the International Reading Association, Dr. J. Allen Figurel stated:

The complexity of the total reading act and the greater holding power of the school has increased the difficulty of teaching reading effectively.

⁷Davies, p. 98.

⁸Smith, p. iv.

to everyone. Now there is greater interest in methodology, reading materials including special media, teacher training, in-service programs, research and its applications, contributions of other disciplines to reading, and many more.⁹

The first organized effort to give serious professional consideration to the problems relating to college and university reading programs began with the First Annual Southwest Reading Conference for Colleges and Universities in Fort Worth, Texas, in April, 1952. From this modest regional beginning the Conference grew so that in 1958 it was changed to the National Reading Conference for Colleges and Adults. At the present time this Conference attracts distinguished educational leaders from all over the nation. One of the stated major purposes of the Conference is "to give encouragement to research and experimentation in the field of reading, and to publish the results."¹⁰

An examination of the various yearbooks of the Conference reveals certain trends in the college reading movement. In the early years the major efforts were devoted to establishing reading programs in colleges and universities and in setting up the legitimate goals of

⁹J. Allen Figurel (ed.), "Foreword," Forging Ahead in Reading, Proceedings of the Twelfth Annual Convention International Reading Association (Newark, Delaware, 1968), XII, Part 1, p. iii.

¹⁰Oscar S. Causey (ed.), "Preface," Significant Elements in College and Adult Reading Improvement, Seventh Yearbook of the National Reading Conference (Fort Worth: Texas Christian University Press, 1958), pp. 5-6.

such programs. Results were evaluated and were generally found to be favorable. As a consequence, reading programs became firmly established in most college curricula. At the present time it is no longer necessary to convince administrators of the need and value of such programs for they have long since justified their existence.

Following the period in which the emphasis was on setting up programs and goals, the Conference concerned itself with the problems of refining and improving college reading programs. Investigators experimented with methods and materials and organizational procedures. They explored the psychological and sociological parameters of college reading. They refined evaluative techniques and investigated many other facets of college and adult reading. The movement has truly come a long way in a relatively short period of time.

With each new study that is undertaken the way is pointed for further research. The need for new knowledge and for validation of old findings is ever present. The college reading movement has come a long way toward achieving its goal of providing guidelines for the best possible kind of program for all students. However, it has yet to test the applicability of the findings of learning research with respect to the distribution of practice to the improvement of reading skills at the college level. It was for this purpose that this investigation was undertaken.

CHAPTER II

REVIEW OF RELATED LITERATURE

In any learning situation there are concepts to be learned, problems to be solved, or skills to be mastered. One of the most urgent problems facing teachers is that of structuring the learning situation so as to achieve the learning objectives most effectively and efficiently. Closely related to this problem is that of determining the appropriate amount and distribution of practice which is needed for maximum learning.

Glaser's study of the role of practice in learning prompted him to write, "It is established that review and repetition are necessary in the process of acquisition and for the maintenance of previous learning."¹ Ausubel added that practice is one of the principal variables influencing cognitive structure; thus, learning implies practice.²

Most instructional programs are planned to fit a timetable which is considered to be an efficient one for

¹Robert Glaser (ed.), Training Research and Education (Pittsburgh: University of Pittsburgh Press, 1962), p. 16.

²David P. Ausubel, The Psychology of Meaningful Verbal Learning (New York: Grune and Stratton, 1963), p. 176.

achieving the established objectives. Educators have looked to research to find a scientific rationale for the role of practice in learning. Researchers have attempted to answer such fundamental questions as that asked by Thorndike,³ "Does practice result in learning?" Questions related to the conditions of practice such as the role of frequency in learning and retention, spacing versus massing of practice sessions, and the optimum length of practice sessions have also been explored.

Frequency has been historically regarded as one of the cardinal laws of associative learning, and more recently, of classical conditioning as well.⁴ Investigations of the past several decades, however, have added some new dimensions to the role of practice in learning.

E. L. Thorndike studied the effect of practice, or drill, upon learning.⁵ He asked a subject to sit, eyes closed, with a pad of paper and a pencil and draw with one quick movement a line four inches long. In twelve sittings, in which the number of lines drawn varied from 171 to 200, there was no significant change in the median length of lines from the first to the last setting. Thorndike concluded from this and similar experiments that the

³Edward L. Thorndike, Human Learning (New York: Century Company, 1931).

⁴Ausubel, p. 178.

⁵Thorndike, pp. 8-15.

repetition of a situation in and of itself does not cause learning. He added the variables of "reward" and "punishment" to the learning situation and concluded that right responses are established largely by rewards and that punishment has little or no effect in causing wrong responses to be eliminated. So, the idea that frequency results in learning was repudiated and its supposed influence was attributed to "reward," or reinforcement.

The constructs of learning which were developed through experimentation by Guthrie, Hull, Skinner, and Tolman, and the Gestalten formulation of learning as the abrupt emergence of "insight" were supportive of Thorndike's pronouncement.⁶ These theoretical developments in the psychology of learning, together with the prevailing child-centered trends in the philosophy of education, were greatly influential in bringing about changes in educational practices. Uncritical analyses of the findings of these learning theorists caused the progressivists to reject the traditional folklore and pedagogy which held that practice makes perfect. More valid interpretations of Thorndike's findings might have included such statements as, practice makes permanent; not necessarily perfect, and practice with reinforcement leads to learning. There was a wide-spread de-emphasis

⁶Ausubel, p. 178.

of the value of practice, or drill, in the teaching-learning process during the progressivist movement.

Ausubel made this comment.

Drill was unwarrantedly stigmatized as necessarily rote in nature, and a fetish was made of uncontrived, unstructured, and incidental learning experience.⁷

He further repudiated the reasoning of the progressivists when he wrote:

Actually, for practice to result in meaningful mastery of material, the only really essential conditions are that the learning task be potentially meaningful, that the learner exhibit a meaningful learning set and possess the necessary relevant background concepts, and that the number, distribution, sequence, and the organization of intra- and inter-task trials conform to empirically validated principles of efficient learning and retention.⁸

Lawther⁹ specified the conditions of learning similarly:

Improvement in a (motor) skill depends upon practice with intent to improve. Without the intent to improve, practice established a lower level of performance. In general, motivation and purpose, and method and equipment establish the level of the skill finally attained.

Gray summarized his review and interpretation of learning research by deducing some guiding principles of learning which apply to problem-solving behavior as well as to other types of learning. Succinctly stated, these

⁷Ausubel, p. 178.

⁸Ibid.

⁹John D. Lawther, "Learning Motor Skills and Knowledge," Educational Psychology, ed. Charles E. Skinner (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959), p. 503.

laws are motivate, reward, and drill. These together are the laws of learning.¹⁰

Thorndike's research--both the experiments dealing with frequency per se and those dealing with frequency plus reinforcement--was concerned with non-meaningful tasks learned by rote. Therefore, generalizations about the learning of tasks dissimilar to those used in the experiments are indefensible. Ausubel deplors the paucity of research dealing with the relationship between frequency and meaningful learning retention.¹¹ He states that most educational psychologists seem content to cite the relevant rote learning studies as verification of the effectiveness of repetition on meaningful learning. For example, Thorndike's research on the effect of repetition on the estimation of length of lines has been followed up by demonstrations that frequency of writing themes, without feedback, has little effect on the acquisition of composition skills. It has further been demonstrated that suitable feedback does result in improvement of these skills. The role of frequency with feedback in meaningful learning situations, however, has yet to be empirically determined.

