

UNIVERSITY *of* DETROIT

EXCERPT from the GRADUATE BULLETIN, 1935 - 1937

Page Nine



Use of Theses and Thesis Materials. The University of Detroit always encourages, and even urges, the use of theses, thesis materials, and term papers submitted to instructors or departments of the University in partial fulfillment of the requirements for credit or degrees. Such use may be oral (before meetings or conventions) or through publication (periodicals, monographs, or books.) However, as such theses, thesis materials, and term papers become the property of the University once they are submitted, -- it is expected that the permission of the University be secured for such oral or printed use, and a suitable credit line arranged. This permission, and arrangement of credit line, should also be observed in the case of the publication of materials which the student intends to use later in partial fulfillment of the requirements for credit or degrees. Failure to observe such courtesy may be followed by the withdrawal of the credit or degree.

Application for the use of materials and arrangements mentioned must be made with the Graduate Office of the University of Detroit.

Casper, James Burton

A Study of the Relationship
Between Intelligence and
Improvement in Rate of Reading
and Comprehension in a
Program Utilizing the Harvard
Reading Films.

1950.

Date submitted: July 5, 1950

Department: Psychology

Approved

Clair L. Noyes
Examiner

Charles G. Weingart, P. I.

Examiner

Alexander A. Schmaier

Adviser

Allan P. Farrell, S. J.

Dean

Examination: July 7, 1950

Accepted: July 7, 1950

THE UNIVERSITY OF DETROIT

A STUDY OF THE RELATIONSHIP BETWEEN INTELLIGENCE
AND IMPROVEMENT IN RATE OF READING AND COMPREHENSION
IN A PROGRAM UTILIZING THE HARVARD READING FILMS

A THESIS
SUBMITTED TO THE GRADUATE FACULTY IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

DEPARTMENT OF PSYCHOLOGY

BY

JAMES B. CASPER

117458

DETROIT, MICHIGAN

AUGUST, 1950

TPS
C 27

ACKNOWLEDGMENT

The writer wishes to express his appreciation to Dr. Claude L. Nemzek, Director of the Department of Education, Dr. Alexander A. Schneiders, Director of the Department of Psychology, and Father Charles A. Weisgerber, S. J., Ph. D., Assistant Professor of Psychology, all at the University of Detroit, for their invaluable assistance and suggestions.

Gratitude is also expressed to the students of the University of Detroit whose cooperation made this study possible, and to my sister, Virginia Casper, for her assistance in typing the original manuscript.

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION.	1
II. RELATED STUDIES	10
III. PROCEDURE AND RESULTS	20
IV. SUMMARY AND CONCLUSIONS	41
BIBLIOGRAPHY.	49

LIST OF TABLES

Table	Page
I. Coefficients of Correlation Between Total Initial Intelligence Scores and Gains in Diagnostic Reading Tests Scores.	27
II. Correlations Between Total Initial Intelligence Scores and Differences in Harvard Reading Course Tests Scores. . . .	27
III. Coefficients of Correlation Between Total Final Intelligence Test Scores and Gains in Diagnostic Reading Test Scores	29
IV. Coefficients of Correlation Between Total Final Intelligence Scores and Differences in Harvard Reading Course Tests Scores	30
V. Coefficients of Correlation Between Gains in Rate of Reading and Comprehension of the Diagnostic Reading Tests	33
VI. Coefficients of Correlation Between Diagnostic Reading Tests Scores and Harvard Reading Course Tests as an Indication of Consistency	34
VII. A Comparison of Initial and Final Rate of Reading Scores Based on the Diagnostic Reading Tests and Harvard Reading Course Tests.	36
VIII. A Comparison of Initial and Final Comprehension Scores Based on the Diagnostic Reading Tests and Harvard Reading Course Tests.	37
IX. A Comparison of Initial and Final Intelligence Scores After Participation in a Reading Program.	39

CHAPTER I

INTRODUCTION

A review of the literature reveals a great increase in interest in reading techniques and remedial work since the beginning of the Twentieth Century. Research in problems of reading has been predominantly concerned with difficulties occurring at the grade school and high school levels. Reading studies have been largely determined by the principle that the correct time to train students properly in reading is in childhood, or at the latest, in early adolescence. Laboratory research in intelligence, eye movements, defective optic mechanisms, emotional instability and the like have provided much valuable information regarding aspects of the reading process.

It is however common knowledge that many students in college have reading disabilities of varying degrees of seriousness. College students have a need for reading and study-practices in nearly every aspect of their curriculum. They are in need of guidance in both their compulsory and voluntary reading; and they often need special remedial work. Many studies have been made in the last ten years with the aim in mind to aid the college student in reading more rapidly and efficiently. Interest has been stimulated in

types of reading disabilities and their diagnosis. Remedial programs have been instituted to correct deficiency in comprehension, vocabulary, rate of reading and eye movements. Reading clinics have been organized in colleges so that individualized training may be given. Progress has definitely been made in problems in reading at the college level.

In addition, many mechanical instruments have been devised to aid in reducing reading difficulties. A few of these instruments are the Metronoscope, Tachistoscope, Flashmeter, and Harvard Reading Films. All have a common purpose, that of improving the fixation span of the reader. There is a divergency of opinion regarding the value of these instruments in a reading program. Traxler, in an article dealing with the value of controlled reading, indicates a lack of clear-cut evidence either favorable or unfavorable to controlled reading.¹ Nevertheless, he feels that the results from the use of these instruments is favorable to the use of controlled reading. Further research is necessary to indicate the true value of these instruments. Since the Harvard Reading Films were utilized in this reading program, a comparison of the initial and final reading scores of the subjects might serve to give a slight indication of the value of this instrument.

Investigations have been conducted to discover different factors influencing the reading process. Such factors as vision, color-blindness, hearing, speech defects, physical

1. Arthur Traxler, "Value of Controlled Reading," Journal of Experimental Education, XI (October, 1943), 280-292.

fitness, defects of imagery, hand-and-eye-dominance, eye movement, emotional instability, and intelligence have been explored to note their influence in the process of reading. It is the purpose of this study to investigate the relationship of intelligence to improvement in rate of reading and comprehension in a program utilizing the Harvard Reading Films. Correlating the data obtained from an intelligence test and two reading tests given both before and after the film and reading selections should result in an indication of the degree of relationship between intelligence and rate of speed and comprehension.

If the obtained correlations are substantial or high then it may be possible to predict the degree of gain that a student might make in improving his reading ability. Evidence will be presented to indicate the limitation intelligence sets upon the college student's capacity to improve rate of reading and comprehension.

Should the results reveal a negligible relationship between intelligence and improvement in reading ability, then it may be possible that other factors are influencing the reading process. Such factors should then be explored to indicate their relationship to reading. Other mechanical instruments might be used to explore these factors more fully. There are many possibilities for exploration in reading problems at the college level. It is hoped that this study

will contribute to the increasing amount of knowledge regarding the reading habits of college students.

Definitions of Intelligence

There are almost as many definitions of intelligence as there are books dealing with the subject. A review of the literature indicates a noticeable lack of agreement concerning the nature of intelligence. It is doubtful whether any existing definition is entirely correct. However, many are valuable contributions to a more adequate understanding of this capacity in man we call intelligence.