¹⁰ Stanley J. Gray, "Creative Thinking, Reasoning, and Problem-Solving," Educational Psychology, ed. Charles E. Skinner (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959), p. 554.

¹¹ Ausubel, p. 186.

Closely related to the problem of frequency of practice is that of the intervals between practice periods. How long should they be? Sorenson specifies that the intervals should be of such a length that the learner is well rested and resumes the task of study with a maximum of interest and available skill.¹² However, the intervals should not be so long that the acquired skill will have been forgotten thus necessitating a "warm-up" period due to the loss. By such general statements as these, Sorenson supports "more frequent periods of learning." He does, however, admit to the mitigating factors of the nature of the material to be learned, the age and capacity of the learner, teaching methods, and motivation.

Ultimately the issues of practice-period length and frequency have to be considered together. Together they comprise the more basic issue: massed versus distributed practice. Travers defines "massed" and "spaced" practice in the following manner:

When learning is scheduled on a concentrated basis with a single long period of practice which is extended until the material to be learned has been learned, it is said that the practice is "massed." When learning takes place in a number of learning periods separated either by other activities or by periods of rest, the practice is said to be "distributed" or "spaced."¹³

¹²Herbert Sorenson, Psychology in Education (New York: McGraw-Hill, 1964), pp. 389-392.

¹³Robert M. W. Travers, Essentials of Learning (New York: McMillan Company, 1963), p. 306.

The problem of spaced versus massed practice has received a great deal of attention in educational and psychological research. There is a general appreciation among researchers that "spacing" is good and "massing" is bad. Generally, the evidence supports the conclusion that distributed practice is more effective than massed practice for both learning and retention.

Ebbinghaus conducted a series of experiments which, according to Travers, laid the foundation for the subsequent experimental development of scientific study of learning.¹⁴ Essentially Ebbinghaus was interested in eliminating the influence of prior experience on a learner's responses. Since the use of meaningful material in a learning task obscured the learner's true acquisition of new material, nonsense syllables were used as the learning task. Subjects were asked to learn nonsense syllables such as "gub," "zac," "ref," "kes," and so forth. With these kinds of materials Ebbinghaus conducted experiments with massed and distributed practice. In the case of massed practice, the subjects were required to learn a list of twenty or more nonsense syllables in a single sitting. Others were given the same list to be learned in distributed practice periods which were separated by periods of rest or other activity. Ebbinghaus's conclusion, which has been well

¹⁴Travers, p. 307.

substantiated by other studies, is that distributed practice is superior to massed practice--that is, it takes less time to learn material if learning is distributed over several spaced sessions than if all the work is done in a single sitting.

The most generally accepted explanation of the advantage of distributed practice over massed practice is that, with spaced practice, there is an opportunity for reactive inhibition to dissipate; whereas, with massed practice, reactive inhibition builds up and interferes with learning. "Reactive inhibition was postulated by Hull as a negative drive state, analogous, if not similar, to fatigue which comes about as a consequence of activity."¹⁵

Ausubel¹⁶ cites research which he feels places qualifications upon the relative efficacy of distributed practice. He says the advantages of distributed practice over massed practice are dependent on such factors as the age and ability of the learner, and the nature, quantity, and difficulty of the learning task. For example, younger and less able learners benefit more from distributed practice than do older and more able learners. Long, rote, and difficult tasks are more amenable to distributed than massed practice while short, meaningful, and easy tasks

¹⁵B. R. Bugelski, The Psychology of Learning (New York: Holt, Rinehart and Winston, 1956), p. 166.

¹⁶Ausubel, p. 187.

are more effectively learned by massed practice. For tasks which require a prolonged warm-up period or considerable concentrated effort, distributed practice is demonstrably less effective than when it is massed.

Bugelski states that the research yields no conclusive and generalizable answers. He summarizes the findings with respect to the distribution of practice as follows:

We find that spacing is favored if the task involved no great amount of warm-up, if the intervals are not too long to allow forgetting but long enough to permit the forgetting of interfering responses, and if fixation of particular responses is desired. The faults of massing can be countered by rests, by increasing motivation, and by elimination of interfering responses.¹⁷

How long should a learning period be, and how far apart should the periods of practice be spaced? Studies have been done which dealt with this question, but there is no consistency in the results which they have produced. This lack of consistency is probably due to differences in the kind of learning tasks involved in the experiments. Travers cites an early study by Warden in which subjects were required to learn a maze.¹⁸ Different groups were given practice at intervals of six hours, twelve hours, one-day, three-day, and five-day intervals. The twelve-hour interval produced the most efficient learning.

¹⁷Bugelski, p. 473.

¹⁸Travers, p. 308.

Different results were obtained by Lorge.¹⁹ Three tasks were used. In one task, mirror drawing, the subject was required to make a line around a given pattern, being guided by what he could see in a mirror. The second task, mirror reading, required the subject to read printed material appearing in a mirror. In the third task, code substitution, the subject was required to substitute letters in printed material with new letters, according to a code given him. Lorge's subjects learned the tasks under three conditions. One learning condition involved massed practice, the second involved distributed practice with one-minute intervals between trials, and the third condition was distributed practice with twenty-four-hour intervals between trials. With every task, the subject performed more efficiently when practice was distributed than when it was massed, and only small differences were found between the distributed practice with one-minute rest intervals and twenty-four-hour intervals.

This review of the literature concerning the task variable of practice leads to the conclusion that practice may be subsumed under learning provided certain conditions are met. The degree of proficiency and retention related to a learning task will depend upon the nature of the task, the motivation and background of the learner, and the schedule of practice. Generally, distributed practice is favored over

¹⁹Ibid.

massed practice, and the optimum length of practice periods probably varies with the nature of the task. No conclusive evidence was found to support any particular schedule of spacing or duration of practice sessions, although "short" practice periods are favored for rote learning tasks.²⁰

Among the conditions for meaningful mastery of material Ausubel specifies that "the number, distribution, sequence, and the organization of intra-and inter-task trials conform to empirically validated principles of efficient learning and retention."²¹ This consideration leads to a review of the literature to see whether any principles regarding the role of practice in college developmental reading programs have been empirically validated.

The basic assumption implied in the term "developmental reading" is that reading is a skill which is subject to improvement through practice. Patty and Ruhl²² believe that a program in developmental reading should be based on the concept of spaced, systematic training and practice. Virtually every set of materials designed for courses in reading improvement emphasizes the importance of practice. Reading specialists and persons responsible for college

²⁰Ausubel, p. 187.

²¹Ibid., p. 178.

²²William L. Patty and Robert G. Ruhl, The Need to Read (New York: American Book Company, 1968), pp. 1-2.

reading programs also affirm the value of practice. Typical of their comments is one made by Triggs:

If we want to improve a manual skill we don't teach him by having him read about that skill. We set up well-spaced practice periods and have him actually practice the skill in the prescribed way. This we must do in reading. We cannot expect results by a generalized approach which may or may not include the specific practice this student needs.²³

A program of reading improvement instruction reported by Jones called for instructor-directed study in spelling and vocabulary to be followed by outside classwork in specified materials.²⁴ Significant gains were made in both spelling and vocabulary. No attempt was made to relate these gains to any particular schedule of practice.

Mayhew and Weaver conclude that "There is some evidence that progress is roughly proportional to the number of practice sessions attended."²⁵ Again, however, no particular spacing or duration of practice sessions are specified.

²³Frances Oralind Triggs, "Appraisal of Reading Skills in Relation to Effectiveness of Teaching and Learning Techniques," Exploring the Goals of College Reading Programs, Fifth Yearbook of the Southwest Reading Conference (Fort Worth, Texas: Texas Christian University Press, 1956), p. 71.

²⁴Ernest A. Jones, "A Small College Reading Program," Techniques and Procedures in College and Adult Reading Programs, Sixth Yearbook of the Southwest Reading Conference (Fort Worth, Texas: Texas Christian University Press, 1957), pp. 7-15.

²⁵Jean B. Mayhew and Carl H. Weaver, "Four Methods of Teaching Reading Improvement at the College Level," Journal of Developmental Reading, III (Winter, 1960), pp. 75-83.

Ammons and Hieronymus describe the reading improvement program at the University of Iowa in 1944-45.²⁶ A group of 167 students in the lower half of the freshman class picked at random were required to attend classes. They were retested at the end of the training sessions and at the end of the school year. Of the remaining students in the lower half of the class, 42 were chosen for a control group. The experimental group made practical and significant gains in the final testing. A third group with more class meetings over a longer period made similar but smaller gains on retesting.

Entwisle reviews a number of study-skills courses.²⁷ She concludes that students wishing to take a study-skills course but prevented from doing so, and therefore presumably of comparable motivation to those enrolled, fail to show significant improvement. The implication is that motivation without systematic instruction and/or practice is not conducive to significant improvement. Another pertinent conclusion states that any gains noted will not necessarily be related to either the content or the duration of the course. There was no conclusive evidence that either the content or the

²⁶R. B. Ammons and A. H. Hieronymus, "Critical Evaluation of a College Program for Reading Improvement," Journal of Educational Psychology, XXXVIII (December, 1947), 449-470.

²⁷Doris R. Entwisle, "Evaluation of Study-Skills Courses-A Review." Journal of Educational Research, LIII (March, 1960), 249.

period of time spent in the course rendered one course superior to another.

Another study which relates the number of sessions attended to the achievement gains was conducted by Pinnock and others.²⁸ The subjects were functional illiterates participating in a government-sponsored program. It is reported that the older group which met three times a week showed an average increase of 1.5 years; the younger group, which met only twice a week showed 0.7. However, an uncontrolled variable, a small competitive cash incentive, doubtlessly played a role in causing the difference.

One of the more relevant studies with regard to the effect of practice in college reading programs is one reported by Magson and others.²⁹ They describe a reading and study skills program at the University of Maryland in which there was optional attendance of practice sessions. The results indicate that gains in reading speed appear to be a function of the number of practice sessions attended. Groups which practiced "three or four times" according to handouts containing practice suggestions to be followed for a week had higher post-test rate and greater gain than did

²⁸Theo J. Pinnock and Others, "Results of an Exploratory Study of Functional Illiterates in Macon County, Alabama," Adult Education, LVII (Summer, 1967), 243.

²⁹Maxwell Magson and Thomas M. Magoon, "A Description of the University of Maryland's Reading and Study Skills Laboratory," Journal of Developmental Reading, V (Spring, 1962), 182-188.

groups which reported practicing "once or twice" or "every day."

This review of literature has revealed support for practice as a necessary ingredient in learning. Systematic practice is favored over incidental practice. Both initial learning and retention are enhanced by frequent, motivated, spaced, and rewarded trials.

Despite recurring statements in the literature about the importance of practice in reading improvement programs, there is little evidence of systematic provision for practice. Nor is there evidence of a clear definition of what constitutes "well-spaced" practice. It is apparent that while many college reading programs do incorporate the practice variable, there is a need for guidelines in the scheduling of practice sessions for optimal results.

CHAPTER III

THE PROBLEM

This investigation was conducted to determine if differing schedules of practice have a significant effect on the reading achievement of male college students enrolled in a course in developmental reading. Four dependent variables were selected to reflect performance: vocabulary, comprehension, reading rate, and spelling.

The Hypotheses

The experimental concern of this study was to determine if different schedules of practice would result in significantly different achievement within the context of a reading skill development course. This study was also concerned with the reading skill gains of the students as reflected by the difference between mean pre- and mean post-test performance on each of four dependent variables selected to reflect achievement. Accordingly, hypotheses of no significant difference between mean pre- and post-test performance were tested for each of four groups on each of the reading sub-skills: vocabulary, comprehension, reading

rate, and spelling. Each hypothesis was tested at the .05 level of significance.

To determine if there were significant differences among the four groups with respect to their achievement in vocabulary, comprehension, reading rate, and spelling, the following hypotheses were tested at the .05 level of significance.

- Ho₁: There is no significant difference among the four groups with respect to mean post-test scores on vocabulary as measured by the Nelson-Denny Reading Test.
- Ho₂: There is no significant difference among the four groups with respect to mean post-test scores on comprehension as measured by the Nelson-Denny Reading Test.
- Ho₃: There is no significant difference among the four groups with respect to mean post-test scores on reading rate as measured by the Nelson-Denny Reading Test.
- Ho₄: There is no significant difference among the four groups with respect to mean post-test scores on spelling as measured by the Metropolitan Achievement Test - Advanced (sub-test spelling).

Subjects

All Central State College students who were enrolled in those eight sections of "Developmental Reading" which were taught by the investigator during the fall semester of 1968 comprised the population of this study. The students who enrolled did so without prior knowledge that they would be involved in an experimental program. The course was offered for two hours elective credit and was open to anyone who desired to improve his reading skills. The size of the classes was limited to a maximum of 22.

The total number of students enrolled was 150: 108 males, and 42 females. The students were told at the beginning of the course that they would be participating in an experimental program, the purpose of which would be to determine future practice requirements of the course. In order to maintain good rapport with and to obtain maximum cooperation from the students who would comprise the experimental sample, all students were requested to participate in the experimental program. The students were randomly assigned, by means of the Table of Random Numbers,¹ to one of four treatment groups.

In view of the fact that random assignment does not assure an equal distribution of the sexes among the groups,

¹William M. Meredith, Basic Mathematical and Statistical Tables for Psychology and Education (New York: McGraw-Hill, 1967), p. 315.

and considering that there was a preponderance of male students enrolled in the course, it was determined that only male students would be included in the experimental sample. This decision was made in order to control the possibility that the sex factor might have an effect on the mean achievement of the groups.

Other factors which might have affected the achievement of the groups were class attendance and practice session attendance. These factors were controlled by setting up arbitrary criteria of 70 per cent class attendance and 70 per cent practice participation for inclusion in the experimental sample.