In 1921 a group of investigators in the field of intelligence contributed to a symposium conducted by the editors of the Journal of Educational Psychology.² Needless to say a wide divergence of opinion regarding the nature of intelligence existed. E. L. Thorndike believed that intellect in a general way may be defined as "the power of good responses from the point of view of truth or fact."³ Pintner held to the idea of intelligence as "the ability of the individual to adapt himself adequately to relatively new situations in life."⁴ Terman said "an individual is intelligent in proportion as he is able to carry on abstract thinking."⁵ Calvin stated that "an individual possesses intelligence in so far as he has learned, or can learn to adjust himself to

2. Symposium: "Intelligence and its Measurement," Journal of Educational Psychology. 12 (1921), 123-147, 195-216.

3. Ibid., p. 124.

4. Ibid., p. 139.

5. Ibid., p. 128.

his environment."⁶ Henmon was of the opinion that intelligence is "intellect plus knowledge."⁷ Peterson indicated that "intelligence seems to be a biological mechanism by which the effects of a complexity of stimuli are brought together and given a somewhat unified effect in behavior."⁸ Thurstone described intelligence as containing at least three different components: "a) the capacity to inhibit an instinctive adjustment; b) the capacity to redefine the inhibited instinctive adjustment in light of imaginably experienced trial and error; c) the volitional capacity to realize the modified instinctive adjustment into overt behavior to the advantage of the individual animal."⁹

In 1927 Thorndike developed a descriptive definition of intelligence. His classification included "operations such as we may call attention, retention, recall, recognition, selective and rational thinking, abstraction, generalization, organization, inductive and deductive reasoning, together with knowledge and learning in general."¹⁰

Recently the investigators of intelligence have statistically analyzed standardized test results in a search for group factors. Thurstone mentions seven primary factors contributing to successful performance in testing situations.

6. Ibid., p. 136.
7. Ibid., p. 195.
8. Ibid., p. 198.
9. Ibid., p. 202.
10. E. L. Thorndike, The Measurement of Intelligence, p. 22.

These factors are number facility, word fluency, visualization or imagery, general memory, perceptual speed or discrimination, induction, and verbal reasoning or deduction.¹¹

Wechsler, who has developed an excellent test for the measurement of intelligence, says that "Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment."¹²

Lastly we have a treatment of intelligence which attempts a synthesis of the salient points of the definitions already reviewed. Schneiders and O'Brien say that

"The term intellect refers to that particular capacity in the human organism by virtue of which he thinks, abstracts, reasons, generalizes, and judges. Intelligence, on the other hand, may be regarded as a quality of human response which is determined by the governance of intellect. Thus when an individual adapts to new situations efficiently, solves problems readily, and otherwise manifests intellectuality, we say that he is behaving intelligently. Intelligence, then, is neither an entity nor a faculty, but the express manifestation of a capacity."¹³

Rate of Reading and Comprehension

Research indicates that there is a wide range of opinion regarding the nature of reading and comprehension in the reading process. Fortunately there is enough agreement

11. L. L. Thurstone, "A New Conception of Intelligence," Educational Record, XXXVII (1936), 441-450.

12. David Wechsler, The Measurement of Adult Intelligence, p. 3.

13. Alexander A. Schneiders and Marguerite J. O'Brien, Introductory Psychology, pp. 184-185.

about the general aspects of reading so that a satisfactory picture of the reading process has emerged.

Burkart sent a questionnaire consisting of a list of 214 distinct reading abilities to 109 reading specialists.¹⁴ She requested that they rate the abilities according to their importance. She concluded from her study that reading is not a single act but is a complex activity made up of many abilities. These abilities are motor, sensory or intellectual in nature. The results of the questionnaires show clearly that educators tend to consider the motor and sensory aspects of reading as relatively unimportant, or at least, of less importance than the mental or intellectual aspects. Speed of reading and comprehension of reading rank second and fourth respectively in importance among all reading abilities. Both are thought of as being highly desirable attributes of the reading process.

The development of satisfactory reading comprehension is of great importance to any student. Adequate comprehension of printed material depends in large part on an individual's ability to adapt to the needs of different situations. Harris indicates a definite need for training in specific comprehension skills. His list of such skills includes: skimming to find answers to specific questions, skimming to

14. K. H. Burkart, "An Analysis of Reading Abilities," Journal of Educational Research, (February, 1945) XXXVIII, 432-439.

get a total impression, reading to grasp the main idea, reading to follow a sequence of events, reading to note and recall details, ability to follow printed directions, development of critical reading ability, and remembering what one has read.¹⁵ Gates lists nine factors involved in reading comprehension. They are similar to the factors outlined by Harris. As specific purposes of reading for comprehension, Gates includes: reading to get the main idea, to note significant details, to note and remember precise directions, to predict what comes next, to evaluate material, to reproduce material in summarized form, to compare one selection with another, and to remember.¹⁶

Rate of reading may be described in terms of the amount of printed material covered in a certain time. It is usually expressed in words per minute. Educators have been interested in discovering its relation to comprehension. Needless to say there is a divergence of opinion regarding this aspect of reading. Many authors are of the opinion that rate of reading and comprehension have a direct influence on one another. They believe that a student can maintain a high level of comprehension while increasing his rate of reading. Others believe that rate of reading can be increased without

15. Albert J. Harris, How to Increase Reading Ability, p. 380 ff.

16. A. I. Gates, The Improvement of Reading, p. 358 ff.

having an adverse effect on comprehension only when the printed material is relatively easy to digest. Tinker states that speed of reading cannot be divorced from comprehension and still remain a measure of reading performance. He feels that speed of reading must be considered as rate of comprehending what is read. Tinker says that rate of reading varies with the kind of material involved.¹⁷ Triggs declares that fast reading is not necessarily good reading. She says that many educators fear that increasing speed will result in loss of comprehension. Triggs indicates that such an attitude is not justified by the facts. The successful student is proof that rate of reading and comprehension are not incompatible. The faster reader must concentrate more, and therefore gains more from his reading.¹⁸ It is the opinion of the present writer that rapid reading is necessary for the completion of college subjects where the emphasis is put on extensive rather than intensive reading.

17. Miles A. Tinker, "Dr. Robinson on Speed Versus Comprehension in Reading: A Discussion," The Journal of Educational Psychology, XXXI (October, 1940), 559-560.

18. Frances O. Triggs, Remedial Reading, p. 82.

CHAPTER II

RELATED STUDIES

Within the past twenty years many studies have been made to analyze various skills and abilities of the reading process. Many of these studies have dealt with improvement in rate of reading. Some have investigated the relationship between rate of reading and comprehension. Several research programs have studied the effect of training in reading on intelligence. And still others have observed the relationship between intelligence and reading ability. These research projects have resulted in an increase in factual data concerning the process of reading.

Improvement In Rate Of Speed

Dearborn and Wilking conducted a series of three experiments at Harvard University using reading films as a technique for improving speed of reading. In the first experiment a group of 16 students was given class instruction in reading techniques for a period of eight weeks. Reading films were used to teach phrasing and increase reading span. The students were also given practice in reading phrases of gradually increasing length. The median rate of the group increased from 251 to 382 words per minute.

Sixty-six students were used in the second experiment. They met one hour a day, five days a week, for four weeks.

Reading films were used as a major part of the experiment. Textbooks and literary materials were used to provide supplementary work on speed and comprehension. The median rate of this group increased from 248 to 333 words per minute.

In the third experiment, a group of 30 students met for fifty minutes a day, three days a week, for a total of six weeks. Films run at a rate of speed varying from one hundred fifty to four hundred words per minute were used. In addition a corrective reading manual was utilized. This third group increased in rate of reading from 213.04 to 316.7 words per minute.¹

Another study dealing with the improvement of reading rate using the Harvard Reading Films has been reported by Glock. The primary purpose of this study was to determine the effectiveness of three methods of training in correcting eye-movements and improving reading rate. The materials used were the Harvard Reading Films, experimental films, and printed material. Glock states that improvement was made in reading rate by using all three methods. The study indicates that rate of reading and rate of comprehension are improved by use of the Harvard Reading Films.²

An interesting study using the Metronoscope was conducted by Garver and Matthews. The Metronoscope has a

1. W. F. Dearborn and S. V. Wilking, "Improving the Reading of College Freshmen," School Review, XLIX (November, 1941), 668-678.

2. M. D. Glock, "The Effect Upon Eye-Movements and Reading Rate at the College Levels of Three Methods of Training," The Journal of Educational Psychology, 40 (February, 1949), 93-104.

similar purpose to that of the Harvard Reading Films. It attempts to improve reading rate and comprehension by decreasing the number of fixations and regressions in material read, and by increasing the span of recognition. The students involved were members of the slowest section of the seventh, eighth, and ninth grades at a junior high school. Prior to the experiment all the pupils were given Form A of the Iowa Advanced Silent Reading Tests. After the experiment they were tested with Form B to see what had happened to their comprehending abilities. The experiment utilizing the Metronoscope consisted of two periods a week, for a total of ten weeks. Garver and Matthews concluded from their results that the Metronoscope is valuable in bringing pupils up to grade in rate of reading.³ In addition "speed drills under controlled conditions as exist with the use of the Metronoscope for improving rate of reading do not result in a decrease in comprehending what is read, as is frequently claimed."^{3a}

These studies indicate that mechanical devices, such as the Harvard Reading Films and the Metronoscope are successful in improving reading rate.

Studies Dealing With Improvement
In Rate of Reading and Comprehension

Reading rate and comprehension are important aspects of

3. F. M. Garver and R. D. Matthews, "An Analysis of the Results of Speed Drills with the Metronoscope to Increase Reading Ability," The Journal of Educational Psychology, XXX (December, 1939), 693-698.

3a. Ibid., p. 698.

the reading process. Starch, Traxler, Buswell, and Tinker give some indication of the relationship of rate of reading to comprehension. Starch, in a study using slow and fast readers, found that the percentage of comprehension for fast readers was almost as great as that for slow readers, notwithstanding the fact that they read almost four times as fast.⁴

Traxler says that a survey of research in reading reveals that

"There is a significant, but fairly low, positive correlation between speed and comprehension of reading. In other words, there is some tendency for the faster readers to understand what they read better than slower ones do, although the relationship is not high and there are many exceptions to the general rule."⁵

Buswell, reporting on a study by J. M. McCallister, found that there is improvement in reading rate without loss in comprehension. Sixty-two cases were used in this study. Twenty-six were academic students, and eight were adult non-students. Initial tests were administered to test the reading abilities of the students. All of the subjects were found to be handicapped by a low rate of reading. After twenty-four, one hour periods of corrective exercises, tests were again administered. The results showed gains of 60 per cent in rate. This improvement in rate of reading was effected without any loss in comprehension. Buswell says that the

4. D. Starch, Educational Psychology, p. 335.

5. A. E. Traxler, "Research in Reading in the United States," Journal of Educational Psychology, 39 (March, 1949), p. 493.

findings support "the hypothesis that, at least above the elementary school level, rate and comprehension are relatively independent factors." He feels that there are no grounds for the popular fear that rapid reading is likely to be accompanied by serious deterioration in comprehension.⁶

In an investigation to determine the relation between rate of work and comprehension in reading, Tinker found evidence to indicate a significant relation between rate and comprehension in reading. He says that "the faster reader tends to comprehend better. This tendency varies from a slight relationship to a moderately high correlation."⁷

Ammons and Hieronymus report a study dealing with the use of the Harvard Reading Films in a program to improve reading abilities of college students. In addition to the films, reading selections and tests were used to facilitate gains in reading. Gains in reading were consistently greater for the experimental than for the control group. The experimental group gained an average of 234 words per minute in rate of reading on the Harvard equated reading selections, with no apparent loss in comprehension. All coefficients of correlation were positive, indicating the possibility of some underlying factor. Ammons and Hieronymus state that this factor might possibly be

6. G. T. Buswell, "The Improvement of Rate and Comprehension in Reading," Supplementary Educational Monographs, edited by W. S. Gray, V (December, 1943), 248-252.

7. Miles A. Tinker, "Rate of Work in Reading Performance as Measured in Standardized Tests," Journal of Educational Psychology, XXXVI (April, 1945), 226-227.

verbal intelligence.⁸

Intelligence And Reading Ability

A review of the literature reveals several studies dealing with the relationship between intelligence and reading abilities. Educators have been interested in the relationship between intelligence and reading rate and comprehension.

Carlson conducted a study among 330 fifth grade pupils from eight schools to investigate problems relating to intelligence and speed and comprehension in reading. He used the Gates Silent Reading Tests to gain measures of reading rate for different purposes. In addition Carlson devised tests to measure reading rate at different levels of difficulty. The California Test of Mental Maturity was used to test the intelligence level of the pupils. Examination of Carlson's data reveals that at the upper level of intelligence the rapid readers were more efficient. At the lower and middle levels of intelligence slow readers tend to be more adequate. Correlations between the middle and lower levels of intelligence scores and scores obtained by reading material of varying difficulty were significant at the 5 or 1 per cent levels of confidence. Coefficients of correlation between the upper level intelligence scores and scores obtained by reading material of varying difficulty

8. R. B. Ammons and A. N. Hieronymus, "Critical Evaluation of a College Program for Reading Improvement," The Journal of Educational Psychology, 38 (December, 1947), 449-470.

were statistically insignificant. Lastly, an increase in the difficulty of materials had less influence on the relationship between rate of reading and accuracy of comprehension at the upper level of intelligence.⁹

The students who scored lowest in a reading test were selected for an experiment conducted by the Presseys. Classes in remedial reading were attended by 422 students for a seven week period. Lectures were given stressing eye movements, vocalization, and how to read paragraphs. A simple type of tachistoscope was devised for training in phrase reading. Initial and final tests were given to note the effects of training. The Presseys concluded that the higher the intelligence of the students involved in the training program, "the larger the per cent who reached a final standing of the 45th percentile or more. Especially noticeable is the very poor standing of those in the lowest quarter of intelligence."¹⁰

A study by Sisson indicates that rate of reading "is the temporal dimension of comprehension. The two do not exist as separate processes, but are two aspects of one and the same process; namely, reading."¹¹ Sisson has analyzed factors which are significant determiners of individual differences

9. T. R. Carlson, "The Relationship Between Speed and Accuracy of Comprehension," Journal of Educational Research, XLII (March, 1949), 500-511.

10. L. C. and S. L. Pressey, "Training College Freshmen to Read," Journal of Educational Research, XXI (March, 1930), p. 203.

11. E. D. Sisson, "The Causes of Slow Reading: An Analysis," The Journal of Educational Psychology, XXX (March, 1939), p. 206.

in reading ability. He states that intelligence is one of the most significant of these factors.