Eighteen male students were eliminated because they failed to meet either one or both of the attendance and practice criteria. This left a total of 90 males: 22 in Group I, 23 in Group II, 20 in Group III, and 25 in Group IV. Three groups were reduced, by means of random elimination, to the size of the smallest group. Therefore, the experimental sample was comprised of 80 male students: 20 in each of four groups.

Instrumentation

The reading sub-skill variables were measured by the following tests:

Nelson-Denny Reading Test.² This is a survey test designed for high schools and colleges and serves predictive, screening, and broadly diagnostic purposes. There are two comparable forms of the test, each containing 100 items for measuring vocabulary and 36 items for measuring comprehension. The Vocabulary Test requires the student to choose the best one out of five words or phrases which corresponds in meaning to a given word or phrase. The time limit for this test is ten minutes. The Comprehension Test has eight selections, each followed by four multiple choice questions. The time limit for the Comprehension Test is twenty minutes. Reading rate is measured by noting the amount of material read from the first selection in one minute. There is an Examiner's Manual accompanying the test. The manual provides all the necessary information for administering and scoring the test. Scores are reported in terms of percentile ranks and norms are available for grades nine through sixteen, and for adults. The equivalent-forms method was used to derive the reliability coefficients of .93 for both vocabulary and reading rate, and .81 for comprehension. The mean validity indices for Forms A and B on the 100 item vocabulary test are 47.5 and 47.4 respectively. On the 36 item comprehension test the mean validity indices are

¹William M. Meredith, Basic Mathematical and Statistical Tables for Psychology and Education (New York: McGraw-Hill, 1967), p. 315.

44.5 and 45.3 for Forms A and B respectively.³ The comprehension passage selected for computing reading rate is neither the easiest nor the most difficult passage in the test.

Metropolitan Achievement Test (Sub-test spelling).⁴

This sub-test is a part of the Advanced Battery of achievement tests designed for grades seven through nine. Fifty words are dictated and the subjects write the words. There are five equivalent forms of this test. Scores are reported in standard scores, grade equivalents, and age equivalents. The corrected (Spearman-Brown formula) split-half reliability coefficient for this test is .94. No validity data were reported for this test in the examiner's manual.

The Nelson-Denny Reading Test was selected because of its high reliability, its ease of administration and scoring, and because it is considered to be one of the better tests of its kind.⁵ It was selected over other tests which also met these criteria primarily because of the

³Validity indices are approximation of the item-total score correlations obtained by means of the Flanagan Table ("Examiner's Manual," Nelson-Denny Reading Test, p. 25).

⁴Richard D. Allen and Others, Metropolitan Achievement Test--Advanced Battery (Chicago: World Book Company, 1947).

⁵Oscar Krisen Buros (ed.) Sixth Mental Measurements Yearbook (Highland Park, New Jersey: Gryphon Press, 1965), pp. 800-801.

limited number of factors which it attempts to measure. Lennon reports that reading tests currently in use identify, or at least label, seventy or more separate reading skills. Yet, he finds through his review of factor analytic studies that separately identified sub-skills of reading are so closely related that they can be assumed to be nearly identical. He concludes that

. . . we may recognize and hope to measure reliably the following components of reading ability; (1) a general verbal factor, (2) comprehension of explicitly stated material, (3) comprehension of implicit or latent meaning, and (4) an element that might be termed "appreciation."⁶

The Metropolitan Achievement Test is one of a very few tests of its kind which includes a sub-test of spelling with norms appropriate for high school and college age students. The number of words administered (50) commended this test over other tests which administer fewer words.⁷ Other factors which commended the Metropolitan Achievement Test (sub-test spelling) were the ease of administration and scoring, and the high reliability.

Operational Definitions

For purposes of this experiment, reading was considered to consist of the measurable sub-skills of

⁶Roger Lennon, "What Can Be Measured?" The Reading Teacher, XV (March, 1962), pp. 326-337.

⁷Oscar Krisen Buros (ed.) Fourth Mental Measurements Yearbook (Highland Park, New Jersey: Gryphon Press, 1953), pp. 198-211.

vocabulary (knowledge of word meanings), comprehension (the ability to recall what was read), and reading rate (the speed of comprehension). These sub-skills were measured by the Nelson-Denny Reading Test.

Achievement was considered to be the level of proficiency in the sub-skills of reading and spelling demonstrated by the subjects on the post-tests administered at the conclusion of the experiment.

Practice consisted of supervised continuation and extension of activities which the subjects pursued during their regular class meetings (see Appendix A for a description of the course content).

The type of practice varied according to individual needs as determined by frequent progress checks made by the instructor and continuous feed-back from the progress records maintained by each subject.

Limitations

This investigation was limited to male college students who were enrolled in "Developmental Reading" at Central State College, Edmond, Oklahoma during the fall semester of 1968. The course is a nine-week course offered for elective credit. The experiment was run for two nine-week sessions. The period during which the experimental treatment was applied covered six weeks of each of the nine-week sessions. Only those male students who met a criterion

of at least 70 per cent compliance with the practice requirements of the experiment, and at 70 per cent class attendance were considered as a part of the experimental sample.

Ausubel stipulated four essential conditions for the meaningful mastery of material.⁸ The present study was conducted under the assumption that three of these conditions were met during the course of the experiment. These were: (1) that the learning tasks were potentially meaningful, (2) that the learners possessed a meaningful learning set, i.e., that they practiced with the intent to improve, and (3) that the learners possessed the necessary relevant background concepts. Ausubel's fourth condition, "that the number, distribution, sequence, and the organization of intra- and inter-task trials conform to empirically validated principles of efficient learning and retention," gave rise to this investigation.

Procedure

College students enrolled in "Developmental Reading" classes at Central State College, Edmond, Oklahoma, were given pre-tests on the reading sub-skills of vocabulary, comprehension, reading rate, and spelling. The Nelson-Denny Reading Test was administered to test vocabulary, comprehension and reading rate. The Metropolitan Achievement Test -

⁸David P. Ausubel, The Psychology of Meaningful Verbal Learning (New York: Grune and Stratton, 1963), p. 178.

Advanced Battery (sub-test spelling) was administered to test spelling achievement. These pre-tests were used to aid the instructor in planning the instructional program for each student. They were also used, along with the post-tests, to determine if significant gains in achievement had been made by the students. The pre-tests also provided an additional experimental control, along with the randomization of group assignments, of the equivalency of groups.

Following the pre-tests, and without regard to the scores obtained from these tests, the students were randomly assigned to one of four treatment groups:

Group I was that group which was assigned a practice schedule of five sessions per week, each session being twenty minutes in length.

Group II was that group which was assigned a practice schedule of two sessions per week, each session being fifty minutes in length.

Group III was that group which was assigned a practice schedule of three sessions per week, two of which were thirty-five minutes in length, and one of which was thirty minutes in length.

Group IV was that group which was not required to observe any practice schedule.

In addition to regular class attendance, each student was required to observe the out-of-class practice schedule to which he had been assigned for a period of six consecutive

weeks. This practice consisted of an extension and continuation of the activities with which the students had been involved in the regular class periods (see Appendix A for a description of the course content). It was specified that the practice be done within the confines of the college reading center between the hours of 7:30 a.m. and 5:30 p.m., Mondays through Fridays. Each student kept a record of his practice on a special form provided for the purpose (see Appendix B). This record was placed in the hands of either the instructor or the Reading Clinic secretary.