An experiment conducted by L. R. and V. D. Wheeler indicates a positive relationship between intelligence and reading ability. The Wheelers employed the American Psychological Corporation's intelligence and reading tests for the purpose of finding the relationship between intelligence and reading ability. The reading scores were correlated with the linguistic, quantitative and gross intelligence scores of university freshmen. They found a high degree of relationship between reading ability and linguistic scores ($r = .70$). A lower degree of relationship was found between reading ability and quantitative scores ($r = .36$). And a high degree of relationship between reading ability and the total scores ($r = .71$) was obtained. They concluded that a relationship exists between reading ability and intelligence as measured by the linguistic and quantitative measures.¹²

Intelligence and Reading Gains

McCullough explored the relationship between intelligence and gains in reading abilities. She says that previous studies in remedial work have exhibited a substantial relationship between reading ability and intelligence as measured by standardized tests. To gather information regarding the relationship between intelligence and reading

12. L. R. and V. D. Wheeler, "The Relationship Between Reading Ability and Intelligence Among University Freshmen," The Journal of Educational Psychology, 40 (April, 1949), 232-236.

ability, McCullough conducted studies with two different groups. The first group, 24 ninth-grade students, was given intelligence tests and reading tests. At the end of a nine-week period, stressing corrective instruction, they were again given reading tests to note improvement. The second group, consisting of 49 college students, was also given intelligence and reading tests. The college students met for ten weeks for instructions of the study type, for discussion and written work on topics of interest to them, and for vocabulary and comprehension exercises. At the end of the program the students were again examined by means of reading tests. Substantial gains were found in every major phase of the work. Comprehension scores revealed substantial gains. Coefficients of correlation between intelligence test scores and reading comprehension gains for both groups indicated no relationship. "According to both studies there is no relationship between comprehension improvement in such courses and intelligence."¹³

The summary of research articles dealing with intelligence, rate of reading and comprehension is not exhaustive, nor are all these directly related to the present study. However, all the studies reviewed have a bearing on one or another aspect of the present problem, and are therefore pertinent to this paper. To the writer's knowledge only one study has

13. C. M. McCullough, "Relationship Between Intelligence and Gains in Reading Ability," The Journal of Educational Psychology, XXX (December, 1939), p. 690.

been made on the relationship between intelligence and gains in reading ability, and none have used the Harvard Reading Films in this precise connection. It is therefore felt that there is justification for this investigation.

CHAPTER III

PROCEDURE AND RESULTS

Procedure

The present study represents an attempt to determine the relationship between intelligence and improvement in rate and comprehension in a program utilizing the Harvard Reading Films. The data were collected from a group of 35 volunteer students at the University of Detroit, Detroit, Michigan. Originally, there were 65 students, but sickness, lack of interest, and other factors reduced the total to 35. Of this number, 16 were students from the College of Commerce and Finance and 19 were from the College of Arts and Science. Further refinement of the data reveals that 3 of the students were seniors, 11 were juniors, 11 were sophomores, and 10 were freshmen.

Since the purpose of the investigation was to determine only the relationship between intelligence and improvement in rate and comprehension in reading it was not necessary to be concerned with such factors as sex, age, scholastic achievement, etc.. All that was required of the students was that they express a desire to improve their reading habits. It was noted, however, that 25 students were below the fiftieth percentile in rate of speed, and 16 were below the

fiftieth percentile in total comprehension.¹ Thus it was apparent that many needed training in reading.

The administration of tests, showing of the films, and completion of the reading exercises covered a period of nine weeks. The students were divided into two sections and met for one-hour periods, twice a week. Initial and final testing involved the use of the American Council on Education Psychological Examination, 1946 edition; the Diagnostic Reading Tests, Survey Sections, Forms A and B; and the Harvard University Reading Course Tests, Forms A and B. The reading tests were balanced by giving half of the students Form A and the other half Form B. To reduce practice effect, all students took one form of the tests in the initial testing, and the other form in the final testing.

The American Council on Education Psychological Examination, 1946 edition, (A.C.E.) was used to determine the general intelligence of the students in both initial and final testing. The test is constructed to determine the quantitative and linguistic abilities of an individual. It is a group examination, with three quantitative and three linguistic subtests arranged in alternate order. The quantitative portion consists of the following tests: Arithmetical Reasoning, Number Series, and Figure Analogies. The linguistic portion consists of the Same-Opposite, Completion, and Verbal Analogies tests. The A.C.E. test yields quantitative, linguistic and total scores for purposes of evaluation. In exploring the relation-

1. Percentile rating table of the University of Denver. Diagnostic Reading Tests Manual.

ship between intelligence and improvement in rate of reading and comprehension only the total score was used.

The test was administered, under uniform conditions, to the two sections at different times. The general instructions for administration of the test were carefully followed. Time was given for the working of the practice problems; questions were answered; time limits for each test were announced; and time was accurately kept.

The tests were scored manually, and the quantitative, linguistic and total scores recorded. The total score is obtained by adding the quantitative and linguistic scores together. Since the test was constructed for use with college freshmen, and the majority of the subjects were sophomores, juniors and seniors, the percentile table for raw score conversion could not be used. It was therefore necessary to use the total raw scores in statistically analyzing the data.

Reading ability was measured first by use of Forms A and B of the Diagnostic Reading Tests. These tests consist of three subtests: General Reading, Vocabulary, and Comprehension. The subtest in general reading measures rate of reading of interesting story-type material and also comprehension of what is read. The comprehension checks consist of 20 items. The vocabulary subtest consists of 60 items drawn from the general vocabulary. The comprehension subtest consists of four selections of reading material similar to those found in textbooks in social studies and science.

Five separate scores are obtained from this test: 1a, a measure of rate of reading obtained by noting the number of the line being read at the end of three minutes; 1b, a measure of story comprehension consisting of 20 items; 2, a measure of vocabulary consisting of 60 items; 3, a measure of comprehension including items 1 to 20 and 81 to 100; and 4, a measure of total comprehension consisting of items 1 to 100.

The two sections of subjects were tested separately, but under similar conditions. The students were allowed to work the practice problems and ask questions. Time was accurately kept to obtain the reading rate of the subjects. Instructions for administering the test were rigidly adhered to.

Five separate scores were recorded by correcting the tests manually. Because this test is constructed for use from the seventh grade to the freshmen level in college, percentile ranks provided by the authors could not be used. It was, therefore, necessary to use the raw scores directly.

The Harvard Reading Course Tests A and B were used to obtain a second measure of reading rate and comprehension. One form is used as Lesson 1 in the reading selections, and the other as a retest in Lesson 16. Each test consists of two parts. Reading rates are obtained from both parts and averaged together. There are ten comprehension checks for each part, making a total of twenty items. The comprehension

scores are totaled together to obtain the comprehension score.

The two groups of students were tested on different days, under uniform conditions. Instructions for administering the test were carefully followed. Rate of reading was determined by the following method: the subjects were told to begin reading the test selection; after 45 seconds had elapsed the instructor began to put the time in seconds, at 5 second intervals on a blackboard; and as each subject finished he noted the time it took him to read the material by recording the last number that appeared on the blackboard as he finished the reading test. A table provided by the authors was then used to convert the total time to read the material into words per minute. The comprehension checks were scored manually. The scores for the two parts were added together and an average score obtained. The raw scores were used directly in analyzing the data.

After the battery of tests had been administered the reading selections for improving speed of comprehension were passed out. The selections consist of fourteen reading lessons of varied content. In addition there are the two tests which are designated as lesson 1 and lesson 16 (see p. 23). The subjects can time themselves for reading rate, and there is a table for converting obtained times to words per minute. At the end of each lesson are ten comprehension checks. A key is provided in the book containing the correct answers.

Lastly, there is a scoring graph which gives the subject an opportunity to keep a daily record of his progress. The students were instructed to read a selection for each film that was shown. They were also instructed to plot their daily progress on the scoring graph. The students plotted daily rate of reading and comprehension on the graph.

After the reading exercise materials had been distributed, the films themselves were shown. There are sixteen films in all. Their purpose is to relieve the student of concern regarding his eye movements. The films tend to restrict regression, result in fewer fixations per line, facilitate more rhythmic reading and thereby aid the student to improve his reading.