The practice records of each student were closely monitored by the instructor to insure maximum compliance. Only those male students who had records of at least 70 per cent compliance with the practice requirements and at least 70 per cent class attendance were considered as a part of the experiment.

At the conclusion of the course, an equivalent form post-test on the four variables of vocabulary, comprehension, reading rate, and spelling were administered to all the students. The post-test scores constituted the dependent variables in the experiment. These scores were used to determine if there were significant differences between the mean pre-test and mean post-test scores for all groups on all variables. They also provided the basis for comparison of achievement among the experimental groups.

Analysis of Data

The following is the sequence of steps followed in the statistical treatment of the data:

- (1) To determine if significant gains in achievement were made, i.e., if significant differences existed between pre- and post-test means, t tests for correlated data were applied to the mean scores obtained by all four groups on all four reading sub-skills. For each test the .05 level of significance was adopted for rejection of the null hypothesis.
- (2) To determine if significant differences existed among the four groups, four one-factor analyses of covariance were computed. The dependent variable in each of the analyses was the mean post-test score obtained by each group on the sub-skill: vocabulary, comprehension, reading rate, or spelling. The covariate, or control variable, in each case was the mean pre-test score obtained by each group on the same sub-skill. For each analysis the .05 level of significance was adopted for rejection of the null hypothesis. Prior to each analysis the test for homogeneity of variances was applied to each sample.

The covariance design was chosen in order to obtain more precise information on the treatment effects, and to equate the group means by the use of a supplementary and correlated measure.⁹ The supplementary and correlated measure in this investigation was the pre-test measure which was obtained prior to the application of the experimental treatment. The analysis of covariance design enables the adjustment, or "correction," of variability which may be due to differences

⁹ Joseph E. Hill and August Kerber, Models, Methods and Analytical Procedures in Education Research (Detroit: Wayne State University Press, 1967), p. 418.

between groups on the pre-test, thus isolating the differences which can be attributed to the treatment effects.

CHAPTER IV

RESULTS OF STUDY

The pre- and post-test scores were tabulated for each subject on all four reading sub-skills: vocabulary, comprehension, reading rate, and spelling. These scores were arranged according to group assignment (Appendix C), and group means and variances were computed for each sub-skill (Tables 1-4).

To test the problem hypothesis of no significant gain in achievement, t tests for correlated data were made for each of the four groups on each of the four reading sub-skills.¹ A comparison of the group means and variances, and t score values obtained from tests of differences between means for vocabulary may be seen in Table 1. Group I, which practiced 20 minutes every day, made a significant gain in vocabulary ($p. < .01$). Group II, which practiced 50 minutes twice a week, and Group III, which practiced 35 minutes once a week and 30 minutes twice a week, also gained significantly in vocabulary ($p. < .001$). Group IV, which did not

¹Norville Morgan Downie and R. W. Health, Basic Statistical Methods (New York: Harper and Brothers, 1959), pp. 127-136.

practice at all, gained in vocabulary, but the t score obtained did not reach the .05 level of significance. Thus, no significant gain in vocabulary may be inferred for Group IV. The hypothesis of no significant gain in vocabulary was rejected for Groups I, II, and III, and accepted for Group IV.

TABLE 1
MEANS, VARIANCES, and t RATIOS: VOCABULARY

	Group I (N = 20)	Group II (N = 20)	Group III (N = 20)	Group IV (N = 20)
Pre-Test	$\bar{x} = 30.15$ $\sigma^2 = 145.44$	$\bar{x} = 32.40$ $\sigma^2 = 192.65$	$\bar{x} = 33.15$ $\sigma^2 = 195.33$	$\bar{x} = 32.54$ $\sigma^2 = 116.95$
Post-Test	$\bar{x} = 35.65$ $\sigma^2 = 122.13$	$\bar{x} = 40.05$ $\sigma^2 = 184.35$	$\bar{x} = 37.25$ $\sigma^2 = 184.09$	$\bar{x} = 36.85$ $\sigma^2 = 156.60$
	$t = 3.87^*$	$t = 5.54^{**}$	$t = 4.55^{**}$	$t = 1.74$

*Significant beyond the .01 level 2.861.

**Significant beyond the .001 level 3.883.

On the sub-skill, comprehension, Groups I and II, which practiced 20 minutes every day and 50 minutes twice weekly respectively, made significant gains ($p < .05$). Group III, which observed a practice schedule of three sessions per week, also made a significant gain in comprehension ($p < .01$). Group IV, with no practice, made no significant gain in comprehension, and in fact sustained a loss over the

pre-test. The hypothesis of no significant gain in comprehension was rejected for Groups I, II, and III, and accepted for Group IV. The obtained means, variances, and \underline{t} scores are presented in Table 2.

All four groups were found to have \underline{t} ratios which were significant beyond the .001 level on the reading sub-skill of reading rate, which is to say that all four groups gained significantly in reading rate.

TABLE 2
MEANS, VARIANCES, and \underline{t} RATIOS: COMPREHENSION

	Group I (N = 20)	Group II (N = 20)	Group III (N = 20)	Group IV (N = 20)
Pre-Test	$\bar{x} = 34.80$ $\sigma^2 = 194.56$	$\bar{x} = 35.40$ $\sigma^2 = 96.04$	$\bar{x} = 39.60$ $\sigma^2 = 239.44$	$\bar{x} = 37.60$ $\sigma^2 = 113.04$
Post-Test	$\bar{x} = 42.10$ $\sigma^2 = 155.39$	$\bar{x} = 40.40$ $\sigma^2 = 65.44$	$\bar{x} = 45.60$ $\sigma^2 = 154.24$	$\bar{x} = 36.40$ $\sigma^2 = 68.64$
	$\underline{t} = 2.86^*$	$\underline{t} = 2.62^*$	$\underline{t} = 3.30^{**}$	$\underline{t} = -0.52$

*Significant beyond the .05 level 2.093.

**Significant beyond the .01 level 2.861.

Therefore, the hypothesis of no significant gain in reading rate was rejected for all four groups. The obtained means, variances, and \underline{t} scores are presented in Table 3.

The obtained means, variances, and \underline{t} scores for the reading sub-skill, spelling, appear in Table 4. Differences

between the pre- and post-test means of Groups I and II, which observed practice schedules of daily 20 minute sessions and bi-weekly 50 minute sessions respectively, were found to be significant beyond the .01 level of significance. Groups I and II made significant gains in spelling. Group III, which practiced three times a week, and Group IV, which did not practice, made no significant gain in spelling ($p. < .05$). The hypothesis of no significant gain in spelling was rejected for Groups I and II, and accepted for Groups III and IV.