The text material of the Harvard Reading Films is projected from a 16 millimeter camera by phrases. The films vary from 180 to 470 words per minute with the machine running at silent speed. The first two films have five phrases per line. Films three through six have four phrases per line. Films seven through fourteen are reduced to three phrases per line. And the last two films have only two phrases per line. After the brief exposure of a phrase it disappears and the next one in the line appears. This pattern continues across and down in conventional reading direction. The material has been phrased in accordance with the fixation span of good readers. The purpose of phrasing is to train poor readers to increase their span of recognition.

A set of comprehension checks accompanies the films. Each film has ten questions accompanying it, and the subjects answer these questions immediately after the presentation of a film. A chart is provided in the comprehension booklet to enable the subject to record his progress.

Time limitations made it necessary to present the first six films in a two-week period. Two films were presented the first period of each week and one film during the last period. The students completed the comprehension checks immediately following each film. Since time was too limited for completion of the reading selections during the first period, the students were requested to complete them at home. During the second period the reading selections were completed in class. The rest of the films were shown at the rate of one each period. The procedure for the rest of the program was as follows: A film was shown at each meeting, the subjects answered the film comprehension check questions, a reading exercise was completed, and the film was shown again.

Final testing consisted of examination to note gains in rate of reading, comprehension, and intelligence. The American Council on Education Psychological examination; The Diagnostic Reading Tests, Form A and B; and the Harvard Course, Tests A and B, were used to accomplish this task.

Results

Relationship Between Intelligence and Improvement in Speed
And Comprehension

Coefficients of correlation for intelligence, as measured by the A.C.E. test, and gain in speed and comprehension, as measured by the Diagnostic Reading Tests, were obtained by use of the Pearson Product-Moment method. Results of this analysis are presented in Table I.

TABLE I

Coefficients of Correlation
Between Total Initial Intelligence
Scores And Gains in Diagnostic
Reading Tests Scores

Total Initial Intelligence Test Scores and:	r
1a. Rate of reading	.626*
1b. Story Comprehension	.096
2. Vocabulary	-.106
3. Comprehension	-.044
4. Total Comprehension	-.108

*Significant at the 1% level of confidence.

TABLE II

Correlations Between Total
Initial Intelligence Scores And
Differences In Harvard Reading
Course Tests Scores

Total Initial Intelligence Test Scores and:	r
Rate of Reading	.344*
Comprehension	-.201

*Significant at the 5% level of confidence.

An analysis of Table I reveals that there is a substantial degree of relationship between intelligence and improvement in rate of reading.² The correlation of .626 is significant at the 1 per cent level. Table I further indicates a negligible relationship between intelligence and gains in the different categories of comprehension. The correlations range from a minus .044 to minus .108. All these correlations are statistically insignificant and not indicative of any true relationship. Therefore, the data demonstrate a substantial relationship between intelligence and improvement in rate of reading, but a negative, negligible degree of relationship between intelligence and improvement in comprehension.

The results of Table II indicate however that there is a low degree of relationship between intelligence and improvement in rate of reading as measured by the Harvard Reading Course Tests.³ The correlation of .344 between gains in speed and intelligence is statistically significant at the 5 per cent level. There is a low, minus relationship between intelligence and gains in comprehension. The coefficient of minus .201 between intelligence and gains in comprehension is statistically insignificant. The conclusion appears to

2. Plus or minus correlations from .40 to .69 are arbitrarily described as being substantial.

3. Plus or minus correlations from .20 to .39 are arbitrarily described as being low.

be that there is a low, positive degree of relationship between intelligence and improvement in reading rate, and a low minus relationship between intelligence and improvement in comprehension.

To arrive at a more adequate picture of the relationship between intelligence and improvement in reading ability, the final intelligence test scores and gains in rate of speed and comprehension were correlated. The coefficients yielded by this investigation are shown in Tables III and IV.

Examination of Table III indicates that there is a substantial degree of relationship between intelligence and improvement in rate of reading. The correlation between intelligence and improvement in rate of speed of .446 is significant at the 1 per cent level. Further analysis shows a negligible relationship between intelligence and differences in comprehension. The correlations are statistically insignificant, ranging from plus .067 to minus .137. There appears to be little relationship between a students' intelligence and his improvement in comprehension.

TABLE III

Coefficients of Correlation Between Total
Final Intelligence Test Scores And Gains
In Diagnostic Reading Test
Scores

Total Final Intelligence Test Scores and:	r
1a. Rate of Reading	.446*
1b. Story Comprehension	-.137
2. Vocabulary	.045
3. Comprehension	-.067
4. Total Comprehension	-.037

*Significant at the 1% level of confidence.

Table IV presents the results of correlating final intelligence test scores and differences in reading rate and comprehension as measured by the Harvard Reading Course Tests. The correlation of .373 between intelligence and improvement in rate of reading is significant at the 5 per cent level. There is a low degree of relationship between intelligence and improvement in rate of speed. The correlation of .057 between intelligence and improvement in comprehension is statistically insignificant and indicates a negligible relationship. The evidence again indicates a low, significant relationship between intelligence and improvement in rate of reading, but little relationship between intelligence and gains in comprehension.

TABLE IV

Coefficients of Correlation Between
Total Final Intelligence Scores And
Differences in Harvard Reading Course
Test Scores

Total Final Intelligence Test Scores and:	r
Rate of Reading	.373*
Comprehension	.057

*Significant at the 5% level of confidence.

The results of the investigation of the relationship between intelligence and improvement in rate of reading and comprehension indicates quite clearly that, within the limitations of the instruments used, there is a positive,

substantial degree of relationship between intelligence and rate of reading,⁴ and a negligible degree of relationship between intelligence and improvement in comprehension. All correlations between intelligence and improvement in speed were significant at either the 1 per cent or 5 per cent levels of confidence. On the other hand, all correlations between intelligence and improvement in comprehension were statistically insignificant.

Several factors influence the results of this study. The American Council on Education Psychological Test results are to some extent dependent on the reading ability of the student. A fast reader, whose comprehension is equal to that of a slow reader, tends to answer more questions, and therefore has a greater opportunity to obtain a higher total score. In addition a student who comprehends well tends to have a higher total score than a student who has difficulty in comprehending what he reads. Hence a high A.C.E. score is to some extent determined by reading comprehension. A student with a high intelligence score will tend to get a high initial comprehension score. Since improvement in the reading comprehension is limited by the number of items on the test, his comprehension score will not increase very much. Gains, then, in comprehension for those who are high on the initial intelligence test are bound to be small. These subjects cannot show a gain in comprehension in proportion to their intelligence score. Hence, these subjects will tend to lower the obtained correlations.

4. The average of the correlations between intelligence and rate of reading is .447, indicating a substantial relationship.

Gains in comprehension were further restricted by the limited number of items of the Harvard Reading Course Tests. The range of the comprehension scores was from 6 to 18 on the test. A student with an initial comprehension score of 18 would have less opportunity to improve than a student who had an initial comprehension score of 6. Limitation of the range of the Harvard Reading Course Tests scores may well have brought down the correlations between intelligence and gains in comprehension.

Relationship Between Improvement in Rate
of Reading and Comprehension

The writer expected to find a high degree of relationship between improvement in rate of reading and comprehension as measured by the Diagnostic Reading Tests and the Harvard Reading Course Tests. The results of the investigation do not substantiate our expectation. Examination of Table V indicates that there is a negligible relationship between increase in speed and increase in comprehension. The correlations between improvement in rate of reading and improvement in comprehension range from plus .169 to minus .092, and are statistically insignificant. There apparently is no true relationship between the two variables.

TABLE V

Coefficients Of Correlation Between Gains
In Rate Of Reading And Comprehension Of The
Diagnostic Reading Tests

Gains in Rate of Reading and Gains in:	r
1b. Story Comprehension	.112
2. Vocabulary	-.092
3. Comprehension	.169
4. Total Comprehension	.000

Further indication of a negligible relationship between differences in rate of reading and comprehension was found by correlating gains in rate of reading with gains in comprehension of the Harvard Reading Course Tests Scores. The resulting correlation of .109 between improvement in speed and gains in comprehension was negligible. This correlation is insignificant statistically. It can only be concluded that improvement in rate of reading and improvement in comprehension are relatively independent factors at the college level.

Relation Between The Diagnostic Reading Tests
and Harvard Reading Course Tests In
Measuring Improvement In Speed And
Comprehension

Correlations were obtained to find out whether the two tests were consistent in measuring improvement in speed and comprehension. Improvement of speed scores was used to give an indication of the relation between the two tests in terms of increase in speed. Gains in Story Comprehension scores were correlated with gains in comprehension scores of the

Harvard test. An indication of the relationship between these two tests in measuring improvement in speed and comprehension is found in Table VI.

Table VI

Correlations Between Diagnostic Reading Tests Scores and Harvard Reading Course Tests Score as an Indication of Consistency

Gains in Diagnostic Reading Tests Rate of Reading and Comprehension Scores and:	r
Harvard Reading Course Tests Gains in Rate of Reading	.802*
Harvard Reading Course Tests Gains in Comprehension	-.029

*Significant at the 1% level of confidence.

Examination of this table indicates that there is a high degree of correlation between the two tests in their measurement of increases in speed. The correlation between increases in speed of .802 is significant at the 1 per cent level of confidence. The correlation of minus .029 between increases in comprehension on the two tests is negligible and statistically insignificant. The Diagnostic Reading Tests and Harvard Reading Tests appear to be highly comparable when used to measure improvement in speed, but not when used to measure improvement in comprehension. The Diagnostic Reading Tests and Harvard Reading Course Tests are consistent in measuring gains in rate of reading. However, these two tests are not consistent in measuring improvement in comprehension. The negligible correlation between gains in comprehension indicates that the two tests are not reliable in measuring improvement in comprehension.

Evaluation of the Reading Program as a Means of Improving Reading Ability in College Students

Differences in speed and comprehension were quite noticeable in the reading program. The data were subjected to statistical analysis to determine whether the observed differences were of such magnitude that they could not be attributed to chance factors or sampling variations. In addition, intelligence score gains were so outstanding that it was deemed advisable to determine whether the gains were due to chance, sampling variation, or to the reading program. The statistical procedure involved determining the means of initial and final scores, the standard deviation of the differences, the standard error of the differences, and finally, the critical ratios.

Inspection of Table VII reveals a large difference between the means of initial and final scores in rate of reading of the Diagnostic Reading Tests. Examination of the table reveals that the mean for initial test scores was 268.09 and that for final scores, 379.43. The standard deviation of the differences is 67.85; and the standard error of differences is 11.635. The critical ratio is 9.569 which is significant beyond the 1 per cent level of confidence and indicative of a dependable difference. A comparison of the initial and final means of the Harvard Reading Tests also reveals a substantial difference. The initial test mean is 217.14 and the final test mean is 343.46. The standard deviation of the differences is 80.59; and the standard

error of the differences is 13.820. The critical ratio of 9.121 is significant beyond the 1 per cent level of confidence and indicative of a dependable difference. Therefore, the data demonstrate that the reading program was effective in improving rate of the subjects.

TABLE VII

A Comparison of Initial and Final Rate of Reading Scores Based on the Diagnostic Reading Tests and Harvard Reading Course Tests

	Initial Mean	Final Mean	σ	σ_x	C.R.
Diagnostic Rate of Speed	268.09	379.43	67.85	11.635	9.569*
Harvard Rate of Speed	217.14	343.46	80.59	13.820	9.121*

*Significant beyond the 1% level of confidence.

Differences between initial and final test scores in comprehension were not as pronounced as the rate of reading score differences. Table VIII presents the comparative data of differences between initial and final comprehension scores of the Diagnostic Reading Tests and of the Harvard Reading Course Tests. A comparison of the comprehension scores reveals the following information:

The initial and final comprehension score means of (1b) Story Comprehension are 15.31 and 15.43. The standard deviation of the differences is 4.16, and the standard error of the differences is .714. The critical ratio of .041 is statistically insignificant. Initial and final means for (2) Vocabulary are 43.69 and 46.89 respectively. The standard deviation of the differences is 5.29; and the standard error

TABLE VIII

A Comparison of Initial and Final Comprehension Scores Based on the Diagnostic Reading Tests and Harvard Reading Course Tests

Diagnostic Reading Tests	Initial Mean	Final Mean	σ	σ_d	C.R.
1b. Story Comprehension	15.31	15.34	4.16	.714	.041
2. Vocabulary	43.69	46.89	5.29	.909	3.630*
3. Comprehension	28.46	30.80	4.79	.821	2.853*
4. Total Comprehension	72.14	75.54	6.68	1.144	2.992*
Harvard Reading Course Comprehension	12.97	12.32	3.16	.542	1.205

*Significant beyond the 1% level of confidence.

of the difference is .909. The critical ratio of 3.630 is significant beyond the 1 per cent level of confidence. Initial and final means for (3) Comprehension are 28.46 and 30.80 respectively. The standard deviation of the differences is 4.79; and the standard error of the differences is .821. The critical ratio of 2.853 is significant beyond the 1 per cent level of confidence. The (4) Total Comprehension score initial and final means are 72.14 and 75.54 respectively. The standard deviation of the differences is 6.68; and the standard error of the differences is 1.144. The critical ratio of 2.992 is significant beyond the 1 per cent level of confidence. The overall picture indicates that the reading program was not very effective in improving the comprehension of the subjects. The gains in comprehension were not large

enough to warrant the conclusion that they were due to participation of the students in the reading program. The gains in comprehension may well have been due to practice effect as the results of taking the initial tests.

Inspection of Table VIII reveals that the initial comprehension score mean of the Harvard Reading Course Tests is 12.97 and that of the final test, 12.32. The standard deviation of the differences is 3.16; and the standard error of the difference is .542. The critical ratio of 1.205 is statistically insignificant. A comparison of the means reveals a loss of .165 between the initial and final tests.

The general conclusion, based on examination of Tables VII and VIII, is that the reading program was successful as a means of improving the rate of reading, while not sacrificing the comprehension of the subjects who participated in this study. It would appear that the Harvard Reading Films and reading exercises are effective techniques for improving the reading rate while maintaining the level of comprehension of college students.

William Gray states that a survey of reading programs indicates that the intelligence scores of students often increase after participation in a reading program.⁵ The data presented in Table IX bear out this statement.

5. William S. Gray, "Summary of Reading Investigations," Journal of Educational Research, XXIX (February, 1936), 411-492.

TABLE IX

A Comparison of Initial and Final Intelligence Scores After Participation in a Reading Program

	Initial Mean	Final Mean	σ	σ_d	C.R.
Quantitative Scores	41.26	45.20	5.65	.971	4.071*
Linguistic Scores	65.63	77.26	10.79	1.850	6.285*
Total Scores	106.89	122.46	7.91	1.183	13.162*

*Significant beyond the 1% level of confidence.