TABLE 3
MEANS, VARIANCES, and t RATIOS: READING RATE

	Group I (N = 20)	Group II (N = 20)	Group III (N = 20)	Group IV (N = 20)
Pre-Test	$\bar{x} = 229.70$ $\sigma^2 = 4448.21$	$\bar{x} = 212.20$ $\sigma^2 = 5710.16$	$\bar{x} = 228.70$ $\sigma^2 = 7151.21$	$\bar{x} = 241.15$ $\sigma^2 = 5232.93$
Post-Test	$\bar{x} = 318.65$ $\sigma^2 = 4422.83$	$\bar{x} = 335.35$ $\sigma^2 = 10981.23$	$\bar{x} = 334.85$ $\sigma^2 = 8520.53$	$\bar{x} = 341.00$ $\sigma^2 = 7562.40$
	$t = 5.60^*$	$t = 7.38^*$	$t = 6.61^*$	$t = 5.51^*$

*Significant beyond the .001 level 3.883.

TABLE 4

MEANS, VARIANCES, and t RATIOS: SPELLING

	Group I (N = 20)	Group II (N = 20)	Group III (N = 20)	Group IV (N = 20)
Pre-Test	$\bar{x} = 27.30$ $\sigma^2 = 98.01$	$\bar{x} = 27.30$ $\sigma^2 = 141.81$	$\bar{x} = 25.40$ $\sigma^2 = 159.54$	$\bar{x} = 27.85$ $\sigma^2 = 112.73$
Post-Test	$\bar{x} = 29.35$ $\sigma^2 = 99.43$	$\bar{x} = 29.00$ $\sigma^2 = 149.00$	$\bar{x} = 27.30$ $\sigma^2 = 159.91$	$\bar{x} = 28.65$ $\sigma^2 = 107.13$
	$t = 3.25^*$	$t = 3.04^*$	$t = 1.78$	$t = 0.54$

*Significant beyond the .01 level 2.861.

To determine if significant differences in achievement existed among the four groups, four one-factor analyses of covariance² were computed. In each analysis the dependent variable was the group's mean post-test score on either vocabulary, comprehension, reading rate, or spelling. The covariate, or control variable, in each case was the group's mean pre-test score on the same sub-skill. Prior to each analysis each sample was examined to determine if it met the assumption of homogeneity of variance.³ No significant

²B. J. Winer, Statistical Principles in Experimental Design (New York: McGraw-Hill, 1962), pp. 568-592.

³Allen L. Edwards, Experimental Design in Psychological Research (New York: Holt, Rinehart and Winston, Inc., 1965), pp. 347-348.

differences were found between the variances of the samples, therefore, all variances were assumed to be estimates of the same population variance.

The covariance analysis for vocabulary in which the mean post-test scores were adjusted for the influence of the performance of the subjects on the pre-test is presented in Table 5.

TABLE 5
SUMMARY OF COVARIANCE ANALYSIS: VOCABULARY

Source	SS	df	MS	F
Treatments	106.51	3	35.50	1.16
Error	2285.80	75	30.48	
Total	2392.31	78		

An F-ratio of 1.16 was obtained for vocabulary. This value did not reach the criterion, 2.73, which represents the .05 level of significance. Therefore, H_{01} , which predicted no significant difference among the groups with respect to mean achievement in vocabulary, was accepted. This is to say that no particular practice schedule resulted in significantly different achievement among the groups with respect to vocabulary.

When the post-test means were adjusted for the influence of pre-test performance on comprehension, a significant difference among the groups was found to exist. The analysis is summarized in Table 6.

TABLE 6
SUMMARY OF COVARIANCE ANALYSIS: COMPREHENSION

Source	SS	df	MS	F
Treatments	792.07	3	264.02	4.17*
Error	4745.38	75	63.27	
Total	5537.45	78		

*Significant beyond the .01 level 4.06.

The covariance analysis of comprehension scores yielded an F-ratio of 4.17. This value exceeded the criteria for both the .05 level of significance (2.73) and the .01 level of significance (4.06). H_0 , which predicted no significant difference among treatment groups with respect to comprehension, was rejected, for there was a significant difference among the treatment groups with respect to comprehension. One or more of the treatment groups had obtained a mean post-test score on comprehension which was significantly different--either higher or lower--than the grand mean of the groups. Further

analysis was necessary to determine which of the groups was responsible for this difference. The summary of this analysis appears in Table 9.

The mean pre-test and post-test scores of the four treatment groups on the reading sub-skill, reading rate, were analyzed for differences among the groups. The summary of this analysis appears in Table 7.

TABLE 7
SUMMARY OF COVARIANCE ANALYSIS: READING RATE

Source	SS	df	MS	F
Treatments	8808.62	3	2936.21	0.55
Error	397464.87	75	5299.53	
Total	406273.49	78		

An F-ratio of 0.55 was found for reading rate. This value was less than the criterion of 2.73 for significance at the .05 level. Therefore, H_0 was accepted for there was no significant difference among the treatment groups with respect to reading rate. The different schedules of practice followed by the various groups did not result in significantly different achievement in reading rate.

Spelling scores were analyzed for differences among the treatment groups. The obtained F-ratio was 0.28, which

did not approach the .05 level of significance (2.73). H_{04} , which predicted no significant difference among the treatment group means with respect to spelling, was accepted. No schedule of practice resulted in achievement in spelling which was significantly different from that of any other group. The covariance analysis data for spelling are presented in Table 8.

TABLE 8
SUMMARY OF COVARIANCE ANALYSIS: SPELLING

Source	SS	df	MS	F
Treatments	16.37	3	5.46	0.28
Error	1463.07	75	19.51	
Total	1479.44	78		

The analyses of covariance revealed a significant difference among the four groups with respect to achievement in comprehension (see Table 6). In order to determine which group had a mean that was significantly different from the others, the post-test means had to be "adjusted" for each group because of covariate effects,⁴ and appropriate t tests applied. Table 9 is a summary of the adjusted treatment means for comprehension. The adjusted treatment mean for Group I

⁴Winer, pp. 590-592.

was found to be 43.27; for Group II, 41.23; for Group III, 44.03; and for Group IV, 35.97. The adjusted grand mean was 41.12. When the appropriate t test was applied to determine significance of difference between the adjusted treatment means of each group and the adjusted grand mean, only Group IV was found to be significant at the .05 level of significance. Thus, Group IV accounted for the difference among the groups with respect to achievement in comprehension. No group, other than Group IV, had a mean which was significantly different from the grand mean of the groups ($p < .05$). Group IV, which did not practice, made no gain; in fact this group sustained a loss in comprehension. While the groups which practiced did make significant gains in comprehension (see Table 2), the mean scores were not significantly different from each other.

Summary of Results of the Data Analysis

The t tests revealed significant gains, beyond the .05 level of significance, across the pre-test--post-test scores for Groups I and II in all four reading sub-skills: vocabulary, comprehension, reading rate, and spelling. Group III made a significant gain, beyond the .05 level of significance, in vocabulary, comprehension, and reading rate, but made no significant gain in spelling. Group IV made no significant gain in any of the sub-skills with the exception of reading rate, where a significant gain, beyond the .05

TABLE 9

TABLE OF ADJUSTED TREATMENT MEANS: COMPREHENSION

	Group I	Group II	Group III	Group IV	Grand Means
Pre-Test \bar{X}_j	34.80	35.40	39.60	37.60	$\bar{X} = 36.85$
$\bar{X}_j - \bar{X}$	-2.05	-1.45	2.75	0.75	
Post-Test \bar{Y}_j	42.10	40.40	45.60	36.40	$\bar{Y} = 41.12$
Adjusted Post Test	43.27	41.23	44.03	35.97*	$\bar{Y}' = 41.12$

*Significant at .05 level of significance.

level of significance, was made. The groups which practiced made significant gains in vocabulary, comprehension, and reading rate. The group which did not practice gained significantly only in reading rate.