The initial and final quantitative score means are 41.26 and 45.20 respectively. The standard deviation of the differences is 5.65; and the standard error of the differences is .971. The critical ratio is 4.071 which is significant beyond the 1 per cent level of significance. The initial and final means of the linguistic part are 65.63 and 77.26 respectively. The standard deviation of the differences is 10.79; and the standard error of the differences is 1.850. The critical ratio of 6.285 is significant beyond the 1 per cent level of confidence. The total score means of 106.89 and 122.46 respectively are indications of the large intelligence score gains by the students. The standard deviation of the differences is 7.91; and the standard error of differences is 1.183. The critical ratio of 13.162 is considerably beyond the 1 per cent level of confidence. It is evident from these data that the differences are not due to chance factors. Since the same form of the examination was used in the initial and final testing, it is probable that some of the increase was due to practice effect. It

is, however, problematical whether the gains of 3.94 in quantitative scores, of 11.63 in linguistic scores, and of 15.57 in total scores is totally due to practice effect. It is therefore, highly probable that some of the increases in the intelligence scores were the result of the reading program.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The present study represents an attempt to determine whether or not there is a relationship between intelligence and improvement in rate of reading and comprehension in a program utilizing the Harvard Reading Films.

The first step involved an attempt to define the concepts of intelligence, rate of reading, and comprehension. It was indicated that there is a wide divergence of opinion regarding the exact nature of intelligence. Definitions of intelligence by Thorndike, Pintner, Terman, Calvin, Henmon, Peterson, Thurstone, Wechsler, and Schneiders and O'Brien were summarized. It was pointed out that the concept of intelligence given by Schneiders and O'Brien attempted a synthesis of the other definitions reviewed.

Research indicated that there is a wide range of opinion regarding the nature of speed and comprehension in the reading process. Discussions of rate of reading and comprehension by Burkart, Harris, Gates, Tinker, and Triggs gave a satisfactory picture of these two aspects of the reading process. It was pointed out that, in the opinion of the present author, rapid reading is necessary at the college level, where the emphasis is put on extensive rather than intensive reading.

Investigation of the literature revealed a number of studies related to the problem. With one exception, none of the studies bore directly upon the present problem. However, these studies were pertinent to the present investigation because they treated of various aspects of the general problem. Dearborn and Wilking found that reading films can be utilized to increase speed of reading. Garvers and Matthews concluded from their experiment that the Metronoscope is valuable for bringing seventh, eighth, and ninth grade pupils up to grade in rate of reading.

Starch, Traxler, Buswell, Tinker, and Ammons and Hieronymus gave some indication of the relationship of rate of reading to comprehension. Starch stated that the percentage of comprehension for fast readers was almost as great as that for slow readers, notwithstanding the fact that they read almost twice as fast as the slow readers. Traxler indicated that there is a correlation between speed and comprehension of reading, although there are many exceptions to this relationship. Buswell found that there is improvement in reading rate without loss in comprehension. An investigation to determine the relationship between rate of work and comprehension led Tinker to state that the faster reader tends to comprehend better. Ammons and Hieronymus, utilizing the Harvard Reading Films to improve the reading abilities of college students, found that reading rate could be increased with no apparent loss of comprehension.

Several studies were reviewed concerning the relationship

between intelligence and reading abilities. Carlson found that the relationship between intelligence and reading varies with the speed of the reader and of the material read.

The Presseys concluded that the higher the level of intelligence of students involved in the reading program, the greater the per cent who reached the 45th percentile in reading, in comparison to those in the lowest quarter of intelligence. Sisson analyzed factors which are determiners of individual differences in reading ability, and found that intelligence is one of the most significant of these factors. Indications of a positive relationship between intelligence and reading ability were found by L. R. and V. D. Wheeler.

The study by McCullough investigated the relationship between intelligence and improvement in comprehension. She concluded that there is no relationship between intelligence and improvement in comprehension.

It will be recalled that the aim of the present investigation was to determine the relationship between intelligence and improvement in rate of reading and comprehension in a program utilizing the Harvard Reading Films. The data were collected from a group of 35 volunteer students at the University of Detroit, Detroit, Michigan. Of this number, 16 were students from the College of Commerce and Finance, and 19 were from the College of Arts and Science. Further refinement of the data revealed that 3 of the students were seniors, 11 were juniors, 11 were sophomores, and 10 were freshmen.

The administration of the tests, showing of the films, and completion of the reading exercises covered a period of nine weeks. Initial and final testing involved the use of the American Council on Education Psychological Examination, 1946 edition; the Diagnostic Reading Tests, Survey Sections, Forms A and B; and the Harvard Reading Course Tests, Forms A and B. The A.C.E. test was used to determine the general intelligence of the subjects before and after the reading program. The reading tests were utilized to determine the initial reading ability of the subjects, and improvement in rate of reading after the program. Information regarding the composition and administration of the tests was also indicated.

The reading exercises and Harvard Reading Films used in the reading program were then described. The reading selections consisted of 14 reading lessons of varied content and two tests which were designated as lesson 1 and lesson 16. There were 16 films in all shown to the subjects. The films varied from 180 to 470 words per minute with the projector running at silent speed. A set of comprehension checks accompanied the films. Each film had ten questions accompanying it, and the subjects answered these questions immediately after presentation of a film. Further information regarding the composition of the reading selections and Harvard Reading Films was given; and the function they served in the reading program was then outlined.

After the reading program was completed the final battery of tests was administered to note gains in rate of reading, comprehension, and intelligence.

Coefficients of correlation between intelligence, as measured by the A.C.E. test, and gains in speed and comprehension, as measured by the Diagnostic Reading Tests, were obtained by use of the Pearson Product-Moment method. Results obtained by correlating total initial and final intelligence test scores with improvement in rate of reading scores revealed a substantial relationship between the two variables. The average of the correlations (.447) was significant at the 1 per cent level of confidence. Correlations between total initial and final intelligence test scores and differences in comprehension indicated a negligible degree of relationship between the two variables. The correlations ranged from a minus .201 to a plus .096. All these correlations were statistically insignificant and not indicative of any true relationship.

The results of the investigation between intelligence and improvement in rate of reading and comprehension indicated quite clearly that, within the limitations of the instruments used, there was a positive, substantial degree of relationship between intelligence and improvement in rate of reading, and a negligible relationship between intelligence and improvement in comprehension. All the correlations between intelligence and improvement in speed were significant at the 1 per cent or 5 per cent levels of confidence. On the other hand, all

correlations between intelligence and improvement in comprehension were statistically insignificant. Mention was then made of several factors which might have influenced the size of the correlations.

Gains in both rate and comprehension as measured by the Diagnostic Reading Tests and Harvard Reading Course Tests were correlated to arrive at an indication of the relationship between these gains. The results of the investigation revealed that there is a negligible correlation between increase in speed and increase in comprehension. The correlations between improvement in rate of reading and improvement in comprehension ranged from plus .169 to minus .092, and were statistically insignificant. It was concluded that improvement in rate of reading and improvement in comprehension are relatively independent factors at the college level.

Correlations were also obtained to find out whether the Diagnostic Reading Tests and Harvard Reading Course Tests are consistent in measuring improvement in speed and comprehension. Examination of the results indicated that there is a high degree of correlation between the two tests in their measurement of increases in speed. The correlation of .802 between increases in speed was significant at the 1 per cent level of confidence. The correlation of minus .029 between increases in comprehension on the two tests was negligible and statistically insignificant. The Diagnostic Reading Tests and Harvard Reading Course Tests were consistent in

measuring gains in rate of reading. However, these two tests were not consistent in measuring improvement in comprehension. The negligible correlation between gains in comprehension indicated that the two tests were not reliable in measuring improvement in comprehension.

Differences in speed and comprehension were quite noticeable in the reading program. In addition, intelligence score gains were so outstanding that it was deemed advisable to determine whether the gains were due to chance, sampling variations, or to the reading program. The statistical procedure involved determining the means of initial and final scores, the standard deviation of the differences, the standard error of the differences, and finally, the critical ratios.

A comparison of initial and final rate of reading scores based on the Diagnostic Reading Tests and Harvard Reading Course Tests revealed that there was an overall average increase of 118.83 words per minute in the reading rate of the subjects. The critical ratio scores were 9.569 and 9.121 respectively. Both critical ratios were significant beyond the 1 per cent level of confidence and indicated a dependable difference. Therefore, the data demonstrated that the reading program was effective in improving rate of reading of the subjects.

It was found that differences between initial and final test scores in comprehension were not as pronounced as the rate of reading score differences. The differences between the initial and final means of the various comprehension categories ranged from a minus .65 to a plus 3.40. The critical

ratios ranged from .041 to as high as 3.630. All but two of the critical ratios were significant beyond the 1 per cent level of confidence. However, the overall picture indicated that the reading program was not very effective in improving the comprehension of the subjects. The gains in comprehension may well have been due to practice effects resulting from taking the initial tests.

On the basis of the results it was concluded that the program was successful as a means of improving the rate of reading, while not sacrificing the comprehension of the subjects who participated in this study. It would appear that the Harvard Reading Films and reading exercises were effective techniques for improving reading rate, while maintaining the level of comprehension of the college students.

Examination of the data revealed dependable differences between initial and final intelligence test scores. The gains between the initial and final means of the quantitative, linguistic, and total score categories were 3.96, 11.63, and 15.57 respectively. The critical ratios for the quantitative, linguistic, and total score differences were 4.071, 6.285 and 13.162 respectively. All these critical ratios were significant beyond the 1 per cent level of confidence. Since the same form of the examination was used in the initial and final testing, it was deemed probable that some of the increase was due to practice effect. However, it is doubtful whether the gains can be attributed solely to practice. It is therefore, highly probable that some of the increase in intelligence scores was the result of the reading program.

BIBLIOGRAPHY

ARTICLES

- Ammons, R. B. and A. N. Hieronymus, "Critical Evaluation of a College Program for Reading Improvement," The Journal of Educational Psychology, 38 (December, 1947), 449-470.

Make use of the Harvard Reading Films to increase rate of reading of college students.

- Burkart, K. H., "An Analysis of Reading Abilities," Journal of Educational Research, XXXVIII (February, 1945), 430-339.

An article which discusses the results of a study to determine the importance of factors involved in the reading process.

- Buswell, G. T., "The Improvement of Rate and Comprehension in Reading," Supplementary Educational Monographs, edited by W. S. Gray, V (December, 1943), 248-252.

Indicates that rate of reading can be increased without deterioration of comprehension.

- Carlson, T. R., "The Relationship Between Speed and Accuracy of Comprehension," Journal of Educational Research, XLII (March, 1949), 500-511.

Discusses several aspects of reading and their relationship to intelligence.

- Dearborn, W. F. and S. V. Wilking, "Improving the Reading of College Freshmen," School Review, XLIX (November, 1941), 668-678.

The Harvard Reading Films were used to improve reading in three groups of college students.

- Garver, F. M. and R. D. Matthews, "An Analysis of the Results of Speed Drills with the Metronoscope to Increase Reading Ability," The Journal of Educational Psychology, 40 (February, 1949), 93-106.

Program utilizing the Metronoscope to increase the reading rate of pupils in the seventh, eighth, and ninth grades.

Glock, M. D., "The Effect Upon Eye-Movements and Reading Rate at the College Levels of Three Methods of Training," The Journal of Educational Psychology, 40 (February, 1949), 93-106.

Author uses the Harvard Reading Films to increase reading rate at the college level.

Gray, William S., "Summary of Reading Investigations," Journal of Educational Research, XXIX (February, 1936), 411-492.

Discusses the effect of improvement in reading on intelligence.

McCullough, C. M., "Relationship Between Intelligence and Gains in Reading Ability," The Journal of Educational Psychology, XXX (December, 1939), 688-692.

A study indicating a meager relationship between A.C.E. intelligence scores and speed and comprehension scores.

Pressey, L. C. and S. L. Pressey, "Training College Freshmen to Read," Journal of Educational Research, XXI (March, 1930), 203-205.

An article having a table which shows the relation between intelligence and increase in reading ability.

Sisson, E. D., "The Causes of Slow-Reading: An Analysis," The Journal of Educational Psychology, XXX (March, 1939) 206-214.

Compares factors present in fast and slow readers.

Symposium: "Intelligence and its Measurement," The Journal of Educational Psychology, 12 (1921), 123-147; 195-216.

Theories of intelligence as stated by many different men interested in this aspect of personality.

Tinker, Miles A., "Rate of Work in Reading Performance as Measured in Standardized Tests," The Journal of Educational Psychology, XXXVI (April, 1945), 217-228.

Mentions factors which change the relation between reading rate and comprehension.

Tinker, Miles A., "Dr. Robinson on Speed Versus Comprehension in Reading: A Discussion," The Journal of Educational Psychology, XXXI (October, 1940), 559-560.

Answers Dr. Robinson's criticisms regarding his opinion of the relation between rate of reading and comprehension.

Thurstone, L. L., "A New Conception of Intelligence," Educational Record, XXXVII (1936), 441-450.

Thurstone, using his own method of factor analysis, announces seven primary factors which make for successful performance in testing situations.

Traxler, A. E., "Value of Controlled Reading," Journal of Experimental Education, XI (September-June, 1942-1944), 280-292.

An article dealing with the opinion of many reading experts regarding the value of controlled reading.

Traxler, A. E., "Research in Reading in the United States," The Journal of Educational Psychology, 39 (March, 1949), 481-499.

Survey of literature dealing with the relationship between speed and comprehension.

Wheeler, L. R., and V. D. Wheeler, "The Relationship Between Reading Ability and Intelligence among University Freshmen," The Journal of Educational Psychology, 40 (April, 1949), 230-238.

An article dealing with the relationship between A.C.E. intelligence scores and reading ability.

BOOKS

Gates, A. I., The Improvement of Reading: A Program of Diagnostic and Remedial Methods. 3rd edition. New York: The Macmillan Company, 1943, Pp. xix + 657.

General treatment of reading including valuable suggestion for diagnostic and remedial work.

Harris, A. J., How to Increase Reading Ability: A Guide to Diagnostic and Remedial Methods. 2nd edition. New York: Longmans, Green and Company, 1949. Pp. xxi + 581.

General treatment of reading including valuable suggestions for diagnostic and remedial work.

Schneiders, A. A. and M. J. O'Brien, Introductory Psychology, Ypsilanti University Lithoprinters, 1948, Pp. xiii + 305.

General treatment of the various fields of psychology.

Starch, D., Educational Psychology, Revised Edition. New York: The Macmillan Company, 1927, Pp. ix + 473.

A study having material which indicates a relationship between rate of reading in reading and comprehension.

Strang, R. M., Bibliography Relating to Reading on the High School and College Level. Columbia University: The Authors Teachers College, 1938, Pp. 196.

A bibliography of 196 pages, including references to problems in reading at grade school, high school and college levels.

Thorndike, E. L., et al., The Measurement of Intelligence. New York: Teachers College, Columbia University Press, 1927, Pp. xxvi + 613.

Further refinement of his concept of the nature of intelligence.

Triggs, Frances O., Remedial Reading: The Diagnosis and Correction of Reading Difficulties at the College Level. Minneapolis: University of Minnesota Press, 1943, Pp. viii + 219.

This book treats of various reading problems prevalent at the college level.

Wechsler, David, The Measurement of Adult Intelligence. 3rd edition. Baltimore: The Williams and Wilkins Company, 1944, Pp. vii + 258.

Contains a thorough discussion of theory and practice of intelligence testing.