The analysis of covariance revealed a significant difference among the four groups with respect to comprehension only. When the comprehension means were adjusted for covariate effects and the appropriate t test was applied, Group IV alone, the group which did not practice, was found to have a mean which was significantly different from the other three groups. The mean of Group IV was significantly lower than the means of the other groups. This finding favors practice over non-practice for achievement in comprehension.

CHAPTER V

SUMMARY, FINDINGS AND CONCLUSIONS, AND RECOMMENDATIONS

Summary

Learning theorists have identified and experimentally verified the conditions of learning. Their findings have implications for the classroom teacher who must arrange the learning environment so that instructional goals may be achieved. There remains the task, which educators must assume, of formulating and testing hypotheses regarding the applicability of the findings of learning research to specific situations.

Research studies have supported the concept that practice plays an important role in the acquisition and maintenance of skills. Studies have also indicated that certain schedules of practice are more effective than others for certain kinds of learning tasks. This study was conceived for the purpose of providing some experimental data which might aid the teacher of college developmental reading courses in structuring the learning environment for maximum student achievement.

The subjects of this study were male students enrolled in a college developmental reading course. The learning tasks involved the acquisition and improvement of reading skills. Four pre-tests were administered to provide for experimental control of the equivalency of treatment groups. The subjects were randomly assigned to one of four different practice schedules. The four treatment effects investigated by analysis of covariance were:

Group I--five practice sessions per week. Each session was twenty minutes in length.

Group II--two practice sessions per week. Each session was fifty minutes in length.

Group III--three practice sessions per week. Two of the sessions were thirty-five minutes long and one was thirty minutes long.

Group IV--no required practice.

Learning performance was measured by post-test scores on the four dependent variables: vocabulary, comprehension, reading rate, and spelling.

Findings and Conclusions

The results of t tests of significance between mean pre-test and mean post-test performance revealed that Groups I, II, and III--the groups which practiced--made significant gains, beyond the .05 level of significance, in the reading sub-skills of vocabulary, comprehension, and

reading rate (Tables 1, 2, and 3). Group IV, which did not practice, gained significantly only in the area of reading rate (Table 3). These findings indicate that students who practice perform significantly better in vocabulary and comprehension skills than do students who do not practice. Reading rate was significantly improved by all students whether they practiced or not. A possible explanation of these findings follows.

Experience with the nature of the reading process and with college students who enroll in reading improvement courses indicates that the area most susceptible to change in the direction of gain is the area of reading rate. This conclusion is based on the observation that students are often highly motivated to increase their reading speed. They demonstrate a strong tendency to equate reading speed with being a "good reader."

Because of this predisposition toward speed in reading, and perhaps because of the nature of the sub-skills themselves, time and experience are required for students to achieve a balance between reading speed and the desired level of comprehension. In the beginning, untrained students often sacrifice gains in vocabulary and comprehension in order to achieve greater speed. With time and practice they come to associate reading speed with "rate of comprehension." They recognize that speed alone, without comprehension, merely causes them to misunderstand faster. Also, with time and

practice, students learn to achieve a flexibility of reading rate to fit the nature of the material and the purpose for which they are reading.

In view of the results of the study and the nature of the process involved in reading improvement, it seems plausible to conclude that Group IV made a significant gain in reading rate at the expense of gains in other skill areas. This group failed to make significant progress in vocabulary and comprehension because a nine-week course (the length of the course under investigation) without the benefit of extra practice sessions to reinforce and extend learnings was insufficient for balanced gains to be achieved.

The t tests of significance between pre-test and post-test performance in vocabulary, comprehension, and reading rate lead to the following conclusions: (1) Significant improvement in vocabulary, comprehension, and reading rate is a function of practice, whereas a lack of significant gain is related to a lack of practice. (2) Significant gain in reading rate, when accompanied by a lack of significant gain in other reading skills, is a function of class attendance alone.

Groups I and II were found to have made small but significant gains (beyond the .01 level of significance) in spelling; Groups III and IV made no significant gains (Table 4) in spelling. These findings cannot be attributed to practice or lack of practice, for Group III did practice.

Nor can the results be attributed to the treatment effects of distribution of practice, for an analysis of covariance revealed no significant difference among the groups. Therefore, it must be concluded that significant gains in spelling for Groups I and II and the lack of significant gains for Groups III and IV are attributable to some uncontrolled variable. Two possible explanations are offered which may point the way for further research.

The size of the gains made (Table 4) suggests the possibility that spelling skills of adults are highly resistant to change. Another possibility, which is related to the first, is that in order for change in spelling ability to occur more time is needed for direct attack on spelling deficiencies than is available in a nine-week college course in which spelling is only one of several skills being taught. These suggestions are offered as hypotheses for further testing.

The analysis of covariance revealed no significant differences among the four treatment groups in any sub-skill except comprehension (Table 6). Further analysis showed Group IV to account for the significant difference among the groups with respect to comprehension (Table 9). This significant difference (beyond the .01 level) was due to a loss; not a gain (Table 2). Group IV's loss in comprehension may be related to its gain in reading rate, and both may be

related to the combination of the brevity of the course and the lack of practice as previously postulated.

The hypotheses of no significant difference in achievement in vocabulary, comprehension, reading rate, and spelling among the four groups were not supported by the evidence. The conclusion is that no particular schedule of practice--daily twenty-minute practice sessions, bi-weekly sessions of fifty minutes each, tri-weekly sessions totaling 100 minutes, or no scheduled practice--emerged as significantly superior to any other schedule in terms of superior achievement in reading and spelling. However, the t tests do clearly indicate that practice, distributed in any one of the three ways specified in this study, is superior to no practice at all.

Recommendations

The following recommendations are offered for classroom practice and further research:

1. That more attention be given to the direct teaching of spelling skills.

2. That a study be made of student-directed, self-help learning experiences in spelling as compared with a method of direct teaching of spelling patterns.

3. That consideration be given to the experimental validation of instructional goals which are commensurate with the amount of time available for their attainment.

4. That college reading improvement courses require that regular laboratory practice sessions be observed in addition to the time a student spends in class.

APPENDIX A

Developmental Reading

Central State College Reading Laboratory
Edmond, Oklahoma

The course, "Developmental Reading," at Central State College is designed for college students desiring to improve reading, vocabulary, spelling, and study skills. It includes complete reading diagnoses and developmental training with emphasis on individual therapy to improve particular weaknesses. The class meets five periods per week for nine weeks. The course is for elective credit only.

According to individual needs, and at the option of the instructor, students are requested to purchase one or more of the following materials:

EDL Listen and Read Workbook. Huntington, New York: Educational Development Laboratories, 1962.

EDL Skimmer and Scanner Workbook. Huntington, New York: Educational Development Laboratories, 1963.

Lewis, Norman. How to Read Better and Faster. New York: Thomas Y. Crowell Company, 1958.

Lewis, Norman. Word Power Made Easy. New York: Pocketbooks, Inc., 1953.

McCorkle, Julia Morton. Learning to Spell. Boston: D. C. Heath Company, 1953.

Staton, Thomas F. How to Study. Nashville: McQuiddy Printing Company, 1968.

Weber, Christian Oliver. Reading and Vocabulary Development. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1958.

The following equipment and materials are furnished in the classroom for all students:

EDL Listen and Read Program--tape library and ear-phones.

EDL Skimmer and Scanner texts and machines.

EDL Controlled Readers and film library.

Simpson, Elizabeth A. SRA Better Reading Books 1, 2, and 3. Chicago: Science Research Associates, 1951.

SRA Better Reading Progress Folder.

SRA Reading Accelerators.

SRA Reading for Understanding.

SRA Reading Laboratory.

Craig Reader--program and machines. Los Angeles: Craig Research Corporation.

SVE projectors and film library.

Miscellaneous programmed texts, workbooks, and mimeographed material.

The major portion of the first week of the course is devoted to diagnostic testing. The following tests are administered:

Nelson-Denny Reading Test.

Metropolitan Achievement Test--Advanced Battery
(sub-test spelling)

Self-Analysis of Reading Habits (mimeographed form)

Keystone Visual Survey (for students who have not had a recent eye examination).

These tests are scored and the results are consolidated on a reading diagnosis report form. All the materials are

stapled in a file folder bearing the student's name. This file is kept at the student's desk during the course for his use in keeping all subsequent records connected with his class work readily accessible. At the conclusion of the course the file is placed in the College Reading Laboratory permanent files. A carbon copy of the consolidated diagnosis, together with a cover letter, and "Some Suggestions for More Efficient Reading" are also placed in the file. This is the student's copy which he may take with him. Certain paragraphs of the "Suggestions" pamphlet are marked for the student's special attention as these sections relate to his responses to the Self-Analysis questionnaire.

During the second week of classes, with his file before him, the student participates in class discussion of the diagnostic data. General recommendations are made for the most advantageous use of class and practice time. Appointments are made for individual student conferences when the instructor or the student feels that the general class discussion is not sufficient for understanding.

The major portion of the balance of the course time is spent in individualized self-help activities which are continually monitored and evaluated by the instructor. As the instructor observes common needs, small groups may be formed for the purpose of providing brief periods of direct teaching or reinforcement of specific skills.

In addition to making use of the classroom materials and equipment, the student is required to bring to class each day an outside reading book of his choice. This book is to be a novel or non-fiction book which is at the student's recreational reading level and is of high interest to the student. The students are strongly encouraged to read approximately 300 pages each week from this kind of material.

APPENDIX B

Name _____ Date _____ Time: From _____ To _____

Total Practice Time _____

Nature of Practice _____

APPENDIX C

RAW SCORES

GROUP I (N = 20)

<u>Number</u>	<u>Vocabulary</u>		<u>Comprehension</u>		<u>Reading Rate</u>		<u>Spelling</u>	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
1	23	36	40	34	226	245	26	29
2	34	37	38	38	250	379	36	38
3	28	30	34	28	140	141	12	18
4	56	60	56	62	238	327	44	48
5	39	39	46	50	262	299	34	34
6	37	42	40	36	245	275	34	32
7	46	44	48	58	238	309	41	42
8	36	39	40	54	216	344	40	33
9	32	37	30	44	195	333	13	13
10	26	28	22	34	226	257	35	39
11	20	31	46	42	262	368	30	31
12	27	39	30	34	298	356	9	16
13	38	41	44	52	250	319	32	36
14	17	27	10	12	150	226	26	24
15	13	14	12	40	150	368	21	21
16	32	32	40	50	238	425	20	25
17	51	58	62	56	407	425	42	46
18	12	38	18	56	115	319	21	25
19	14	16	18	24	327	368	20	18
20	22	25	22	38	161	290	20	19

RAW SCORES

GROUP II (N = 20)

<u>Number</u>	<u>Vocabulary</u>		<u>Comprehension</u>		<u>Reading Rate</u>		<u>Spelling</u>	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
1	50	57	36	40	195	333	32	36
2	29	44	34	42	174	403	37	38
3	65	69	54	50	491	615	35	36
4	31	38	42	32	226	309	32	38
5	24	32	34	38	174	235	16	18
6	25	31	34	30	174	279	10	11
7	33	41	28	40	207	379	44	44
8	20	21	28	34	140	117	22	21
9	55	63	44	52	207	309	48	47
10	27	30	30	44	195	299	33	37
11	22	26	20	36	150	235	16	15
12	21	38	18	36	174	290	7	7
13	27	37	40	30	238	450	23	29
14	20	37	34	46	185	257	26	29
15	30	35	32	36	140	245	15	17
16	57	54	50	44	309	379	41	45
17	45	61	50	64	216	368	44	45
18	20	26	20	32	161	499	27	30
19	15	22	44	42	238	327	11	14
20	32	39	36	40	250	379	27	23

RAW SCORES

GROUP III (N = 20)

<u>Number</u>	<u>Vocabulary</u>		<u>Comprehension</u>		<u>Reading Rate</u>		<u>Spelling</u>	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
1	36	41	50	60	216	309	7	11
2	31	37	18	38	74	299	38	35
3	44	50	48	52	359	356	40	47
4	17	24	22	40	226	235	28	23
5	39	37	46	48	298	327	25	24
6	35	42	60	56	287	319	33	39
7	22	27	42	36	150	309	34	35
8	41	40	42	44	250	356	39	35
9	19	22	16	34	174	290	9	11
10	29	30	44	38	238	344	19	24
11	43	44	54	64	275	511	24	35
12	59	70	68	64	262	379	46	44
13	14	19	28	38	207	290	3	6
14	42	45	58	64	287	368	40	42
15	30	35	32	42	185	327	15	26
16	22	22	24	24	128	344	12	8
17	16	28	30	32	226	309	22	21
18	70	69	58	66	426	615	41	44
19	28	31	36	38	238	257	18	23
20	26	32	16	34	68	153	15	13

RAW SCORES

GROUP IV (N = 20)

<u>Number</u>	<u>Vocabulary</u>		<u>Comprehension</u>		<u>Reading Rate</u>		<u>Spelling</u>	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
1	25	19	32	28	298	257	33	33
2	33	33	18	30	195	245	40	36
3	36	42	40	42	262	309	28	30
4	41	53	54	50	226	299	38	35
5	27	31	38	24	185	309	30	24
6	52	46	30	56	396	449	25	24
7	49	54	48	46	259	524	46	46
8	39	47	44	38	262	356	16	19
9	58	50	52	44	275	368	43	42
10	46	44	42	46	195	438	36	32
11	36	35	36	32	226	235	27	31
12	33	39	24	26	195	333	38	36
13	27	41	38	38	207	290	16	15
14	40	44	56	34	207	279	28	42
15	36	35	50	36	287	438	16	38
16	28	32	28	23	226	475	26	24
17	24	33	26	32	185	413	25	25
18	17	10	26	32	195	344	1	4
19	19	23	24	30	226	245	26	23
20	23	26	36	30	216	214	19	14

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